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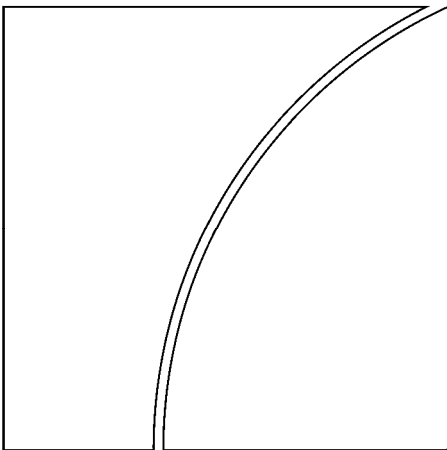
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The international financial crisis and policy challenges in Asia and the Pacific

Proceedings of the wrap-up conference of the Asian
Research Programme, Shanghai, 6–8 August 2009

Monetary and Economic Department

July 2010



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Programme

Thursday 6 August 2009

Welcome dinner hosted by Jaime Caruana, General Manager,
Bank for International Settlements

Friday 7 August 2009

Opening remarks

Zhou Xiaochuan, Governor, People's Bank of China

Jaime Caruana, General Manager, Bank for International Settlements

Presentation of the special BIS background paper for the conference

Chair: Már Gudmundsson, Deputy Head of Monetary and Economic Department,
Bank for International Settlements

The international financial crisis: the timeline, policy responses and impact in Asia and the Pacific, Andrew Filardo (BIS)

Session 1: Development of financial markets in Asia and the Pacific

Chair: Joseph Yam, Chief Executive, Hong Kong Monetary Authority

Keynote speech: Suresh Sundareshan, Capula Investment Management and Columbia University

Paper presentations:

Internationalisation of Asia-Pacific bond markets, Susan Black
(Reserve Bank of Australia), Anella Munro (BIS), Philip Wooldridge (BIS)

Private information, stock markets and exchange rates, Eric Chan
(BIS), Jacob Gyntelberg (BIS), Mico Loretan (BIS), Tientip Subhanij (Bank
of Thailand)

Discussant: Sukhdave Singh, Assistant Governor, Central Bank of Malaysia

High-level policy panel on the development of financial markets

Panellists: Joseph Yam, Chief Executive, Hong Kong Monetary Authority
Grant Spencer, Deputy Governor, Reserve Bank of New Zealand
Ong Chong Tee, Deputy Managing Director, Monetary Authority of
Singapore

Session 2: Monetary policy and exchange rate issues in Asia and the Pacific

Chair: Jaime Caruana, General Manager, Bank for International Settlements

Keynote speech: Charles Engel, University of Wisconsin

Paper presentations:

Targeting inflation in Asia and the Pacific: lessons from the recent past
Andrew Filardo (BIS), Hans Genberg (BIS)

Financial deleveraging and the international transmission of shocks
Michael Devereux (University of British Columbia), James Yetman (BIS)

Discussant: Kyungsoo Kim, Deputy Governor, Bank of Korea

High-level policy panel on monetary policy and exchange rate issues

Chair: Jaime Caruana, General Manager, Bank for International Settlements

Panellists: Amando Tetangco, Jr, Governor, Bangko Sentral ng Pilipinas
Ric Battellino, Deputy Governor, Reserve Bank of Australia

Adjournment

Conference dinner hosted by Zhou Xiaochuan, Governor,
People's Bank of China

Dinner address: Zeti Akhtar Aziz, Chair, Asian Consultative Council and Governor,
Central Bank of Malaysia

Saturday 8 August 2009

Session 3: Financial stability issues in Asia and the Pacific

Chair: Zhou Xiaochuan, Governor, People's Bank of China

Keynote speech: Charles Goodhart, London School of Economics

Paper presentations:

Contagion and risk premia in the amplification of crisis: evidence from Asian names in the CDS market, Mico Loretan (BIS), Don Kim (Yonsei University Business School), Eli Remolona (BIS)

Determinants of house prices in nine Asia-Pacific economies, Eloisa Glindro (Bangko Sentral ng Pilipinas), Tientip Subhanij (Bank of Thailand), Jessica Szeto (Hong Kong Monetary Authority), Haibin Zhu (BIS)

Discussant: Diwa Guinigundo, Deputy Governor, Bangko Sentral ng Pilipinas

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Masaaki Shirakawa, Governor, Bank of Japan
Tarisa Watanagase, Governor, Bank of Thailand

Closing remarks

Zeti Akhtar Aziz, Chair, Asian Consultative Council and Governor,
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Jaime Caruana, General Manager, Bank for International Settlements

End of formal sessions

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Introduction

Andrew Filardo and James Yetman¹

This volume is a collection of the speeches, presentations and papers from a conference on “The international financial crisis and policy challenges in Asia and the Pacific”. The event was co-hosted by the People’s Bank of China (PBC) and the Bank for International Settlements (BIS) to mark the formal completion of the BIS Asian Research Programme. It was held on 6–8 August 2009 in Shanghai, China, at the same location where the establishment of the Programme was first announced in 2006. Senior officials from all 12 Asian Consultative Council (ACC) central banks, as well as academic scholars and economists from the BIS Representative Office for Asia and the Pacific attended the conference. The formal addresses included speeches by Jaime Caruana, General Manager of the BIS, Zeti Akhtar Aziz, Chair of the ACC and Governor of the Central Bank of Malaysia, and Zhou Xiaochuan, Governor of the PBC.

The conference formally wrapped up the BIS Asian Research Programme (<http://www.bis.org/arp>). From September 2006 to August 2009, the Asian Research Programme focused on policy-oriented studies of topics of interest to central banks and supervisory authorities in Asia and the Pacific, and it co-organised a series of conferences, seminars and workshops in the region. The objectives of the three-year programme were to contribute to a better understanding of the policy challenges and to establish a lasting research footprint for the BIS in the region. Topics of interest included improving monetary policy and operations, developing financial markets, maintaining financial stability and strengthening prudential policy.

The conference also provided an opportunity to re-examine the existing approaches to preserving monetary and financial stability in Asia and the Pacific, in the light of the lessons of the international financial crisis. Even though the impact of the crisis was more muted in this region than elsewhere, there are many lessons to be learned.

Summary of the conference papers

The conference showcased a special background paper written especially for the event by the staff of the Asian Research Programme, offering a unique Asian Office perspective on the crisis. Three sessions then followed, reflecting the broad themes of the programme: the development of financial markets, monetary policy and exchange rates, and financial stability. Each session began with a keynote address from a pre-eminent academic scholar. This was followed by presentations of two BIS research papers produced in the Asian Research Programme, which in many cases were joint research efforts of the Asian Office and central bank colleagues from the region. Each session concluded with a high-level policy panel discussion.

¹ Bank for International Settlements

The international financial crisis in Asia-Pacific

The first presentation was based on a paper written by the economists of the Asian Office that outlines the impact of the international financial crisis on Asia and the Pacific. It offers a timeline of the developments in the region, as well as identifying key factors that help to explain the cross-country variations of the crisis in different economies. The policy challenges of the crisis for central banks in the region are highlighted.

Developing financial markets

The first full session focused on the development of financial markets in the region. The keynote address, by Suresh Sundaresan (Columbia University), offered several insights. First, financial market development in the region should take account of the large number of households who are effectively unbanked, given the potential for positive feedback effects between financial markets, economic growth and stability. Second, there is a need for fundamental banking reforms of capital structures and liquidity sources to mitigate bankruptcy risks, as well as the cost to taxpayers of insolvency and bailouts. Third, credit disintermediation in the shadow banking system, as seen during the crisis, represents a new development and requires corresponding changes in regulatory and policy frameworks to ensure a smooth transition to a more open and transparent financial system.

This first session also explored the remarkable developments in regional bond markets, based on two papers by Anella Munro and Philip Wooldridge, and Susan Black (Reserve Bank of Australia) and Munro respectively. The papers document the significant increases in non-resident involvement over the past decade, in both local currency and offshore bond markets. The growth can be explained in large part by a combination of gains in the competitiveness of domestic credit issuance and the development of efficient swap markets. The data show that borrowers across the region face different transactions costs in different markets. They therefore seek out opportunities to issue bonds in the lowest-cost markets and then swap the proceeds into the desired currency.

In the second paper of the session, Jacob Gyntelberg, Mico Loretan and Tientip Subhanij (Bank of Thailand) examine a unique set of daily data to identify the sources of equity price and exchange rate fluctuations in Thailand. They find that non-residents' equity transactions are driven primarily by private information and that only the relatively small portion of the net capital flows linked to these equity transactions has a permanent impact on the exchange rate. These results demonstrate that close monitoring of interactions between foreign exchange and capital markets can yield important information to policymakers.

Monetary policy and exchange rates

The second session explored key monetary policy and exchange rate issues in the region. In his keynote address, Charles Engel (University of Wisconsin) makes the case for stabilising exchange rates. He argues that large swings in exchange rates can lead to inefficient resource allocations and, therefore, justify a pro-active role for central banks to lean against such swings. However, he also raises some political economy concerns about whether policymakers can achieve the best outcome by intervening in foreign exchange markets in a benign way. He suggests that, given the counterproductive incentives for competitive devaluations, efforts to control exchange rate fluctuations may best be made in the context of cooperation among policymakers.

Andrew Filardo and Hans Genberg then examine the central bank experience in achieving price stability in the region. They compare the experiences of six Asia-Pacific central banks that adopted formal inflation targets with six that employ more eclectic approaches to monetary policy. The authors find that formally adopting an inflation target is not a dominant factor in accounting for differences in cross-country performance. The paper also argues that the inflation control and financial stability can reinforce each other in a properly designed monetary policy framework.

The second presentation in this session, based on a paper by Michael Devereux (University of British Columbia) and James Yetman, develops a model that seeks to account for international contagion during the recent international financial crisis. The key mechanism works through private sector balance sheets. During periods of financial turmoil, a collapse in asset prices that impair balance sheets in one country can lead, through a negative “international finance multiplier”, to a vicious circle of asset price declines across economies. In contrast, during normal times, balance sheet considerations have little effect on macroeconomic outcomes, and financial market developments are relatively independent across countries.

Financial stability

The final session addressed financial stability issues in Asia and the Pacific. The keynote address by Charles Goodhart (London School of Economics) compares the attractiveness of two different models of commercial banking, specifically the Anglo-Saxon model and the Asian model. The author argues that the Anglo-Saxon model imploded during the crisis for good reasons. He discusses the potential for a synthesis of the two models as a way forward, drawing on the desirable elements of the Asian model together with desired improvements to the Anglo-Saxon model based on lessons learnt during the crisis.

The presentation that followed, based on a paper by Don Kim (Yonsei University), Mico Loretan and Eli Remolona, explored the nature of the contagion from the West to Asia by looking at credit default swap (CDS) contracts and expected default frequencies (EDF). They argue that contagion in Asia during the crisis stemmed mainly from a rise in global risk premia, rather than a deterioration in the credit quality of Asian firms. The implications of this distinction for macroprudential policy are carefully spelled out.

The final paper, by Eloisa Glindro (Bangko Sentral ng Pilipinas), Tientip Subhanij (Bank of Thailand), Jessica Szeto (Hong Kong Monetary Authority) and Haibin Zhu, analyses the determinants of house prices in Asia and the Pacific. They characterise house prices as being made up of three factors: a fundamental factor; the deviation from the fundamental factor that can be attributed to frictions in the housing market; and a “bubble” component driven by overly optimistic expectations. Applying this approach to regional real estate, the authors find little evidence of generalised bubble behaviour in the past decade, despite evidence of frothy housing prices in some jurisdictions at times.

Electronic versions of the papers and presentations can be found at http://www.bis.org/arp/conf_0908.htm.

Executive summaries

“The international financial crisis: timeline, impact and policy responses in Asia and the Pacific” by Andrew Filardo, Jason George, Mico Loretan, Guonan Ma, Anella Munro, Ilhyock Shim, Philip Wooldridge, James Yetman and Haibin Zhu¹

The international financial crisis has become a defining event in economic history and will probably cast a long shadow over policymaking for years to come. Even though it may be risky to draw firm conclusions from this event for Asia and the Pacific before the cessation of the financial market headwinds, a number of lessons have already emerged for Asia-Pacific central banks that are likely to stand the test of time. Such lessons learned, though naturally still tentative, can contribute to the ongoing discussions in various national, regional and international forums. In particular, these lessons should help guide discussions about possible reforms of the financial system and also about the design of exit strategies to help ensure a return to sustainable and less crisis-prone growth while maintaining price stability.

To that end, the special background paper prepared for the conference examines the impact of the international financial crisis on Asia and the Pacific and the implications of this episode in economic history for central banks in the region. Part I presents a stylised timeline of the spillovers to the region, as well as key factors that account for the cross-country variations in the impact of the crisis. Part II explores some of the policy challenges posed by the crisis, through three lenses that correspond to the research priorities of the BIS Asian Research Programme: development of financial markets; monetary policy and exchange rates; and financial stability. Annex A details the range of actions taken by authorities in Asia and the Pacific since September 2008 to stimulate growth and stabilise financial markets and institutions.

Part I: Timeline

Pre-crisis conditions. Most countries in Asia and the Pacific entered the 2007–09 period with a sound set of economic and financial fundamentals. Standards of living were significantly higher after years of robust growth, inflation fairly well behaved, banking systems healthy, government fiscal positions sustainable, and foreign exchange reserves sizeable. In part, the region’s success can be attributed to many of the lessons learned from the Asian financial crisis of the late 1990s.

In spite of the underlying strength of the fundamentals, there were of course vulnerabilities, not least those arising from the increased financial and trade openness that was part and parcel of the growth story. Greater openness had not only helped to propel robust economic activity in the decade but had also widened channels through which the unexpected spillovers from the international financial crisis in the west could affect the region. For example, these financial vulnerabilities were eventually realised in the large portfolio flows, such as in Korea, Malaysia and Singapore, and fragility of household balance sheets owing to rising indebtedness, such as in Australia, Korea and New Zealand.

Phase 1. When the international financial crisis began in mid-2007, the initial impact on the Asia-Pacific region was limited in scale and severity. Financial markets were mildly disrupted in Australia and New Zealand, owing to those countries’ large external borrowing

¹ Staff at the BIS Asian Research Programme.

requirements, and Japan, owing to its close links to dollar and euro markets. In most other Asia-Pacific countries, banks were neither exposed to the structured credit products that caused so many problems for US and European institutions nor reliant on interbank or capital markets for funding. The region was nonetheless vulnerable to the decline in the risk appetite of global investors, and less creditworthy borrowers, for example in India and Indonesia, encountered difficulties accessing markets. Nevertheless, the strength of economic and financial fundamentals insulated the region from the worst of the spillovers and even led some to initially suggest that Asia and the Pacific had the ability to effectively decouple from economic and financial developments in the United States and Europe. Indeed, high commodity prices and building inflationary pressures continued to weigh heavily on the minds of many Asia-Pacific central bankers through the middle of 2008, despite the extent of the early financial headwinds coming from the west.

Phase 2. Together with the rest of the world, prospects for Asia and the Pacific abruptly changed in mid-September 2008 following the bankruptcy of US investment bank Lehman Brothers. The region experienced large capital outflows and serious difficulties refinancing US dollar liabilities. Most Asia-Pacific currencies depreciated, although an unwinding of carry trades contributed to an appreciation of the yen and the Hong Kong dollar. Asia-Pacific authorities responded by easing monetary policy aggressively and by intervening to stabilise financial markets. Liquidity assistance in local currency and in foreign currency along with government guarantees and recapitalisation schemes (see Annex A for detailed programmes across the region) significantly relieved financial market stresses and helped to prevent the metastasising of liquidity problems in the region into a full blown solvency crisis.

Phase 3. Towards the end of 2008, financial markets showed tentative signs of stabilising, albeit at a low level, and the attention of policymakers shifted to the rapidly deteriorating outlook for economic growth. Exports and industrial production plummeted in late 2008, leading to a pronounced deceleration of GDP growth, or outright economic contraction in some economies. The downturn was especially severe in the highly open economies such as Hong Kong SAR and Singapore. Monetary policies were eased further and special fiscal stimulus packages were passed across most of the region to support growth. Having reached the effective zero lower bound for the policy rate, Japan adopted unconventional monetary policy measures to stimulate financial conditions and economic activity while policy rates elsewhere in the region remained comfortably above the zero lower bound.

Phase 4 and beyond. From March 2009 onwards, policymakers and market participants appeared increasingly confident that the worst possibilities (ie tail risks) of the financial crisis and economic downturn had been avoided. Conditions in financial markets then improved significantly, and capital inflows to the Asia-Pacific region resumed. While the economic outlook for the global economy remained grim, it was no longer deteriorating. Tentative signs of a recovery in economic activity emerged in Asia and the Pacific towards the end of the first quarter of 2009, a few months earlier than in the United States and Europe. Indeed, growth in China appeared to rebound especially quickly, owing in large part to the effects of the country's large fiscal package. Policymakers thus increasingly turned their attention to strategies for exiting from the exceptional measures taken in late 2008 as well as reforms to mitigate the risk of future financial crises.

Part II: Policy challenges in Asia and the Pacific

The international financial crisis created immediate policy challenges in the region as central banks and other governmental authorities dealt with the spillovers. The underlying nature of the crisis also presented longer-term challenges concerning the possible need to adapt financial institutional structures and monetary policy frameworks to the changing policy environment. This part of the special background paper focuses on the effects of the crisis, the policy responses and the lessons for Asia-Pacific central banks in the decade ahead.

II.1 Monetary policy and exchange rates

The Asia-Pacific region had achieved considerable monetary stability with robust growth in the decade prior to the crisis, and this inflation-fighting credibility undoubtedly contributed to the resiliency of the region. During the first year of the international financial crisis, most central banks were still focused on rising inflationary pressures driven by food and energy prices and strong domestic demand, as the spillovers to the region were limited in scale and scope.

However, in September 2008 it was recognised that a different strategy was needed. As the outlook deteriorated rapidly after the collapse of Lehman Brothers, central banks reacted quickly and aggressively as tail risks (low probability, high impact) spiked. Monetary policymakers addressed the extreme financial and macroeconomic conditions with a diverse set of policy tools. Complementing fiscal and prudential policies adopted at the time, monetary policy actions included interest rate cuts, reduced reserve requirements, use of official reserves to stabilise foreign exchange markets, and policies to expand domestic credit. Together these various actions greatly mitigated the impact of the crisis on Asia-Pacific economies and financial systems. However, the effects of these actions were compromised to some degree by financial headwinds including higher risk premia, liquidity pressures and lower asset prices.

Looking forward, central banks in the region face several challenges. As financial markets normalise and economies recover, the timing and pace of the withdrawal of the monetary stimulus will require a familiar balancing act, but with greater complexity: an overly hasty exit could contribute to an economic and financial relapse; an overly late exit could feed inflation pressures and/or financial excesses that could provide the seeds for a future crisis. Indeed, some recent anecdotal evidence about frothy asset markets has raised the stakes of staying too low for too long. Complicating the domestic trade-offs in the region is the considerable uncertainty about prospects for recovery abroad. Adding to that uncertainty is concern about the impact of fiscal stimulus, a serious relaxation of fiscal discipline here in the region and abroad, and the possibility of a disorderly unwinding of global imbalances.

The international financial crisis may offer lessons about monetary policy frameworks. While the diverse monetary policy frameworks in the region served the respective central banks well, there are nonetheless questions about whether improvements can be made. Should central banks pay more attention to financial stability in the future? Should financial stability concerns – and in particular boom-bust dynamics, both home-grown and external – play a bigger role in monetary policy risk assessments? How explicitly should these concerns be articulated in formal monetary policy frameworks and emphasised in central bank communications? Finally, questions about the benefits of smoothing exchange rate volatility through central bank intervention may take on increasing significance with the enhancement of regional reserve pooling and with the possibility of the unwinding of unsustainable global imbalances.

II.2 Development of financial markets

The development of financial markets in Asia and the Pacific was supposed to reduce the fragility of financial intermediation. The experience over the past two years lends support, though qualified, to this hypothesis. In particular, initiatives taken to develop local financial markets helped mitigate the initial impact of the international crisis on the region. Local currency markets better fulfilled their role as a “spare tyre” in 2007–09, open to borrowers when other funding sources were not available.

At the same time, the region was fortunate in that its financial markets were less developed and integrated than those in the United States and Europe. For example, structured credit markets, where problems first emerged in the United States, were in their infancy in Asia and the Pacific. Also, while Asia-Pacific markets were gradually opened to foreign participants, remaining restrictions on transactions with non-residents partly insulated domestic financial markets from disruptions occurring abroad. Nevertheless, when the dislocations in US dollar

markets intensified after the Lehman bankruptcy, even less-open financial markets experienced pressures.

Looking forward, a key question for policymakers is how and when to scale back the relief efforts they put in place to support financial markets, particularly the extensive liquidity support offered in both local and foreign currencies. Clear communication can help in this regard, especially in the case of discontinuing special facilities that were not designed to naturally unwind as markets normalise.

A longer-term question is how to realise the benefits of further development of financial markets while managing vulnerabilities to external shocks transmitted through financial markets. The breadth and severity of the deterioration in market liquidity during the current crisis surprised many, and while financial markets were not necessarily a source of shocks, they were an important propagator. Reforms that could help to strengthen the capacity of markets to absorb shocks include: increasing the flexibility of monetary policy operating procedures and the capacity of standing facilities; reducing counterparty and operational risks in over-the-counter markets; and increasing transparency about trading activity, prices and exposures.

Further opening of financial markets in Asia to foreign participants still offers the potential for promoting stability by adding diversity, but the appropriate policy approach to cross-border financial integration is likely to differ across countries depending on the stage of market development, the state of private sector risk management practices and the inherent stability of the financial system.

II.3 Financial stability

In the years preceding the international crisis, banking systems in the Asia-Pacific region performed quite well. Banks in most jurisdictions had adopted fairly conventional business models, had manageable levels of risk on their balance sheets, were well capitalised and maintained sufficient liquidity. Developments in the region's credit and asset markets further contributed to the stability of the banking systems. As a consequence, when the international crisis unfolded, Asia-Pacific banking systems were able to absorb the impact quite resiliently, though with help from government backstops. In fact, local banks are now in a position to capitalise on a financing gap in certain financial products and services created by the retreat from the region of many foreign institutions.

Looking ahead over the near term, the design of credible exit strategies for the various stabilisation programmes, as well as dialogue among countries, will be important to maintain the stability of financial systems. Authorities have already taken stock of the range of vulnerabilities that in many respects were not fully appreciated and adopted various policy measures designed to mitigate the risk of spillovers to the financial sector and reduce the likelihood that a credit crunch could induce or exacerbate a recession.

More broadly, the international crisis may give cause to authorities to adopt additional reforms to institutional frameworks for oversight and stability of their financial system.

At an international level, the G20 and Financial Stability Board have put forth recommendations covering various aspects of financial regulation and supervision. While the proposals have been designed to contribute to global financial stability, some of them are particularly relevant for Asia and the Pacific. In the light of recent experiences, the key proposals include: further resources to operationalise a macroprudential approach to supervision and regulation; further efforts to strengthen banks' risk management practices, particularly in the context of Basel II; implementation of an effective liquidity risk management framework, including reserve pooling mechanisms for foreign currency liquidity such as the Chiang Mai Initiative Multilateralisation; and enhanced home-host banking regulations.

“Internationalisation of Asia-Pacific bond markets” by Susan Black, Anella Munro and Philip Wooldridge

In the past decade, Asia-Pacific bond markets have seen a significant increase in both non-resident involvement in local currency markets and offshore activity. The motivations underlying these trends in bond issuance are explored in two papers. Together they provide a regional perspective on the evolution of local currency bond markets and point to how international bond markets can facilitate the development of local currency bond markets.

The first paper, “Motivations for swap-covered foreign currency borrowing”, by Anella Munro and Philip Wooldridge, asks why residents issue foreign currency debt and swap the proceeds for local currency funding instead of simply issuing local currency debt. The volume of swap-covered borrowing is large in some countries, including Australia and New Zealand, and it is growing in some others. The existing literature does not adequately explain either phenomenon. The authors compare the characteristics of bonds issued by swap counterparties and conclude that market frictions – including transactions costs, information asymmetries, regulatory frictions and the scope for unbundling risks – give different borrowers a comparative advantage in different markets, which makes swap-covered borrowing a cost-effective means of raising domestic currency funding.

The second paper, “Why issue bonds offshore?”, by Susan Black and Anella Munro, examines the motivations for onshore and offshore bond issuance by residents of Australia, Hong Kong SAR, Japan, Korea and Singapore. Issuers in these five economies are found to actively arbitrage cost differences between direct and swap-covered borrowing. The results indicate that the use of offshore markets has offered a cost-effective way to secure funding, especially for those issuers that have relatively low credit ratings, large local currency funding needs and a preference for long-term borrowing. In this way, offshore issuance can complement national and regional initiatives to enhance local currency funding opportunities.

The papers recognise that these types of issuance are not risk-free from a public policy standpoint. With the benefits come risks to both financial stability and market development. Mismatched hedging structures and increased exposure to potentially volatile wholesale funding markets could increase the vulnerability of the corporate and banking sectors to shocks. Fragmentation of liquidity between onshore and offshore markets could retard the development of local currency markets. In spite of this, the experience of some countries during the recent crisis, particularly Australia, indicates that these risks can be well managed even during extreme periods. In large part this is because swap-covered borrowing is effectively denominated in local currency. That said, risks may loom larger in countries with less developed financial markets and weak risk management practices.

In the light of the trends in Asia and the Pacific towards financial liberalisation and cross-border integration, the functioning of bond markets warrants further study. Key questions include the obstacles to onshore issuance by lower-quality borrowers; the benefits and risks of securitisation and other forms of credit enhancement; the role of financial centres in market development; and the reasons that issuers rather than investors seem to be the dominant arbitrageurs in international bond markets. Better understanding may help the authorities guide the future development of local currency bond markets.

“Private information, stock markets and exchange rates” by Jacob Gyntelberg, Mico Loretan, Tientip Subhanij and Eric Chan

From 2004 to 2007, foreign exchange trading volumes in Asian currencies more than doubled, and gross capital flows to and from the region grew rapidly. At the same time, net capital flows to the region were strong. Since the onset of the international financial crisis,

however, net capital flows and exchange rates have been quite volatile. The potential for significant reversals in capital flows indicates that a better understanding of the relationships between capital flows and exchange rates would enhance the ability of policymakers to achieve their economic and financial stability objectives.

Traditional open economy macroeconomics does not offer much guidance on these issues. In contrast, according to the market microstructure literature, international capital flows that convey new information about investors' return expectations should have a permanent influence on exchange rates, while other types of flows should have a short-term or transitory impact. The authors find empirical support for this theory.

The authors examine a unique set of daily data to distinguish exchange rate fluctuations driven by private information of investors from those driven by macroeconomic and other public data. The dataset covers the net flows arising from the activities of non-resident investors, and returns, in the foreign exchange, stock, and government bond markets in Thailand in 2005–06. The authors find that non-residents' equity transactions are driven primarily by private information and that only the relatively small portion of the net capital flows linked to these equity transactions has a permanent impact on the exchange rate. Other external capital flows, such as those generated by bond transactions, have effects that are numerically smaller, generally statistically insignificant and transitory.

These results suggest that close monitoring of foreign exchange and capital markets and interactions across those markets can yield important information to policymakers. Armed with better information about the links between fundamentals and different types of capital flows, authorities might be better able to smooth transitory exchange rate volatility by being more discriminating in foreign exchange interventions.

Developing readily available and comprehensive high-frequency data for Asia-Pacific economies would have important benefits. It would allow extension of this research to other Asia-Pacific economies and over longer periods to improve our understanding of the relationship between types of capital flows and exchange rates. Additionally, expanding the coverage of the data to include transactions of resident investors would allow an assessment of the extent to which foreign exchange markets and equity markets efficiently serve both types of investors. And using high-frequency data to analyse capital flows from resident as well as non-resident investors may also reveal new ways in which central banks and other government authorities can further develop financial markets to promote efficient risk sharing and sustainable economic growth.

“Targeting inflation in Asia and the Pacific: lessons from the recent past” by Andrew Filardo and Hans Genberg

Central banks in Asia and the Pacific have overwhelmingly chosen inflation control as the principal objective of monetary policy. Some of these monetary authorities have declared themselves to be formal inflation targeters, while others have pursued their objective without adopting this particular label. And central banks in the region have chosen diverse policy options to achieve their inflation goals – the chosen options vary according to such features as the explicitness of the inflation target, the choice of headline inflation indicator and the choice of policy instruments. These observations suggest that the region is a good “laboratory” in which to draw lessons about the effectiveness of different monetary policy frameworks in pursuit of the control of inflation.

In this paper, the authors study the experiences of six Asia-Pacific central banks that have adopted formal inflation targeting and compare them with six Asia-Pacific central banks that have adopted more eclectic approaches. The authors focus on how the various monetary

policy frameworks have affected inflation forecasts by the private sector, taking into account amongst other things different levels of institutional independence and policy transparency.

Despite the considerable diversity of policy regimes in Asia and the Pacific, the empirical results indicate that the decision to adopt *formal* inflation targeting has not been the dominant factor accounting for differences in cross-country inflation performance since the 1990s. Put another way, the findings add to the growing body of evidence that formal inflation targeting is not the only monetary policy framework capable of delivering price stability. This conclusion is consistent with Asia-Pacific experiences during the recent commodity price cycle and international financial crisis.

The final section of the paper addresses policy implications for regional central banks. One issue of immediate relevance is how central banks should trade off inflation control and financial stability. The results of the paper suggest that the pursuit of inflation control and actions taken to support financial stability can reinforce each other provided that monetary policy frameworks are properly designed. Underlying this perspective is the argument that the classic assignment problem – the oft-mentioned requirement that each policy goal requires an independent policy tool to assure success – may be less constraining in practice than theory would suggest.

With respect to lessons learned about monetary policy frameworks, the paper's implications are consistent with the explicit multi-perspective or multi-pillar approaches such as those at the Bank of Japan and the ECB. Those frameworks may offer advantages in communicating key policy risks, both during normal times and during crisis periods. One issue of relevance is whether they could simplify the communication challenges faced by a central bank trying to explain why its exit strategy might require monetary policy to be tightened even though inflation pressures are subdued. Further research is called for on the conceptual underpinnings of such approaches and on their broad applicability in Asia and the Pacific.

“Financial deleveraging and the international transmission of shocks” by Michael B Devereux and James Yetman

The international financial crisis has spread across the world through a variety of real economy and financial channels. For the major European economies and the United States, there was a clear transmission path from losses on toxic assets, increasing fragility of bank balance sheets, disintermediation of the financial system, and finally rapid deleveraging of various sectors of the economy. For many Asian economies, the story was very different. The exposure of domestic banks to toxic assets was limited, and banks generally remained well capitalised. Yet the region still experienced a significant slowdown. A complicating factor in calibrating central bank policy responses in Asia and the Pacific to such events is the difficulty in adequately modelling the nature of the transmission mechanism associated with the international financial crisis.

The authors make progress in modelling the international propagation of shocks to the Asia-Pacific region through a new financial channel. A key aspect of their approach is that fluctuations in asset prices affect investment and the real economy via financial linkages *between* countries. In particular, asset price declines that lead to a severe deterioration of bank balance sheets in one country can then spill over to financial institutions in other countries. During normal times, when shocks are small, balance sheet considerations have little effect on macroeconomic outcomes, and financial market developments are relatively independent across countries. But during periods of financial turmoil, a collapse in asset prices and impaired balance sheets in one country can lead, through a negative “international finance multiplier,” to a vicious circle of asset price declines across countries.

While stylised, the model has important implications for the conduct of monetary policy. The results of the model provide a justification for the view that central banks should lean against the wind. That is, central banks may wish to increase policy rates as financial system leverage increases, so as to mitigate the potential size of international deleveraging cycles. Moreover, in the event of a deleveraging cycle, this model calls for a more aggressive monetary policy response than does a model without an international finance multiplier. In this sense, monetary policy recommendations should be state-dependent, calling for proportionally more aggressive responses in periods of financial turmoil than in normal times. Arguably, the behaviour of central banks in the Asian Consultative Council during the international financial crisis has been consistent with this theoretical prescription.

The results highlight the importance of paying greater attention to vulnerabilities potentially created in one region by financial disruptions emanating from another. The Asian financial crisis in the 1990s and the experience of Asia and the Pacific during the current international financial crisis underscore the value of improving the conceptual foundations of international macroeconomic models along this dimension. Current international efforts to identify systemically important financial institutions and to develop early warning indicators of financial instability along the lines of those being pursued by the Financial Stability Board and the International Monetary Fund would be consistent with the nature of the transmission mechanism modelled in the paper.

Further efforts to operationalise the model for policymaking can undoubtedly contribute to the development of central bank policies in the region. A more satisfactory model would include greater attention to the interplay of monetary policy and macroprudential regulatory frameworks in the region, as well as the interaction of such policies across borders.

“Contagion and risk premia in the amplification of crisis: evidence from Asian names in the global CDS market” by Don H Kim, Mico Loretan and Eli Remolona

In the financial turmoil of 2007–09, troubles in a corner of the US mortgage market escalated into a crisis of global proportions. A striking feature of the crisis has been the contagion that spread across Asia. In a region where exposure to subprime mortgages and toxic financial instruments was minimal, it is remarkable that credit spreads for Asian borrowers widened as much as they did in Europe and the United States. The authors argue that contagion in Asian credit markets stemmed not only from a reassessment of credit risks but also more importantly from a global repricing of risk; the higher price of risk reflected heightened risk aversion and resulted in higher risk premia.

The authors analyse the key factors that led to valuation losses on debt securities issued by major Asian firms. Their analysis of valuation losses is based on prices of credit default swap (CDS) contracts rather than on prices of the underlying bonds, owing largely to the fact that the CDS markets remained reasonably liquid even during the crisis. Using asset pricing theory, the authors distinguish the part of the losses due to higher default risks and the part due to the higher global price of risk. The default risks are measured by expected default frequencies (EDFs), which are forward-looking measures of borrowers' credit quality. The global repricing of risk is estimated by extracting principal components from several major CDS indexes for Europe, the United States and Asia. The authors argue that the largest principal component can be best thought of as a measure of the global price of risk.

Given the monthly variation in the components over the past few years, the authors conclude that the spread of the international financial crisis to Asia was mainly driven by a rise in global risk premia and only to a small extent by the deterioration in the credit quality of the Asian firms associated with the global slowdown.

The paper offers a framework of analysis for macroprudential policy and tools that can be used by the authorities. First, the paper shows that it is important to distinguish between risk and risk premia and that it is movements in the latter that tend to account for procyclicality. Indeed, low global risk premia during periods of rapid credit growth and high global risk premia during periods of deleveraging have been an important part of boom-bust behaviour in financial markets. Second, the paper offers a new set of tools to measure the variation of default risk and the variation of risk premia, which can complement each other as early warning indicators of financial instability. Third, a better understanding of the factors driving valuation losses should improve our ability to appreciate the implications of mark to market rules for spillover risks. Fourth, risk premia as measured in this paper may also be used as a means to calibrate capital standards over the cycle and therefore help financial sector supervisors mitigate procyclicality. Finally, the ability to distinguish the factors driving valuation losses opens up the possibility of future research into the interactions of risk premia, default probabilities and the systemic health of financial institutions.

“Determinants of house prices in nine Asia-Pacific economies” by Eloisa Glindro, Tientip Subhanij, Jessica Szeto and Haibin Zhu

Throughout history, boom-bust cycles have been a major cause of financial instability in the region and elsewhere. Indeed, experiences from the 1997 Asian crisis, from the lost decade of the Japanese economy and from the current international financial crisis all attest to the enduring relevance of such cycles in modern economies. One theme found in most destabilising boom-bust episodes is large swings in house prices. It has become generally accepted that policymakers armed with a macroprudential orientation and knowledge of unsustainable house prices could adopt policies to rein in perceived excesses, possibly preventing a disorderly unwinding or, at least, reducing the size of the fallout. But an important policy question is how to assess whether the level of house prices is well out of line with fundamentals.

Using a statistical methodology to estimate house price dynamics in Asia and the Pacific, this paper characterises house price movements as the sum of three separate factors: (i) the fundamental value of housing (a trend term) that is determined by longer-term economic conditions and institutional arrangements; (ii) the deviation from fundamental values that is attributable to frictions in the housing market (a cyclical term); and (iii) an irrational or “bubble” component that is likely to be driven by overly optimistic expectations (an error term). Applying this approach to nine economies in Asia and the Pacific, the authors found that national house price movements before the onset of the current international financial crisis mainly reflected adjustments in fundamental values. Cross-country differences in land supply and business environments largely explained distinctive national patterns of house price dynamics across the region.

The authors’ approach highlights two empirical issues that are important for assessing asset prices. First, institutional factors matter. The liberalisation of housing markets and housing finance systems affect both the fundamental value of houses and the short-term dynamics of house prices. Second, all three sources of house price movements – fundamentals, frictions and bubbles – are important in calibrating macroprudential policy responses. For example, a run-up in house prices that reflects improved fundamentals would not call for a tightening of regulatory measures or an increase in policy rates. And a cyclical run-up due to market imperfections may call for actions that differ from those needed to deflate asset price bubbles.

The authors’ assessment of the risks of boom-bust housing dynamics in Asia and the Pacific is consistent with the fact that sharp downward revisions in the economic and financial outlooks did not lead to a collapse of houses prices and bouts of home-grown financial

instability. This suggests that the authors' approach to identifying components of disruptive house price dynamics may deserve greater weight in policy deliberations. Financial sector supervisors at both the national and subnational levels can use the methodology more generally to monitor property market developments (residential and commercial) as part of a general policy toolbox to assess financial sector vulnerabilities. In the medium term, such assessments could also provide valuable insights into policy trade-offs associated with exit strategies.

More broadly, this study calls for continued research to develop a deeper understanding of the roles of liquidity and risk-taking in generating asset price bubbles and of the implications of these factors for the transmission mechanisms of monetary policy and the design of macroprudential frameworks.

Opening remarks

Zhou Xiaochuan¹

General Manager Caruana, Chair Madame Zeti, fellow Governors, ladies and gentlemen:

It is a great pleasure for the People's Bank of China to co-host in Shanghai the Wrap-up Conference of the Asian Research Programme with the BIS. On today's occasion, I feel delighted to see old friends from the ACC and the BIS, as well as many professionals and experts. I would like to extend a very warm welcome, on behalf of the People's Bank of China, to everyone presenting here.

The research programme, which took off here in Shanghai three years ago, has manifested the BIS's commitment to strengthen its interactions with the Asia-Pacific central banks and brings into the region valuable policy advice and international experience. Today, with its fruitful outcome benefiting both the region and the BIS, the programme is expected to continue in other forms to further take advantage of such research resources and achieve more prominent results in addressing policy challenges ahead.

The theme of this conference is "The International Financial Crisis and Policy Challenges in Asia and the Pacific". Since the outbreak of the international financial crisis, Asia-Pacific economies as a whole have shown resilience to shocks. With lessons carefully drawn from the Asian crisis, economies in the region have built up solid foundations for economic growth that are reflected in low inflation, healthy fiscal positions and abundant official reserves. Prudential regulation was applied to financial institutions, contributing to a strengthened banking system, with capital adequacy exceeding 10% of total risk-weighted assets in most countries. Regional trade and investment have grown very fast, to some extent alleviating the reliance on the outside world. In addition, the region has strengthened policy coordination and cooperation via various channels, such as the platform provided by the EMEAP and the self-managed foreign exchange reserve pool under the multilateralisation of the Chiang Mai initiatives

Nevertheless, the effects of the current financial crisis were still strongly felt in these economies. First, the economies of most Asia-Pacific members have contracted, dragged down mainly by a dramatic fall in net exports. At the same time, as investors became more risk-averse and demanded higher premiums, the cost of international bond issuance has markedly risen. Financial market intermediation has slowed and securitisation declined.

Asia-Pacific governments have taken effective measures to cope with the crisis and prop up their economies. Fiscal stimuli and accommodative monetary policies have already yielded good results. Financial markets in the region are recovering, as evidenced by improved investor sentiment in the regional equity and credit markets. Since March 2009, Asia-Pacific equity markets have enjoyed a rally. Bond markets have recovered around 85% of the losses incurred in the 2008 crisis. The strength in Asian currencies is supported by capital inflows, improving trade balances, firmer signs of bottoming in the industrial cycle and an overall bearish market view on the US dollar.

However, efforts are still needed in the following areas. First, regional economies should endeavour to alleviate the negative contribution to growth from exports. Measures should be taken to address difficulties in trade financing, to diversify export markets, optimise industrial

¹ Governor of The People's Bank of China

structures, and adjust growth models. Second, a more macro-oriented regulatory approach should be adopted and procyclicality should be eased to build a more resilient financial system. Third, the authorities should take further action to boost domestic demand, by, for example, increasing spending on public infrastructure, reducing the savings rate, and promoting structural reforms. Fourth, Asia-Pacific countries should beef up cooperation to actively address challenges and issues of mutual concern.

In response to the negative impact of the international financial crisis, the Chinese government has made a timely adjustment in its stance towards macroeconomic management, and it has adopted a series of measures to promote steady and rapid economic development. A proactive fiscal policy and appropriately accommodative monetary policy were pursued and the sound functioning of the financial system was safeguarded. Thanks to this policy package, economic performance improved and market confidence was restored. Domestic demand rose steadily, liquidity in the banking system remained ample, the money and credit supply increased rapidly, and the financial system performed in a stable manner. Going forward, we will further strengthen and improve macro management, steadily enhance policy consistency and effectiveness, and appropriately handle the relationship between boosting economic growth and preventing financial risks in an effort to promote sound economic and financial development.

Before I conclude, let me acknowledge with thanks the work that the BIS Representative Office for Asia and the Pacific has done in preparation for the conference.

I wish the conference a great success and hope all of you will have a good time in Shanghai.

Opening remarks

Jaime Caruana¹

Welcome

Governors, deputy governors, professors, distinguished guests, ladies and gentlemen, good morning.

It is a great pleasure for me to be part of this BIS Asian Research Conference – the so called “Wrap-Up Conference” – and I join Governor Zhou in welcoming you. It certainly feels good to be among friends here in Asia. And I am especially grateful that the People’s Bank of China has invited us to this exciting cosmopolitan city of Shanghai.

The topic of our conference should not come as a surprise. I think the Governors were right in advising us to focus on the international financial crisis, given what has been happening here and elsewhere in the world. While there may be a risk in trying to draw firm lessons about a crisis from which we have yet to fully emerge, I hope that you will find the discussions over the next two days to be quite rewarding and enlightening with regard to the policy challenges facing the region.

The BIS Asian research programme

In February 2006 in this very hotel, my predecessor Malcolm Knight announced several BIS initiatives to deepen our involvement in Asia and the Pacific. One of the main initiatives was a three-year research programme on monetary and financial issues, to be undertaken in close cooperation between the BIS and Asia-Pacific central banks.

The initiatives had been endorsed, only one day before his announcement, by a meeting of the Asian Consultative Council (ACC), which some of the Governors present here today had attended. However, that was only the end of a long process of internal deliberations at the BIS and of consultations with our shareholding central banks in the region.

At the meeting of the ACC in June 2005, the BIS General Manager reported that BIS Management had set up a working group to make detailed proposals on how to deepen the involvement of the BIS in Asia and the Pacific, and a special research programme was mentioned at that point. The working group was chaired by Már Gudmundsson, Deputy Head of our Monetary and Economic Department, who is now attending his last event for the BIS before taking up the position of Governor of the Central Bank of Iceland later this month.

The deliberations of the working group formed the basis for BIS Management proposals that were submitted to the shareholding central banks in the region and discussed in visits by the General Manager and the Deputy General Manager to each of these banks.

You could say that this was a resource-heavy process¹, but we think that its collaborative nature contributed to the success of the programme. We also had a sound foundation to build on. The BIS had opened its Representative Office for Asia and the Pacific in 1998, in the Hong Kong SAR, and the Asian Consultative Council was set up in 2001.

¹ General Manager, Bank for International Settlements

Although significant input to the Asian Research Programme would come from Basel, both in terms of content and oversight, most of the resources for the programme were located in the BIS Asian Office. Launched in September 2006, the programme was managed in the Asian Office by the Head of Economics for Asia and the Pacific – first, Eli Remolona, and now, Andy Filardo. The Chief Representative in the Asian Office – first, Bob McCauley, and now, Eli – provided support and oversight, and so did Már in Basel. And all along, the ACC has been instrumental in providing guidance to the programme.

The goal of the Asian Research Programme was simple but ambitious – to strengthen our capacity for working with central banks in Asia and the Pacific on policy-oriented research. Today we are back here, where the journey began, to evaluate some of the fruits of our labour during the three-year programme.

The conference agenda is designed to illustrate some of the fundamental goals of the programme – high-quality, collaborative research; policy relevance; and the integration of informed insights from academia.

Moreover, in all our work, we have relied heavily on the ACC's sage advice, which has been invaluable. Perhaps, in reviewing our progress, you might want to assess the effectiveness of the research programme on the basis of how well we have listened to you. And I ask you to do so in three areas:

First, collaborative research: our staff has worked closely with central bank researchers and academics in the region on a range of key policy-related topics, including the development of Asia-Pacific financial markets; asset prices and monetary policy; capital flows; exchange rate determinants; the dynamics of household debt; and macroeconomic modelling.

Second, research networks: we have developed two research networks to facilitate the sharing of information among central bank researchers and to foster research collaboration. One network focuses on monetary policy and exchange rates, the other on financial markets and financial stability.

Third, organising high-quality conferences, meetings and seminars: the research programme has staged about a dozen events each year. These events were often jointly organised and hosted by regional central banks and covered a wide range of topics, including the development of financial markets, monetary policy operations, communication strategies of central banks and currency internationalisation. And, of course, today's event highlights our effort to better understand the implications of the international financial crisis for this region.

Other initiatives

As I mentioned before, the Asian Research Programme has been part of a broader set of initiatives to deepen the BIS involvement in Asia and the Pacific. Let me just mention two of them.

- On the banking side, we have continued to expand the range and to improve the quality of our Banking Department in the Asian time zone, including our services as the manager of ABF1 and administrator of ABF2.
- On the outreach side, we have expanded the work of the Financial Stability Institute in the region through training seminars and analytical services for financial sector supervisors.

We certainly hope you have found these efforts to be valuable.

As the new General Manager of the BIS, I am happy to have joined an institution that seems to have already built a strong foundation of trust and confidence in this region. We see Asia and the Pacific as not only a strategically important region of the world but also as an

important strategic partner of the BIS. Our efforts to offer a high level of service to the region are part of the BIS mission to foster greater central bank cooperation.

Looking forward

Given the growing economic and financial significance of this region, it will not come as a surprise that we are working to foster an even closer relationship with you. The economies represented by the ACC account for nearly 25% of global GDP, 50% of the world's population and 30% of world stock market capitalisation. And despite the formal end of the three-year research programme this month, the BIS will build on the legacy of that programme by, first and foremost, maintaining a significant research presence in the region.

We will continue to build on our proven strengths. Through our Asian Research Programme, we not only made significant contributions to the understanding of Asia-Pacific economies and their policy challenges but we also learned much about services we could offer that would be of value to the region.

So as we move forward, we will be proposing to you some specific research initiatives for the region, and once again, we will be seeking the guidance of the ACC Governors. Broadly speaking, we will more sharply focus our activities on monetary and financial stability. In the light of the international financial crisis, we will naturally pursue topics related to financial stability and contagion as well as topics on the nexus between monetary policy and macroprudential policy. This research will be part of our broader Basel workplan, with the Asian Office focusing on the special challenges facing Asia and the Pacific.

We will also continue to seek out opportunities to leverage our research assets through collaboration with the central banking community and in academia. As you can see from today's conference programme and from the research compendium of the three-year programme, we have benefited greatly from such collaboration.

We will continue to support conferences and workshops covering the policy concerns of the region's central banks. And we will continue to welcome opportunities to co-organise and co-host the events with the ACC central banks.

The events of the past year caused us to focus most of our attention on economic and financial developments as they unfolded. Now we are in a position to return much of our attention to research projects on topics of longer-term interest to the central banks of the region and the rest of the world.

At this point, and with an eye towards the future, I would like to give special thanks to you, the ACC Governors, for your involvement and guidance. During my first ACC meeting, in Basel last June, I was impressed by the lively give and take. It is clear that your views play a key role in directing the work of the BIS in Asia and the Pacific. My hope is that when you look at the quantity and quality of what has been achieved in the Asian Research Programme over the past three years, it will encourage you to continue your unstinting support for our efforts with your much appreciated spirit of collaboration, trust and confidence.

The conference preview

Let me now briefly turn to the business at hand and provide a few remarks to preview the conference.

I will save my specific views for the discussions later; for now, I would just like to emphasise the importance of the type of research being presented today and tomorrow. Beyond the

analytical tools it helps create, the research is valuable to policymakers because it helps clarify policy trade-offs facing central banks.

At this juncture in economic history, we are all looking to whatever may help us better understand the causes and spillovers of the international financial crisis. Maybe we will never know the whole story. But the lessons from this crisis will surely shape our ways of thinking for years to come, just as the Asian financial crisis did a decade ago.

As a policymaker at the Bank of Spain, I was often frustrated with the limitations of the models but nonetheless recognised their indispensable role in central banking. Today, the limits of the current set of models we employ are still clear and still frustrating. Just a few years ago – I don't have to think back far – many conventional models in economics and finance argued for much greater reliance on the inherent efficiency of markets, on much narrower mandates for monetary policy and on market-based regulatory regimes. Well, what a difference a crisis makes. So we have lots of work to do, especially on research on monetary stability and financial stability.

The seven BIS papers at this conference showcase some of the best research from the Asian Research Programme that is relevant to our current thinking about the crisis. They make some progress in developing new tools and laying out new conceptual frameworks for the challenges awaiting us.

In focusing on Asia and the Pacific, the research programme has recognised the special characteristics of the region. This is nowhere better illustrated than in the paper produced by our Hong Kong research team, which reviews the regional impact of the international financial crisis. It shows that the experience in Asia and the Pacific certainly shared some aspects with other regions of the world, but its experience was also unique in many ways, and, to that extent, so too are the policy challenges we face.

We have organised the programme into three sessions to highlight the primary research areas of the Asian Research Programme – (1) financial market development, (2) monetary policy and exchange rates and (3) financial stability. We have scheduled ample time for general discussion so that you can help us shape the priorities for our future research.

Conclusion

In sum, I am eagerly anticipating the presentations and discussions to come over the next day and a half. We will have a chance to benefit from the BIS's enhanced capacity for policy research in Asia and the Pacific while listening to the informed views of three eminent scholars. And we will have the opportunity to learn from you, our central bank colleagues from the region: What are your concerns? And what policy options do you see for the further development of efficient financial markets in the region, for restoring economic and financial prosperity in the near term, and for promoting crisis-free growth over the longer term? I am most eager to hear your views.

The international financial crisis: timeline, impact and policy responses in Asia and the Pacific¹

Andrew Filardo, Jason George, Mico Loretan, Guonan Ma, Anella Munro, Ilhyock Shim, Philip Wooldridge, James Yetman and Haibin Zhu²

Introduction

This paper examines how the international financial crisis impacted Asia and the Pacific and discusses the implications of the crisis for central banks in the region. The paper consists of two parts. Part I presents a simplified timeline of the spillovers of the international financial crisis to the region, as well as some key factors that help explain cross-country differences in the impact of the crisis on Asia and the Pacific. Part II examines the effects of the crisis in more detail, exploring some of the policy challenges it poses through three lenses that correspond to the research priorities of the BIS Asian Research Programme (ARP): monetary policy and exchange rates, development of financial markets, and financial stability. The paper highlights the role of the research output from the ARP in illuminating these challenges for central banks. The focus throughout the paper is on twelve regional economies: Australia, China, Hong Kong SAR (hereafter Hong Kong), India, Indonesia, Japan, South Korea (hereafter Korea), Malaysia, New Zealand, the Philippines, Singapore and Thailand.

¹ This paper was written for the wrap-up conference of the Asian Research Programme by staff at the BIS Representative Office for Asia and the Pacific. Excellent research assistance was provided by Eric Chan, Clara Garcia, and Marek Raczko. We thank Susan Black, Piti Disyatat, Luci Ellis, Prasanna Gai, Eloisa Glindro, Dong He, Janak Raj, Edward Robinson, Toshitaka Sekine, Sukhdave Singh, Grant Spencer, Tientip Subhanij, Seonghun Yun and our colleagues in Basel for comments. The views expressed here are those of the authors and not necessarily those of the BIS.

² Staff at the BIS Asian Research Programme.

Part I: Timeline³

	Pre-crisis conditions (Before Q3 07)	Phase 1 (Q3 07–mid-Sep 08)	Phase 2 (mid-Sep 08–late 08)	Phase 3 (late 08–Q1 09)	Phase 4 (Q2 09–present)
Asia-Pacific	Sound macro fundamentals and banks; signs of financial exuberance	Inflation top policy concern; mild financial headwinds	Capital outflow; falling stock markets; trade collapse; much easier monetary policy	Sharp GDP contraction; large fiscal packages	Financial markets rally; green shoots; economic and financial prospects improve
World	Extended period of loose monetary policy, credit expansion and asset price booms	BNP funds suspended; aggressive policy easing; high commodity prices; liquidity support	Lehman Brothers bankruptcy; global finance freezes up; expanded liquidity support	Strong market interventions; synchronised G3 recession; fiscal stimulus	Steps to strengthen bank balance sheets; financial markets rally; G3 real activity still weak

This section provides an overview of what happened in the Asia-Pacific region, focusing on the impact and propagation of the international financial crisis to the region, as well as on the range of policy actions that were taken. It describes the four main phases of the crisis in Asia and the Pacific, and it concludes with a brief discussion of the factors that help to explain the diverse cross-country experiences in the region.

Pre-crisis conditions

The region as a whole came into the international financial crisis with a sound set of economic and financial fundamentals.

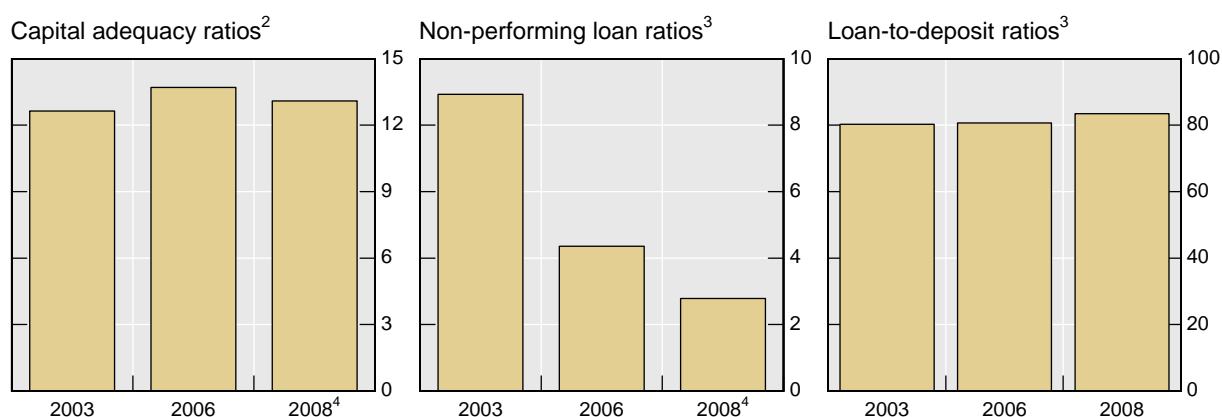
Banking systems were generally healthy (Graph I.1). Banking systems were strengthened due in large part to favourable economic conditions, as well as conservative bank regulators. Reported capital adequacy exceeded 10% of total risk-weighted assets in most economies, and non-performing loan ratios were low and declining secularly across the region. The traditional banking model remained dominant. Loan-to-deposit ratios of less than 100% in most economies reflected relatively low reliance on wholesale funding. At the same time, financial markets in the region benefited from improvements in the quality of payment systems and market microstructure. In bond markets, the range of issuers and both the maturity and liquidity of issues increased.

Inflation was well behaved, with underlying inflation trends low and relatively stable (Graph I.2, left-hand panel). Monetary policy had generally been viewed as successful in bringing inflation under control in the 2000s, especially in terms of core inflation. Even focusing on headline inflation, the rate of price change was low and stable in Korea, Malaysia, the Philippines and Thailand, while Indonesia had seen inflation drop from the high teens of previous years to a steady 6%.

³ See the 2009 BIS Annual Report for a detailed description of the unfolding of the international financial crisis.

Graph I.1

Soundness of banking systems in Asia-Pacific¹



¹ In per cent. Unweighted average for Australia, China, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore and Thailand. ² Total capital as a percentage of total risk-weighted assets. ³ Definitions may vary across economies. ⁴ For 2008, latest available figure in GFSR is used.

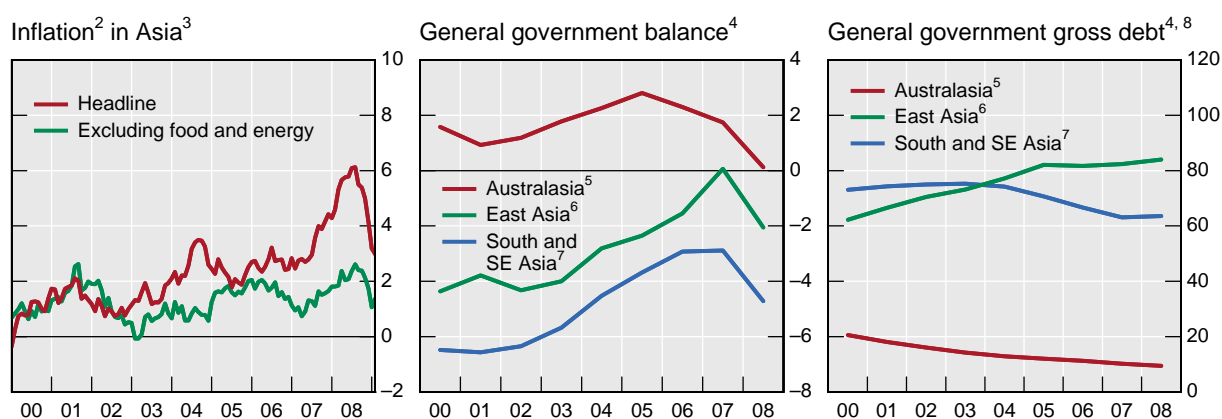
Sources: IMF Global Financial Stability Report; national data.

Government fiscal positions were healthy in most economies (Graph I.2, centre and right-hand panels). Consistently strong economic growth and sound medium-term fiscal frameworks kept deficits at bay and debt levels sustainable. Australia, China, Hong Kong, Korea, New Zealand, Singapore and Thailand enjoyed budget surpluses in 2007, and debt was falling as a percentage of GDP in all regional economies.

Official reserves were generally thought to be ample (Graph I.3). In many economies in the region, managed exchange rates and current account surpluses kept foreign exchange reserves flowing in. Indeed, reserve levels exceeded 100% of short-term external debt by mid-2007 in most economies in the region.

Graph I.2

Inflation and public finance in Asia-Pacific¹

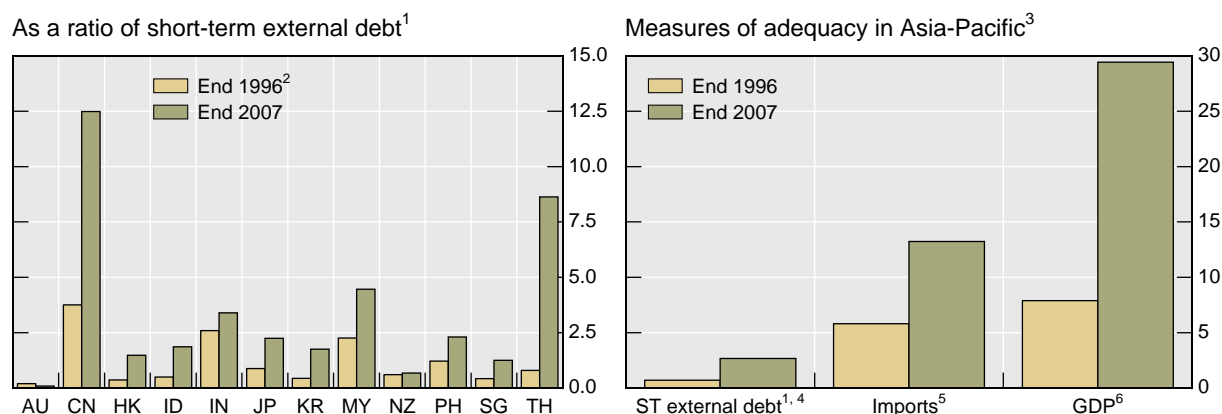


¹ In per cent; aggregates refer to weighted averages based on 2005 GDP and PPP exchange rates. ² Twelve-month changes in consumer prices. ³ China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore and Thailand. ⁴ As a percentage of GDP. ⁵ Australia and New Zealand. ⁶ China, Hong Kong SAR, Japan and Korea. ⁷ Singapore, India, Indonesia, Malaysia, the Philippines and Thailand. ⁸ For China, net debt.

Sources: OECD; CEIC, © Consensus Economics; Datastream; national data; BIS calculations.

Graph I.3

Foreign exchange reserves



AU = Australia; CN = China; HK = Hong Kong SAR; ID = Indonesia; IN = India; JP = Japan; KR = Korea; MY = Malaysia; NZ = New Zealand; PH = Philippines; SG = Singapore; TH = Thailand.

¹ Short-term external debt comprises consolidated international claims of BIS reporting banks with a maturity up to and including one year, plus international debt securities outstanding with a maturity up to one year. ² For Japan, 1999. ³ Refers to the average over Australia, China, Hong Kong SAR, Indonesia, India, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand. ⁴ Ratio of short-term external debt. ⁵ Months of imports. ⁶ In per cent.

Sources: IMF; Datastream; national data; BIS.

All these pre-crisis conditions reflected a decade of lessons learnt from the Asian financial crisis of 1997–98 and the subsequent efforts in the region to strengthen the foundations for sustained economic growth. It is important to remember the seminal nature of that crisis on the thinking of policymakers. The Asian crisis hit economies hard, as large capital inflows reversed course sharply in Thailand, Indonesia and Korea. Real GDP fell by more than 8% year on year in Hong Kong, Indonesia, Korea, Malaysia and Thailand, and by lesser amounts elsewhere. (See Box I for a comparison of the Asian crisis with the current international financial crisis).

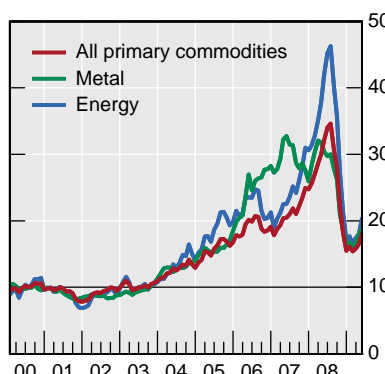
Despite the underlying strength of the economic and financial fundamentals during the run-up to the current international financial crisis, there were several near-term risks to the outlook in the region (Graph I.4). For one, monetary policymakers were concerned about the possible consequences of the commodity price boom for inflation and inflation expectations, especially as spare economic capacity in the region, and globally, was declining. There were also economic and balance sheet adjustments in economies that had experienced asset price booms, particularly in real estate markets, and increasing household indebtedness and rapid credit growth in some economies. On the whole, however, such vulnerabilities by themselves were fairly limited.

On the international side, there were some additional reasons for concern. Cross-border financial activity in the region was booming. For example, the gross value of financial account transactions increased by a factor of more than three in Korea, Malaysia and Singapore in the two years prior to the international crisis, with most of the change accounted for by increased portfolio investment. This heightened potential vulnerability to capital reversals. A number of economies ran large and persistent current account imbalances, including deficits in Australia and New Zealand and surpluses in China and a few others.

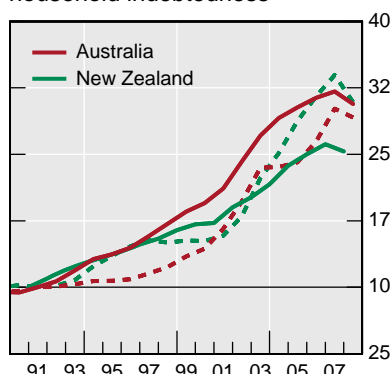
Graph I.4

Selected vulnerability indicators

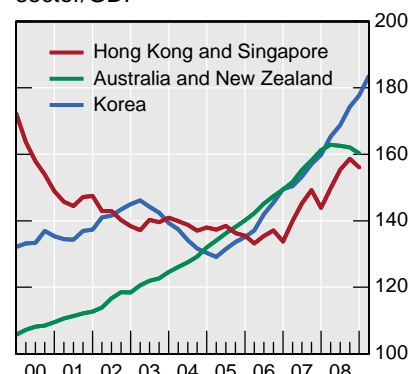
Commodity prices¹



Residential property prices² and household indebtedness³



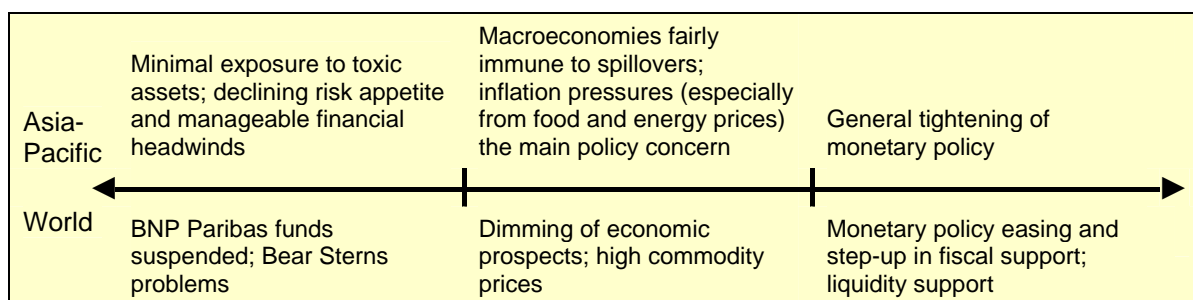
Domestic credit to the private sector/GDP⁴



¹ 2000 = 100. ² Dashed lines; 1991 = 100. ³ Solid lines; 1991 = 100. Total household debt as a percentage of household disposable income. ⁴ Weighted averages based on 2005 GDP and PPP exchange rates of the economies shown.

Sources: IMF; OECD; national data.

Phase 1: Initial financial turmoil (Q3 2007–mid-September 2008)



Up until mid-2007, global financial markets were still buoyant. Indeed, equity indices were hitting new highs, and rapid credit growth in the United States had led to a rapid expansion of assets associated with innovations in financial engineering, including those based on subprime mortgages that were to become infamous.

Early in the third quarter of 2007, however, global markets reversed course. The increasing inability of market participants to price some risky assets, highlighted by BNP Paribas's announcement to this effect on 9 August, signalled the start of the financial crisis. At first, the turmoil seemed isolated and manageable. But the breakdown in interbank markets soon necessitated large liquidity injections by many major central banks, including those in Australia and Japan, to help restore more orderly conditions.

Underlying the turmoil was an underpricing of risk, especially credit risk. Concerns initially focussed on structured credit products, particularly securities backed by US subprime mortgages, on the balance sheets of major financial institutions. These toxic assets themselves had little direct impact on banks in Asia and the Pacific, as the exposures to them were small. Initially, confidence about the region suffered, but as information indicating that the exposures were minimal spread in financial markets, Asia-Pacific economies were spared the worst. In Thailand, for example, banks held collateralised debt obligations (CDOs)

representing just 0.04% of their balance sheets. Those banks with some exposure to CDOs, such as banks in Singapore, held relatively safe assets and were generally much less leveraged than those in the United States and Europe. Therefore, they were not particularly vulnerable to a collapse in the valuations of structured credit products.

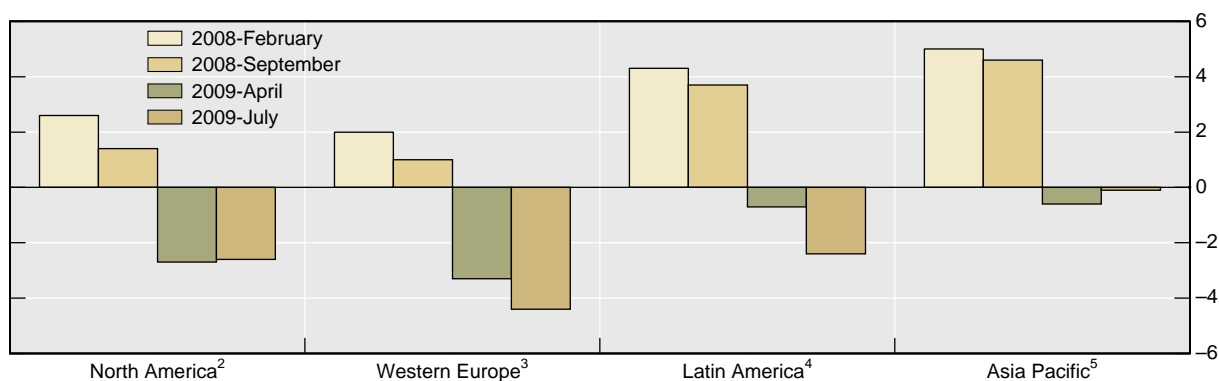
The initial turmoil did have some important indirect effects, as the risk appetites of global investors declined. Low-grade borrowers, such as those from India, Indonesia and the Philippines, lost access to markets. High-grade borrowers with large external financing requirements faced much higher funding costs over time. Australian and New Zealand banks recognised the changing risk profile of their funding early on and during Phase 1 extended the maturity of their foreign liabilities and prefunded maturing obligations.

Decreasing risk appetite also affected other markets in early 2008. Portfolio investment reversed course and became moderate outflows in Hong Kong, Japan and Korea, while the unwinding of the carry trade by institutional investors saw the yen reach 12-year highs against the US dollar in March 2008 following the takeover of Bear Stearns. Securitisation markets in Australia, important for funding housing credit, dried up.

Meanwhile, the relative resilience of Asia-Pacific economies led to suggestions that the region might decouple economically from the rest of the world. Such views were particularly prevalent as the pace of economic activity in the United States and Europe began to slow in early 2008 while prospects for Asia-Pacific economies remained strong (Graph I.5). Indeed, commodity prices continued their upward trajectory, with the price of oil finally peaking at nearly \$150 a barrel in July 2008. Food prices were also surging on higher global demand; in July, prices stood around 50% higher than a year earlier. For economies in which food and energy prices were a major share of the typical consumption basket, the headline inflation pressures mounted.

Graph I.5

Consensus Economics GDP growth forecasts for 2009¹



¹ GDP forecast for 2009; regional totals are weighted averages calculated using 2007 GDP weights, converted at average 2007 exchange rates. ² Canada and the United States. ³ Denmark, the euro area, Norway, Sweden, Switzerland and the United Kingdom. ⁴ Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. ⁵ Australia, China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Sri Lanka, Thailand and Vietnam.

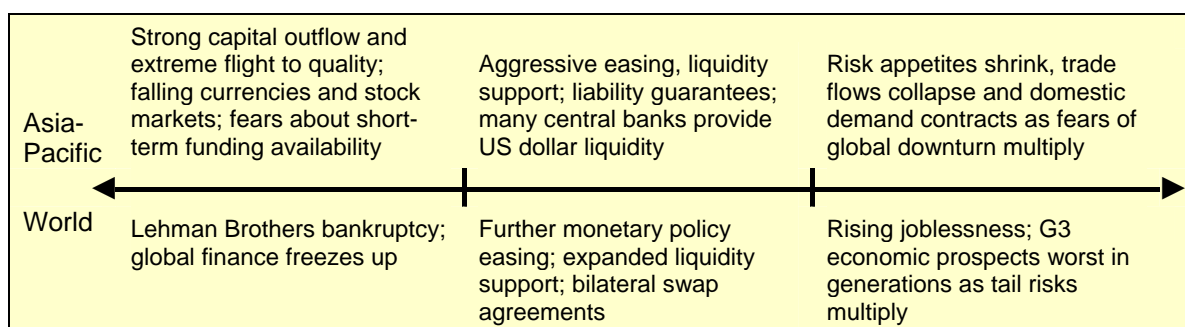
Source: © Consensus Economics.

Thus, despite the financial headwinds blowing from the United States and Europe, inflation pressures remained the key policy concern for many central banks through the middle of 2008. Accordingly, many central banks in the region pursued a tighter monetary policy stance. In India and Indonesia, for example, where inflation peaked at over 12% in August–September 2008, policy rates were raised by 175 and 125 basis points respectively in the first eight months of 2008. Smaller policy rate increases were seen elsewhere in the region.

There were exceptions. Malaysia, while concerned about inflation, emphasised the downside risks associated with the expected fallout from the global slowdown later in the year, and kept rates fixed even as inflation surged to 8.5%. Japan held its very low policy rate of 0.5% throughout this period as concerns about the financial headwinds and the durability of the incipient expansion weighed on the minds of policymakers. In July, however, the Reserve Bank of New Zealand started lowering its relatively high policy rates due to a slowing domestic economy and increased funding costs faced by banks.

By the end of this period, the downside risks to economic activity and the upside risks to inflation in the region were seen as largely balanced, given the policy adjustments in the middle of the year. True, additional policy actions were still being contemplated, as spillovers from the international financial crisis were materialising. Declining equity prices in Japan had also started to impact on banks' capital adequacy due to large cross-holdings. But banks in the region were still able to raise funds, despite some financial market segments still being effectively closed. But few were anticipating what was about to happen, in terms of both its swiftness and severity.

Phase 2: Sharp financial market deterioration (mid-September 2008–late 2008)

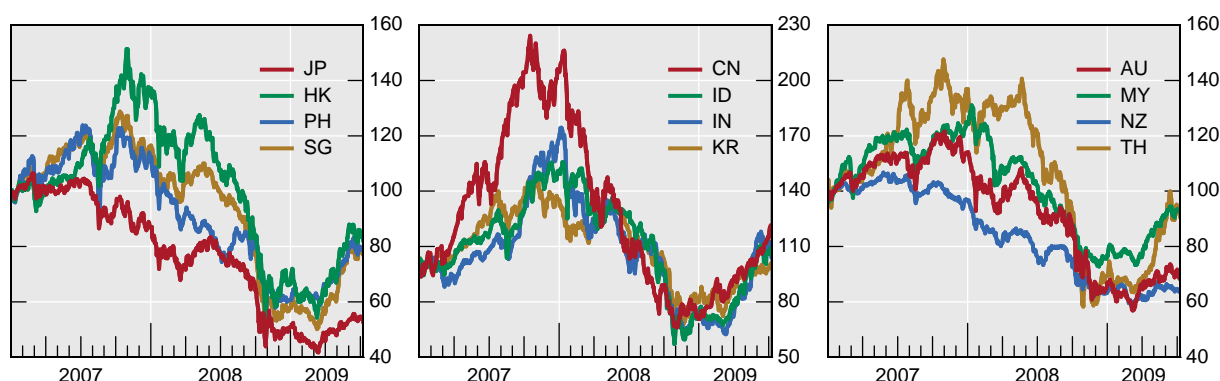


Together with the rest of the world, prospects for Asia and the Pacific abruptly changed in mid-September 2008 with the bankruptcy of Lehman Brothers. This phase of the crisis posed much stronger policy challenges to the central banks in the region than the earlier phase. The initial consequences were a crisis of market confidence and a dramatic collapse in risk appetites that spilled over to the region with unprecedented intensity. An extreme flight to quality led to massive sell-offs by international investors in many markets in the region. Excluding China, Asia-Pacific equity indices dropped an average of almost 40% in two months, with those in Japan falling 23% in just four consecutive days (Graph I.6). CDS indices in North America, Europe, Asia and the Pacific as well as the CDS spreads of major banks in all these regions jumped up immediately after mid-September 2008 (Graph I.7).

Capital flight from the region, together with the continued reversal of the carry trade, was accompanied by sharp depreciations (exceeding 20%) of the rupiah, won and Australian and New Zealand dollars. The rupee hit six-year lows in October, despite heavy intervention, and cash rates in India rose to almost 20%. As regional investors sought to reduce exposure to any but the most secure assets, borrowers struggled to roll over debt. The shortage of liquidity in the region, in turn, inhibited the ability of markets to intermediate funds smoothly, resulting in disorderly market conditions. This general market stress fed further regional contagion and a spike in counterparty risks.

Graph I.6
Equity prices in Asia-Pacific

Jan 2007 = 100

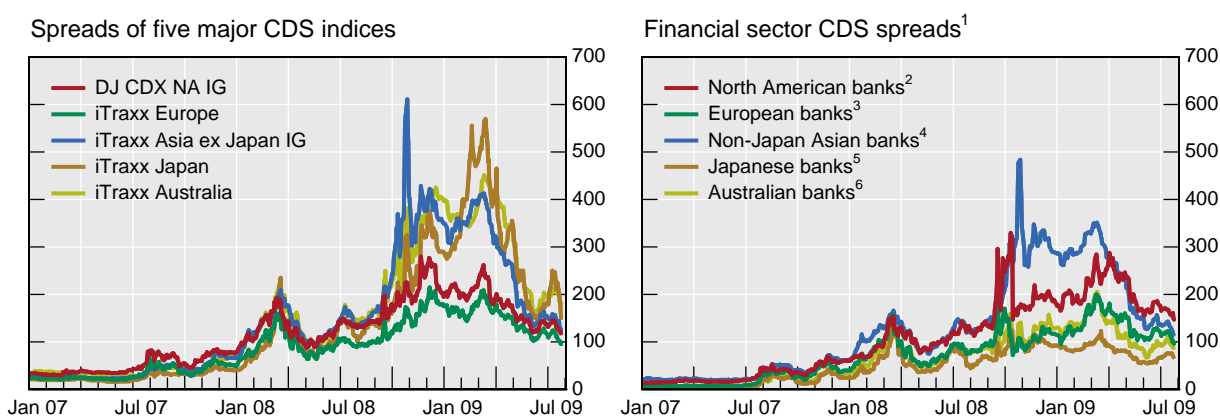


For an explanation of the economy abbreviations, see Graph I.3.

Source: Datastream.

Graph I.7
Changes in CDS spreads in the US, Europe and Asia-Pacific

In basis points



¹ Equally weighted average five-year senior CDS spreads. ² Eleven banks headquartered in North America. ³ Twelve banks headquartered in Europe. ⁴ Seventeen banks headquartered in non-Japan Asia. ⁵ Three banks headquartered in Japan. ⁶ Four banks headquartered in Australia.

Sources: Datastream; JPMorgan Chase; Markit; BIS calculations.

Despite persistently high headline inflation, the combination of a deteriorating outlook, a rapid reversal in commodity prices and financial stability concerns led to an array of policy responses (Table I.1). Many of the actions were preventive in nature as downside tail risks multiplied. With respect to monetary policy, policy rates and required reserve ratios were cut sharply. By year-end, all regional central banks had aggressively eased the stance of monetary policy. In the case of New Zealand, the cumulative decline in the policy rate was 325 basis points. In addition, China, India, Indonesia and the Philippines had lowered reserve requirements.

Beyond these conventional monetary policy measures, additional steps to restore market confidence and to improve the performance of markets were also taken. Local currency liquidity support was expanded in many economies, with various measures focusing on extended maturity of financing and broadened eligibility of collateral. In addition,

governments and central banks provided liquidity assistance in foreign currencies, injected capital into banks, offered guarantees for the liabilities of financial institutions and directly supported asset prices. Some economies also benefited from bilateral swap facilities with the Federal Reserve, and additional bilateral swaps within the region were increasingly discussed.

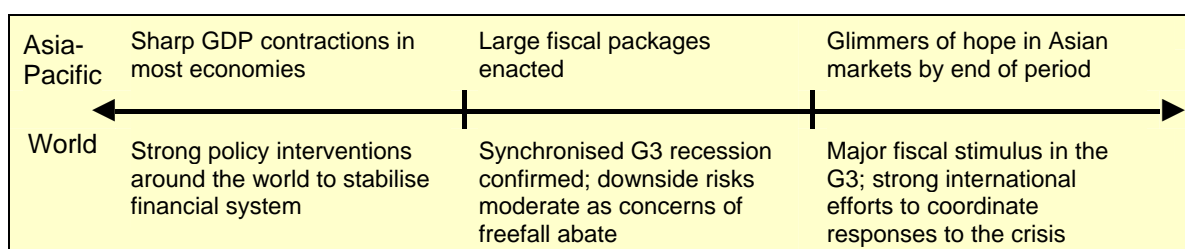
Trade activity fell rapidly, driving increased concern about the real economy. By December, aggregate exports from Asia were down 18% year on year, with imports declining at a similar rate, prompting many governments in the region to introduce special programmes to support trade finance. In addition to the monetary policy stimulus already in play, governments announced aggressive fiscal stimulus, amounting to approximately 1% of GDP in Australia, Malaysia and Thailand, and a massive 13% in China.

	CA	US	EU	CH	UK	AU	CN	HK	IN	ID	JP	KR	MY	NZ	PH	SG	TH
Ease monetary policy	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Introduce fiscal stimulus		√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Liquidity assistance in local currency	√	√	√	√	√	√		√	√	√	√	√		√	√		
Lend foreign exchange	√		√	√	√	√			√	√	√	√		√	√	√	
Expand deposit insurance		√	√		√	√		√		√		√	√	√	√	√	√
Guarantee non-deposit liabilities	√	√	√		√	√						√		√			
Prepare bank capital injection		√	√	√	√		√	√	√		√	√					√
Create demand for assets	√	√	√	√		√	√		√	√	√	√	√				
Impose short sale restrictions	√	√	√	√	√	√		√		√	√	√				√	
Relax mark to market rules		√	√ ²	√	√					√	√	√	√		√		

CA = Canada; US = United States; EU = Euro area; CH = Switzerland; UK = United Kingdom; AU = Australia; CN = China; HK = Hong Kong SAR; IN = India; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; NZ = New Zealand; PH = Philippines; SG = Singapore; TH = Thailand.

¹ As of July 2009. This table summarises policy actions proposed but not necessarily implemented. Details in Annex A. ² Applies to economies whose companies report under IFRS.

Phase 3: Macroeconomic deterioration (late 2008–Q1 2009)



As 2008 drew to a close, many of the policy measures aimed at stabilising financial markets and shoring up the banking system were gaining traction, and attention naturally gravitated to the apparent freefall in the macroeconomy.

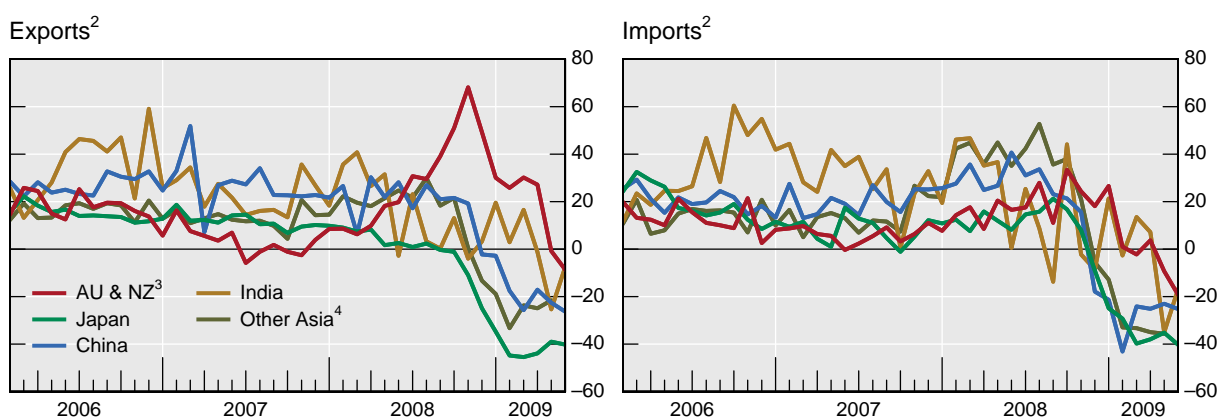
In retrospect, the strong explicit and implicit government guarantees played a significant role in calming markets. The fear that additional major financial institutions would be allowed to fail diminished, decreasing counterparty risk. Use of official reserves, and the establishment of bilateral swap arrangements with the Fed, mitigated liquidity shortages in local US dollar markets. Confidence was further boosted by other cooperative initiatives to increase available foreign currency funding, such as bilateral swaps among Asian economies and progress towards the eventual creation of a multilateral reserve pool under the Chiang Mai Initiative.

Banks in Australia, Japan and Korea were able to source new capital in the marketplace, and credit growth stabilised in many economies. Nonetheless, this newfound stability was punctuated by episodes of investor pessimism, and risk indicators remained elevated. Indeed, US, European and Japanese equity markets hit new lows in early March 2009.

In contrast to the gradual stabilisation of financial markets, exports and industrial production in Asia and the Pacific decelerated sharply. In the final months of 2008, exports fell sharply across the region (Graph I.8). Imports also declined, in many cases by more than exports (for example, in China, Hong Kong, Indonesia, New Zealand and Thailand). For highly open economies, including Hong Kong and Singapore, the effects of the fall in trade on the wider economy were particularly severe.

GDP growth slowed across the region. The change in annual growth rates between Q3 and Q4 2008 averaged -3.4% . The fall in growth was especially sharp in Thailand and Korea, which contracted by -3.4% and -4.2% , respectively, in Q4 2008 after posting positive growth in Q3. Growth in Hong Kong, Japan, New Zealand and Singapore started to slow in Phase 1, and by Q1 2009 each had endured three or more consecutive quarters of contracting GDP. At the other extreme, Indonesia saw only a modest slowdown, from 6.4% in Q3 2008 to 4.4% in Q1 2009. In India and China too, high growth rates were maintained, although they slowed relative to earlier performance.

Graph I.8
Trade¹ developments in Asia-Pacific



AU = Australia; NZ = New Zealand.

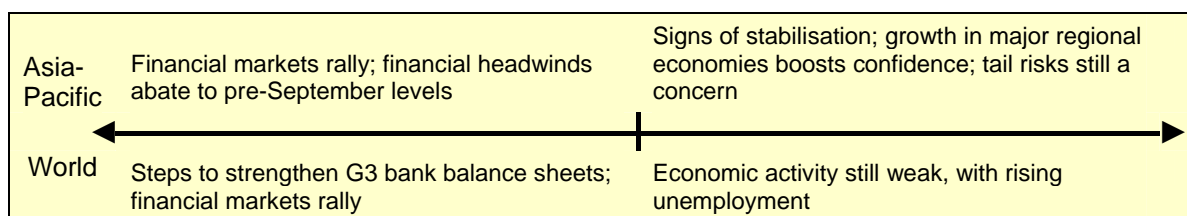
¹ Of goods. ² Annual changes in per cent. ³ Weighted averages based on 2005 GDP and PPP exchange rates. ⁴ Hong Kong SAR, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand. ⁵ In billions of US dollars.

Sources: Datastream; national data.

Substantial new monetary and fiscal policy measures were taken. New fiscal stimulus plans were announced across the region, amounting to 5% of GDP in Japan and 8% in both Malaysia and Singapore. Monetary policy easing also continued. By the end of March, policy rates were at record lows in Australia, Indonesia, Korea, New Zealand and the Philippines.

Towards the end of the first quarter of 2009, some tentative signs emerged that the region's economies were no longer in freefall.

Phase 4: Stabilisation and tentative signs of recovery (Q2 2009–present)



Even though the macroeconomy was still in decline, forward-looking indicators offered glimmers of hope in an otherwise grim situation. To be sure, indicators on the whole remained weak, with depressed investment and rising unemployment in most economies. Yet, in the first quarter of 2009, household consumption in Indonesia accelerated to 5.8%, and GDP growth in India of 5.8% significantly exceeded market expectations. In April, Japan's industrial output surged the most in 56 years, and monthly out-turns for exports improved for China, Hong Kong, Japan, Korea, Malaysia, New Zealand, the Philippines and Singapore.

Financial indicators also began to recover, as investors came back to the markets. Sovereign CDS spreads, though well above pre-crisis levels, continued to fall, and regional exchange rates were stable or appreciating. Stock markets rallied across the board from March, and sentiment surveys indicated expected improvement in Australia, China, Indonesia, Korea, New Zealand, the Philippines and Singapore.

Key policy challenges are currently being addressed with respect to monetary policy, the normalisation of financial markets and the strengthening of financial stability in the region. On the monetary policy side, central banks face a very challenging policy environment in which to navigate in the near term. Downside risks to economies in the region, and even a bout of entrenched deflation, continue to concern central bank policymakers at the end of the period under review. These concerns were being weighed against the fact that monetary stimulus already in the pipeline may be more than adequate to address these risks, and the chance that a surge in inflation might be in the offing if commodity prices rebound strongly.

On the financial markets side, the process of normalisation appears to be under way, but far from complete. Most of the policy initiatives adopted, both in and outside the region, are generally seen as being exceptional and are expected to be removed as the private sector goes back to playing the central role in financial markets. Questions about how best to facilitate that transition remain.

On the financial stability side, considerable efforts are being made to ensure that another financial crisis like the current one will never occur again. International and regional efforts continue to make progress towards filling in the prudential and regulatory gaps that emerged, and strengthening the overall international financial architecture.

Part II discusses all these issues, along with the attention increasingly focused on the need to ensure sound medium-term frameworks with respect to monetary, fiscal and prudential policies.

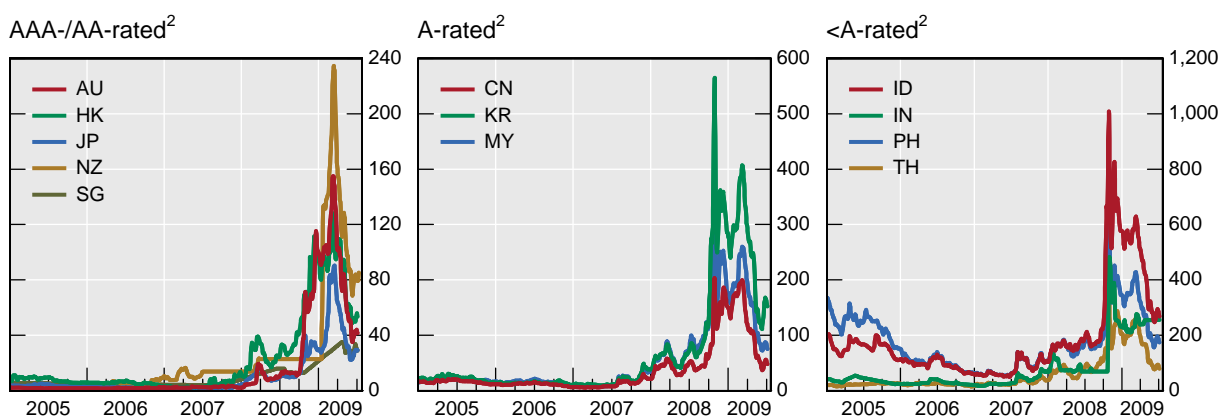
Cross-sectional variation within Asia-Pacific

While all Asia-Pacific economies have been affected by the international financial crisis, the nature and severity of the spillovers to regional financial markets and economies have varied considerably. While there are many details that characterise the differential impact of the crisis across the region, four key cross-country differences stand out as indicators of the nature and severity of the spillovers: sovereign CDS spreads, cross-border financial flows, exports and economic activity. We address each in turn.

Sovereign CDS spreads provide an indicator of risk aversion, together with a measure of the perceived riskiness of an economy. At one extreme, Hong Kong, Japan and Singapore, all highly rated, net creditor economies, each saw increases in spreads of less than 100 basis points in the aftermath of the bankruptcy of Lehman Brothers (Graph I.9). At the other extreme, spreads increased by approximately 500 basis points in India, Korea and the Philippines, and 885 basis points in Indonesia. In particular, Korea's CDS spread increased more than those of China, Malaysia and Thailand. Kim (2009) explains this by showing that CDS spreads of economies which have experienced a crisis or default, or have high capital mobility and a large equity market compared to GDP, tend to increase more than those of economies which do not.

Graph I.9

Five-year CDS sovereign spreads¹



For an explanation of the economy abbreviations, see Graph I.3.

¹ In basis points; five-day moving average. ² For each economy, the mode of the ratings from the three major rating agencies is used.

Source: Markit.

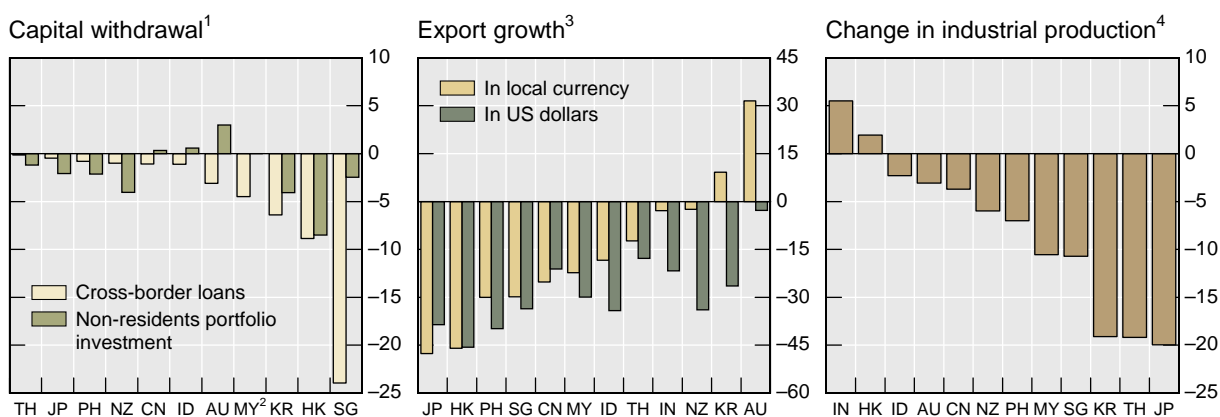
A different type of financial stress is indicated by the extent of disintermediation associated with the retreat of international banks, and difficulty in accessing credit. Credit withdrawals were experienced in all Asia-Pacific economies. The credit crunch manifested itself initially in outflows of relatively liquid portfolio investment, and subsequently in the difficulty of rolling over maturing US dollar debt as liquidity pressures mounted (Graph I.10, left-hand panel). The drop in cross-border loans, as a percentage of GDP, was largest in the financial centres of Singapore and Hong Kong. Portfolio outflows were largest in Korea and New Zealand, which have liquid and open equity markets, and Malaysia, which has a large domestic bond market with significant foreign participation.

The impact of the adverse macroeconomic shock hitting the region was most clearly reflected in the adjustment of exports (Graph I.10, centre panel). The decline in trade was particularly evident where exports were concentrated in high-end manufactures (for example, autos and electronics) and investment goods, and destined for US markets. In US dollar terms, the fall in exports was pronounced, partly reflecting the sharp appreciation of the US

dollar. In domestic currency terms, the negative impact was generally more modest. In contrast to exports, the impact of net trade on GDP tended to be small, as imports also declined dramatically, in some cases by more than exports.

Graph I.10

Impacts of the international financial crisis on capital flows, exports and industrial production



For an explanation of the economy abbreviations, see Graph I.3.

¹ Q4 2008 data for cross-border loans and 2008 annual data for non-resident portfolio investment (gross flow), both as a percentage of 2008 GDP. ² Data on non-resident portfolio investment not available. ³ January–February 2009 over January–February 2008. ⁴ December 2008 over June 2008; percentage change.

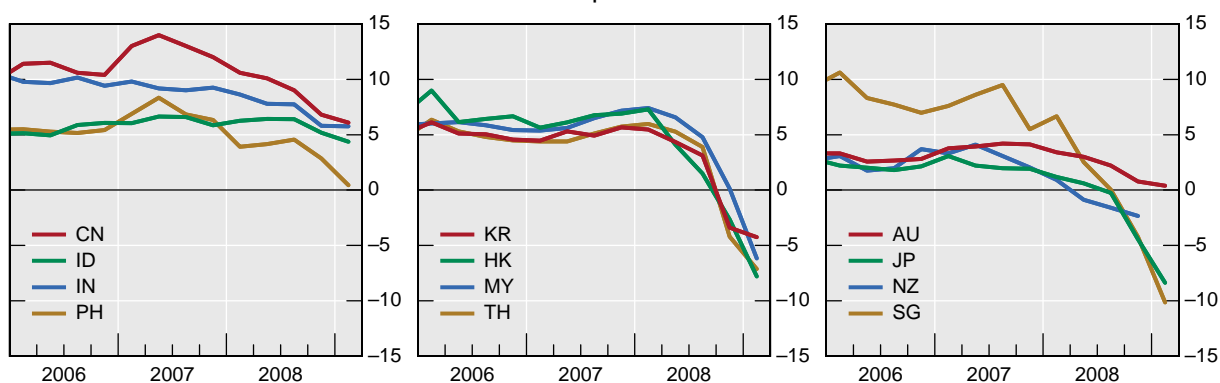
Sources: IMF; CEIC; Datastream; IMF; national data; BIS.

The output consequences of the international financial crisis were quite stark in some cases. Declining consumption, collapsing exports and inventory destocking resulted in falling industrial production in most economies (Graph I.10, right-hand panel). Japan, Thailand and Korea were hit hardest. Aside from the predominantly service-based Hong Kong economy, the only economy to experience expanding industrial production through the crisis was India where it increased by only 0.5% from October 2008 to March 2009. In terms of real GDP growth, the most affected economies were Hong Kong, Japan, Singapore and Thailand. In these economies, the rate of real growth fell by more than 9% (Graph I.11).

Graph I.11

Real GDP growth¹

In per cent



For an explanation of the economy abbreviations, see Graph I.3.

¹ Annual changes.

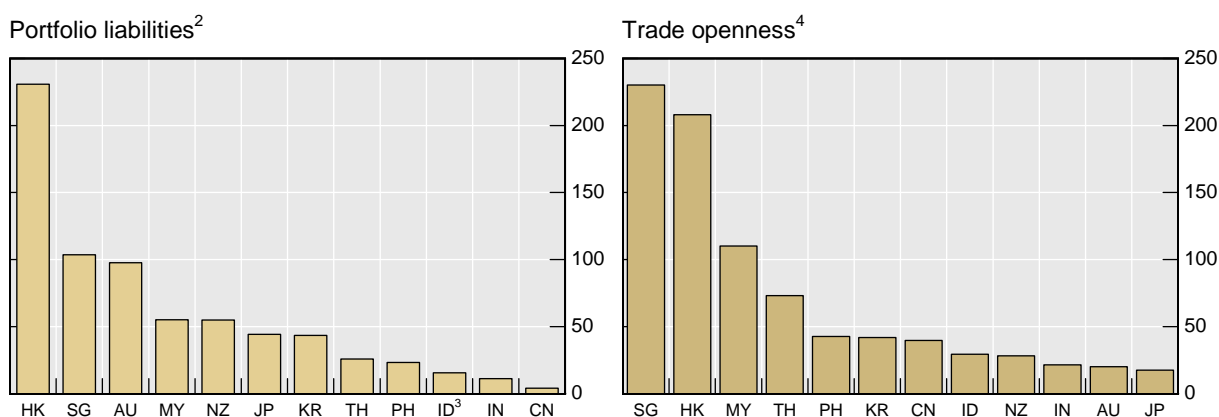
Source: national data.

Digging a bit deeper into the forces at work in the region, we find it useful to look at the cross-country experience during the crisis through the lens of differences in vulnerabilities, and the effectiveness of buffers against those vulnerabilities. As outlined above, some economies were affected much more than others by the crisis. We account for this, focusing first on the effects of the crisis on the real economy, followed by financial markets.

The cross-country macroeconomic story is fairly straightforward. The economies most open to trade were also most vulnerable to the cutback in external demand. The economies with the highest share of exports to GDP (Graph I.12, right-hand panel) were China, Hong Kong, Korea, Malaysia, the Philippines, Singapore and Thailand. A key buffer that mitigated the effects of falling external demand was exchange rate flexibility. In Japan, exchange rate movements exacerbated the impact of weaker external demand because capital inflows caused the yen to appreciate (Graph I.13).

Another contributing factor to the macroeconomic story is the sectoral composition of output. The most exposed economies were those where high-end manufactures (autos in Japan and Korea, electronics in the Philippines and Singapore), transport (ships in Korea, shipping services in Singapore) and investment goods (Japan, Korea and China) were a large share of exports (Graph I.14).

Graph I.12
External vulnerabilities¹



For an explanation of the economy abbreviations, see Graph I.3.

¹ As a percentage of GDP. ² Defined as gross external portfolio liabilities in 2007. ³ 2006. ⁴ In terms of exports of goods and services in 2007; includes re-exports.

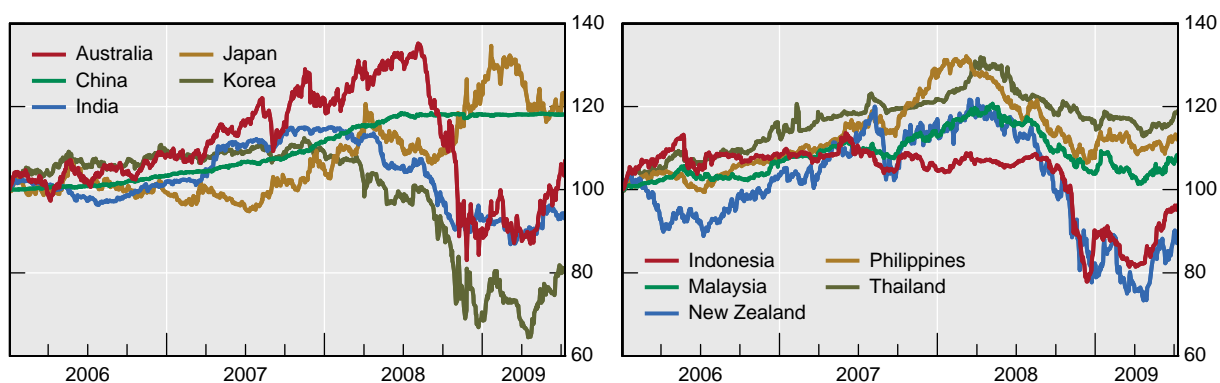
Sources: IMF; national data.

On the financial side, the explanation for the cross-country pattern is more complex. The vulnerabilities depended on the importance of particular funding markets, and various special factors.

Vulnerabilities associated with portfolio flows were related to the size and openness of equity and bond markets. Going into the crisis, portfolio liabilities were more than 50% of GDP in Australia, Hong Kong, Malaysia, New Zealand and Singapore, and only a little less in Japan and Korea (Graph I.12, left-hand panel). As risk appetite receded, the lower-rated economies suffered larger withdrawals relative to initial liabilities. While foreign capital was withdrawn from liquid markets in Hong Kong, Japan and Singapore, those economies had large external surpluses, and repatriation of capital more than offset capital withdrawal.

Graph I.13

Foreign exchange rates¹



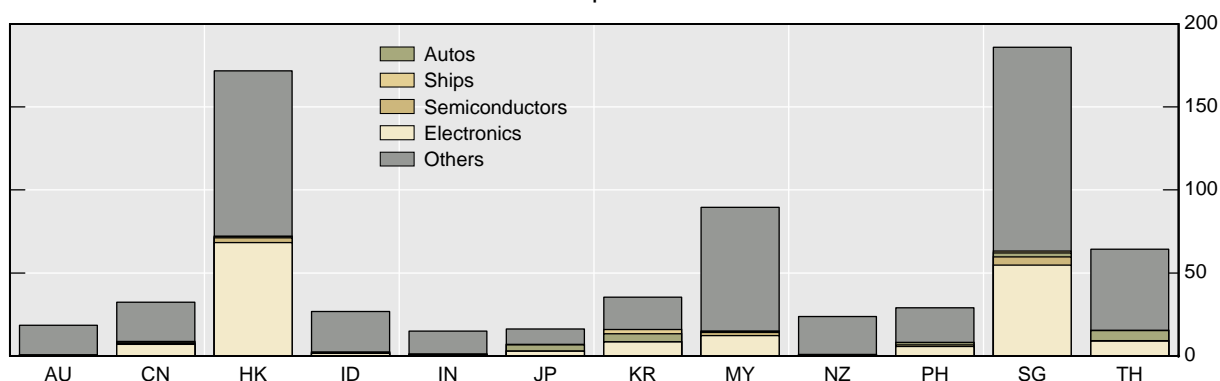
¹ US dollars per unit of local currency; 2 January 2006 = 100.

Source: Bloomberg.

Graph I.14

Exports as a percentage of GDP, by products¹

In per cent



For an explanation of the economy abbreviations, see Graph I.3.

¹ Products are classified according to the HS standard of the United Nations Commodity Trade Statistics. Autos = 87; Electronics = 85 excluding 8541; Semiconductors = 8541; Ships = 89; Others = total minus the listed four categories. 2008 numbers (2007 for Japan and Korea).

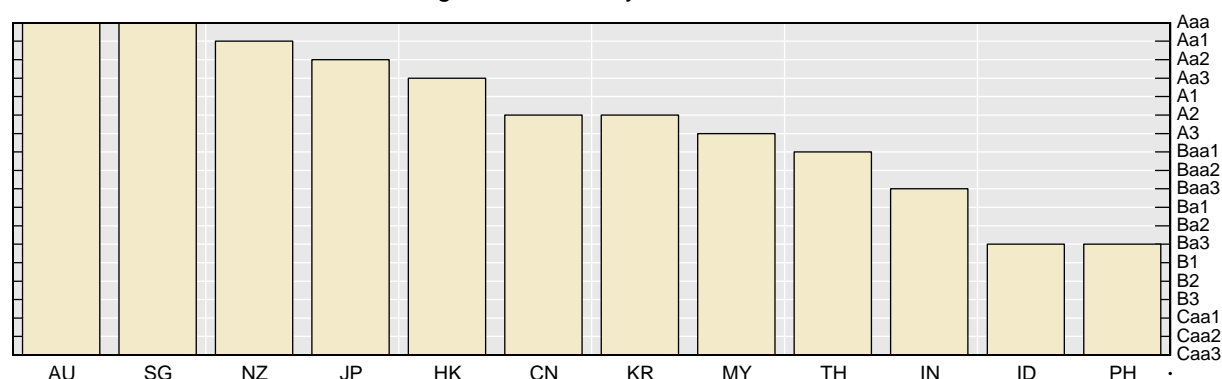
Sources: IMF, *World Economic Outlook*; United Nations Commodity Trade Statistics; BIS calculations.

Cross-border loans from BIS-reporting banks fell across the region, but to different extents. Cross-border loans to the financial centres of Hong Kong and Singapore were very high. However, a number of factors helped to buffer the financial markets of Hong Kong and Singapore against these vulnerabilities. For example, persistent current account surpluses, high sovereign ratings (AA– and AAA respectively; see Graph I.15) and expanded deposit insurance supported repatriation of capital, thus providing a substitute for external lending. Further, relatively stable exchange rates, which inhibited macroeconomic adjustment to the trade shock for these economies, increased the perception of the safety of their currencies, and so served as a buffer for financial markets as risk aversion rose. Nevertheless, the large role of financial services meant a fall in domestic demand as business activity slowed sharply in both economies.

Graph I.15

**Credit ratings on long-term foreign currency sovereign debts
for Asia-Pacific economies**

Rating scale of Moody's Investors Services



For an explanation of the economy's abbreviations, see Graph I.3. As of June 2007. For each economy the mode of the ratings from the three major rating agencies is used. The equivalent rating scales from Standard & Poor's and Fitch Ratings are: AAA (Aaa), AA+ (Aa1), AA (Aa2), AA- (Aa3), A+ (A1), A (A2), A- (A3), BBB+ (Baa1), BBB (Baa2), BBB- (Baa3), BB+ (Ba1), BB (Ba2), BB- (Ba3), B+ (B1), B (B2), B- (B3), CCC+ (Caa1), CCC (Caa2) and CCC- (Caa3).

Sources: Fitch Ratings; Moody's Investors Services; Standard and Poor's.

In other economies with highly developed financial markets, the story varied. In Australia and New Zealand, the hedging of foreign currency liabilities meant that domestic currency liquidity was an effective substitute for foreign currency lending. In Japan, repatriation of capital mitigated foreign currency liquidity pressures. However, this also caused the exchange rate to appreciate, reinforcing pressures on the trade side.

Korea provides an illustration of the importance of additional factors in determining the impact of financial spillovers. In contrast to Australia, Hong Kong, Japan, New Zealand and Singapore, Korea was much more affected by capital outflows. Outflows began earlier, in Q3 2007, and continued throughout the crisis. By December 2008, over \$70 billion (7.7% of GDP) had been withdrawn from Korea's equity market by non-residents. When foreign currency liquidity pressures became severe, the central bank rapidly scaled up liquidity provision. But credit guarantees, so effective in some other economies, were less so here due to Korea's foreign currency exposure. Substantial holdings of foreign currency reserves, however, proved useful in Korea's case: they were used both to smooth foreign exchange market volatility and, perhaps more importantly, to provide foreign currency liquidity to domestic banks and exporters. The foreign currency swaps from the Fed, China and Japan subsequently bolstered both confidence and the provision of foreign currency liquidity.

Other lower-rated economies in the region were also adversely affected during this time of heightened risk aversion and flight to quality. Borrowers in these economies either faced very high credit premia or were shunned by lenders altogether. However, being less financially open, these economies tended to have smaller initial exposures, and were therefore ultimately less vulnerable.

Another vulnerability related to trade credit. Trade credit is normally considered safe, with the traded goods serving as collateral; however, it is largely denominated in US dollars and short term in nature, so rollover of trade credit appears to have become difficult, especially for exporters in lower-rated economies, as US dollar funding markets and FX swap markets became dysfunctional at the height of the crisis. Expanded lending by domestic banks and regional "international" banks, together with guarantees by governments and (AAA-rated) multilateral agencies, all supported continued trade credit supply shortages during the crisis. Nonetheless, anecdotal evidence suggests that some firms, especially those exposed to

sectors and export destinations where demand contracted sharply, found it difficult to secure trade credit.

Box I

The Asian and international financial crises compared

A comparison of the current international financial crisis and the Asian financial crisis highlights some similarities, but many differences. One similarity between Asia a decade ago and the United States and western Europe now is that, on the eve of both crises, signs appeared of credit and asset price booms across a range of markets in the region, fuelled in part by strong capital inflows. Another similarity is that the economies at the centre of each crisis witnessed devastating meltdowns in their banking systems. In addition, in both crises Asia saw its equity markets plummet sharply and experienced large capital outflows.

The differences are equally stark. While the initial shock of the Asian crisis had its epicentre in Southeast Asia, the origins of the current international crisis lay outside the region. In contrast to the large current account deficits of 3–8% of GDP in the four most affected economies of the Asian crisis (Indonesia, Korea, the Philippines and Thailand), many Asia-Pacific economies now run sizeable current account surpluses. While the Asian crisis was a classical twin currency and banking crisis, the region's banking sector has today held up well to the spillovers from the United States and Europe, and economies have been flush with foreign reserves. This time the export powerhouses of Japan, Korea and Singapore have been harder hit, under the weight of collapsing trade flows.

The challenges facing regional policymakers are quite different today than they were a decade ago. While IMF-administered austerity measures featured prominently in the Asian crisis, most economies in the region now have chosen expansionary fiscal and monetary policies, and have eschewed overtures from the IMF for financial assistance. Last time, massive regional exchange rate devaluations and a strong US economy largely supported an export-led recovery; this time, a more home-grown recovery may be needed, owing to the retrenchment of US consumers, stubborn global imbalances and the limited depreciation of most Asian currencies. Finally, Asian policymakers are now actively participating in regional and international forums to devise strategies to combat the international financial crisis, to draw useful lessons from the crisis and to search for more robust global financial stability frameworks.

Table I.2

Impact of the Asian and international crises

	Exchange rate changes ¹ (in per cent)		Stock market changes ² (in per cent)		Change in GDP growth ³ (in percentage points)	
	Asian crisis ⁴	Intl crisis ⁵	Asian crisis	Intl crisis	Asian crisis	Intl crisis
Australia	-23	-32	-11	-51	-2.0	-3.8
China	0	12	-12	-71	-3.5	-6.5
Hong Kong SAR	-1	1	-56	-59	-15.3	-15.1
India	-20	-23	-35	-56	-1.3	-3.5
Indonesia	-83	-24	-62	-55	-23.5	-2.2
Japan	-21	36	-35	-58	-4.6	-11.0
Korea	-47	-37	-60	-49	-14.1	-9.9
Malaysia	-43	-14	-72	-40	-19.6	-13.6
New Zealand	-32	-36	-34	-41	-4.4	-6.2
Philippines	-40	-17	-58	-51	-8.4	-7.9
Singapore	-19	-11	-56	-58	-13.6	-19.6
Thailand	-53	-12	-68	-56	-13.3	-13.1

¹ Maximum depreciation (-) or appreciation (+) against the US dollar. ² Peak-to-trough change in the benchmark stock market index. ³ Largest difference in year-on-year real GDP growth rates. ⁴ From June 1997 to June 2000. ⁵ From June 2007 to March 2009.

Sources: Bloomberg; BIS calculations.

Part II: Policy challenges in Asia and the Pacific

With the timeline as a background, we now consider the crisis through three lenses: monetary policy and exchange rates, financial market development and financial stability. In each case, we focus on the effects of the crisis, the policy responses and the challenges ahead.

II.1 Monetary policy and exchange rates

The international financial crisis was remarkable in its scope, size and synchronicity. Equally remarkable was the policy reaction to the intensification of spillovers to Asia and the Pacific in the post-Lehman bankruptcy period. This section briefly summarises some of the key monetary policy actions, putting them in the perspective of ongoing thinking about appropriate conduct of monetary policy during crises. We then turn to contemporary policy issues associated with exit strategies out of the crisis, and some lessons for thinking about monetary policy frameworks over the medium term. We conclude the section with some thoughts on optimal reserve levels in the light of the enhanced swap lines, and consequences for the effectiveness of monetary policy control if the region were to move away from export-led growth strategies in the future.

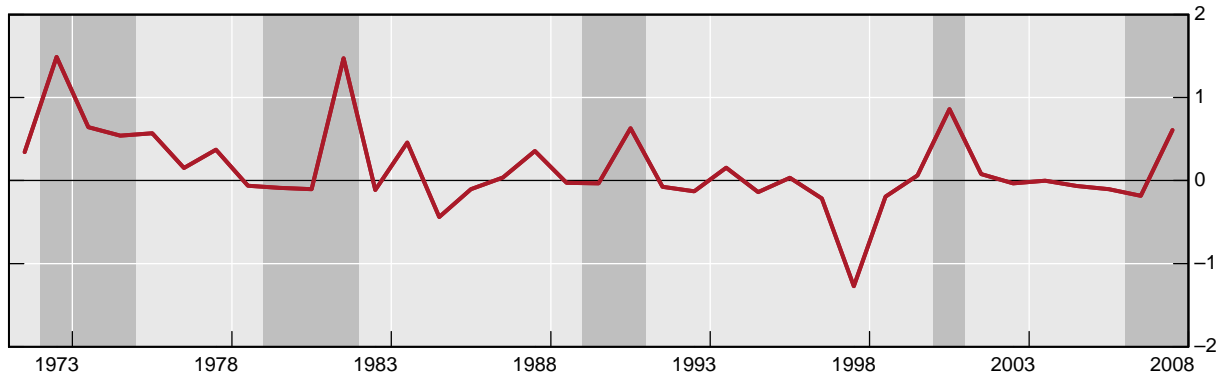
II.1.1 Regional monetary stability prior to the crisis

In the decade prior to the crisis, the region had achieved considerable success in promoting monetary stability. Inflation had generally stabilised, although price pressures were building in many economies in the run up to the crisis. Central banks focused clearly on maintaining price stability, whether achieved through interest rate or exchange rate management. Indeed, over the past decade, several central banks adopted formal inflation targeting regimes, and even those that did not assigned priority to inflation control in their policy frameworks. Evidence of regional central banks' success in this regard can be seen in a reduction in the inflation rate and inflation volatility. In addition, the region saw a general narrowing of the dispersion of private sector inflation forecasts, and the relative stability of inflation expectations, even during the crisis (Filardo and Genberg (2009)). Prudent progress towards price stability helped to promote real side performance, and uneventful exchange rate adjustments.

These positive developments even led in the first phase of the international crisis to consideration of the possibility that Asia could decouple economically and financially from the fates of the United States and Europe.⁴ In the end, the spillovers from the recession and financial turmoil in the United States and Europe were too strong to avoid, despite the increased resilience of the region relative to the Asian crisis. Yetman (2009) shows that the sensitivity across economies around the globe to US recessions during the crisis was consistent with past cyclical correlations, and hence should not have been such a surprise (Graph II.1.1). Further, the rising degree of financial openness, when combined with deleveraging by international investors, provided an additional channel for the transmission of the crisis to Asia-Pacific (Devereux and Yetman (2009)).

⁴ Decoupling hypotheses have generally emphasised that economies around the world appeared not to co-move as closely in recent decades as in the past. However, this evidence was partly misleading. Yetman (2009) shows that the decline in co-movement primarily reflects the greater duration of expansions in the West associated with the Great Moderation. Global linkages have always tended to strengthen significantly during recessions.

Graph II.1.1
Business cycle phase co-movement¹



¹ Average co-movement of annual real GDP growth in Asia-Pacific economies with the United States. Shaded areas represent NBER-dated recessions. See Yetman (2009) for details on construction.

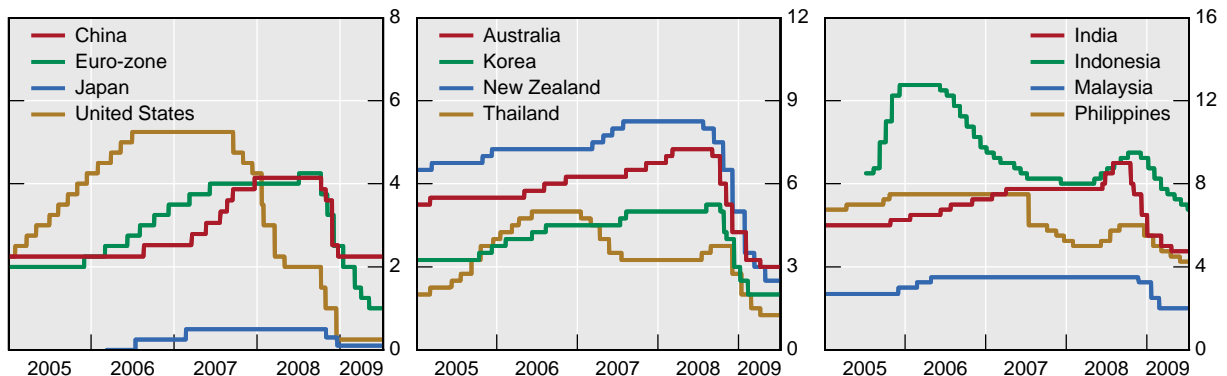
Sources: IMF; NBER; BIS calculations.

II.1.2 Policy responses during the crisis and their effectiveness

Monetary policymakers addressed the extreme financial and macroeconomic conditions with a diverse set of policy tools. Complementing fiscal and prudential policies adopted at the time, monetary policy actions included interest rate cuts, reduced reserve requirements, use of official reserves to stabilise foreign exchange markets and policies to expand domestic credit. Together these various actions greatly mitigated the impact of the crisis on Asia-Pacific economies and financial systems.

Graph II.1.2
Policy rates¹

In per cent



¹ Policy target rates or their proxies. For China, household saving deposits one-year rate; for the euro area, ECB minimum bid refinancing one-week rate; for Japan, BoJ target rate; for the United States, fed funds rate; for Australia, RBA cash target rate; for Korea, overnight call rate target before 7 March 2008, one-week BOK Base Rate thereafter; for New Zealand official cash daily rate; for Thailand, 14-day repo rate before 17 January 2007, one-day repo thereafter; for India, RBI repo cutoff yield; for Indonesia, BI reference interest rate; for Malaysia, overnight policy rate; for the Philippines, overnight reserve repurchase agreement RRP daily rate.

Source: Bloomberg.

Asia-Pacific central banks cut policy rates aggressively following the Lehman bankruptcy (Graph II.1.2). The biggest rate reductions were seen in New Zealand (–500 basis points), India (–425 basis points), Australia (–400 basis points) and Korea (–325 basis points).

Singapore recentred the target band for the nominal effective exchange rate downwards, and adopted a zero appreciation path. In Indonesia and the Philippines, the first cuts in policy rates occurred later than in other parts of the region owing to inflationary and exchange rate pressures, and continued through mid-2009 after other central banks had paused.

Central banks complemented policy rate cuts with reductions in reserve requirements. China lowered its reserve requirement ratio for large banks by 2%, India decreased its cash reserve ratio by 4%, Indonesia cut its rupiah reserve requirement by 4.1%, Malaysia reduced its statutory reserve requirement by 3%, and the Philippines decreased its reserve requirement ratio by 2%. The reductions in reserve requirements were used to help boost liquidity in banking systems and, as a result, cushion pressures that might otherwise increase borrowing costs.

The sale of assets in the region by international banks, and subsequent pressure on domestic asset prices, exchange rates and local currency liquidity in late 2008, prompted an additional range of policy responses. As liquidity pressures spread to domestic financial markets and confidence fell, impairing the effectiveness of the interest rate transmission channel, Asia-Pacific central banks and governments supported the provision of credit through domestic currency liquidity support, expansion of deposit insurance, debt guarantees, asset purchases, bank capital injections, short sale restrictions and relaxation of mark to market rules (see Section II.3.2). Foreign exchange reserves and central bank access to swap lines were also used to smooth volatility in foreign exchange markets and, in some cases, provide foreign currency liquidity. Further, exchange rates were allowed to adjust to shifting capital flows, except in the case of Hong Kong, which operates a currency board.

Finally, as interest rates approached the zero lower bound in Japan, the Bank of Japan resorted to unconventional monetary policy measures. These included outright purchases of commercial paper and expanding the range of eligible collateral in order to ease liquidity conditions, as well as outright purchases of corporate debt securities to ease credit conditions. The BoJ balance sheet increased by 11.4 trillion yen in the half-year to 31 March 2009, with receivables under resale agreements, commercial paper and corporate bonds, loans and bills discounted, and foreign currency loans accounting for the lion's share of the increase. These measures resulted in some flattening of the yield curve, even though financial conditions in Japan as a whole remained relatively tight.

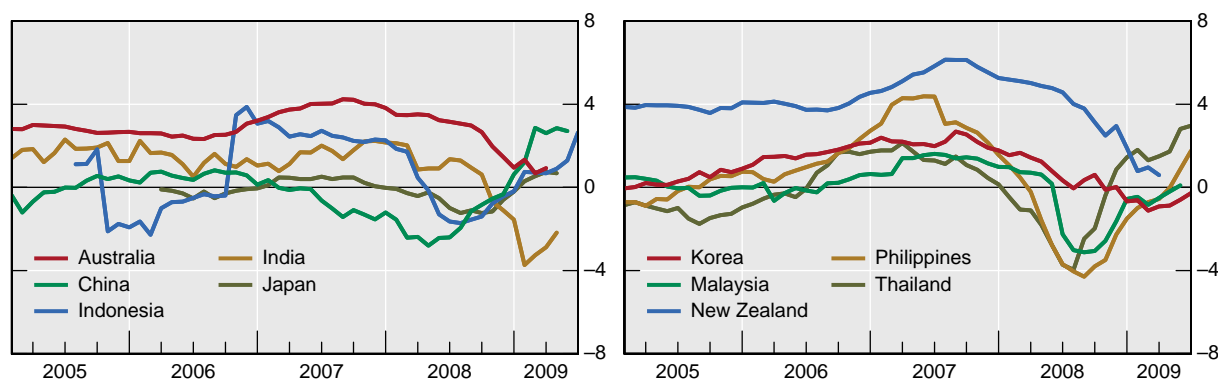
Questions about the effectiveness of unconventional easing measures remain uncertain. In the case of Japan earlier in the decade, quantitative easing appeared to have a greater impact via increasing the expected duration of the zero interest rate environment rather than by jump-starting bank lending, or pumping up domestic demand. In contrast, purchases of risky assets aimed at improving market functioning appear to have been relatively effective in depressing interest rates and improving borrowing conditions. However, uncertainty about the effectiveness of unconventional easing policies suggests that, as central banks approach the zero lower bound, it may be desirable to put more (asymmetric) weight on the downside risks than otherwise. The Japanese example also throws water on the concern that aggressively pumping liquidity into the financial system necessarily results in inflation overshooting. Nonetheless, such concerns cannot be ruled out in the current situation. With banks in the Asian region being relatively sound and in a strong position to lend, making a commitment to a timely exit of unconventional measures may be important.

One complication in reading the effective stance of monetary policy in the region has been the impact of inflation on real policy rates. While nominal monetary policy settings have been much lower since September 2008, the effective stimulus has been heavily influenced by the wide swings in inflation associated with commodity prices. Graph II.1.3 illustrates just how variable real conditions have been in the region. Real policy rates had already begun to fall across the region in mid-2007 as headline inflation picked up. Indeed, real policy rates were either close to zero or in negative territory for extended periods for all regional economies

except Australia and New Zealand (which may explain the large nominal interest rate cuts in those economies). At the time of writing, real rates were negative in India and Korea (based on an average of forward and backward looking measures of inflation). In recent months, real rates have been rising in many economies, despite the cuts in nominal rates, and particularly in China, the Philippines and Thailand as inflation rates have fallen.

Graph II.1.3

Real policy rates, based on forward- and backward-looking inflation¹



¹ Policy target rates or their proxies corrected by forward- and backward-looking inflation component (equally weighted 12-month backward-looking CPI inflation and 12-month forward-looking consensus expectations). For Australia, RBA cash target rate; for China, household saving deposits one-year rate; for Indonesia, BI reference interest rate; for India, RBI repo cutoff yield; for Japan, BoJ target rate; for Korea, overnight call rate target before 7 March 2008, one-week BOK Base Rate thereafter; for Malaysia, overnight policy rate; for New Zealand official cash daily rate; for the Philippines, overnight reserve repurchase agreement RRP daily rate; for Thailand, 14-day repo rate before 17 January 2007, one-day repo thereafter. In per cent.

Source: Bloomberg; © Consensus Economics; national sources.

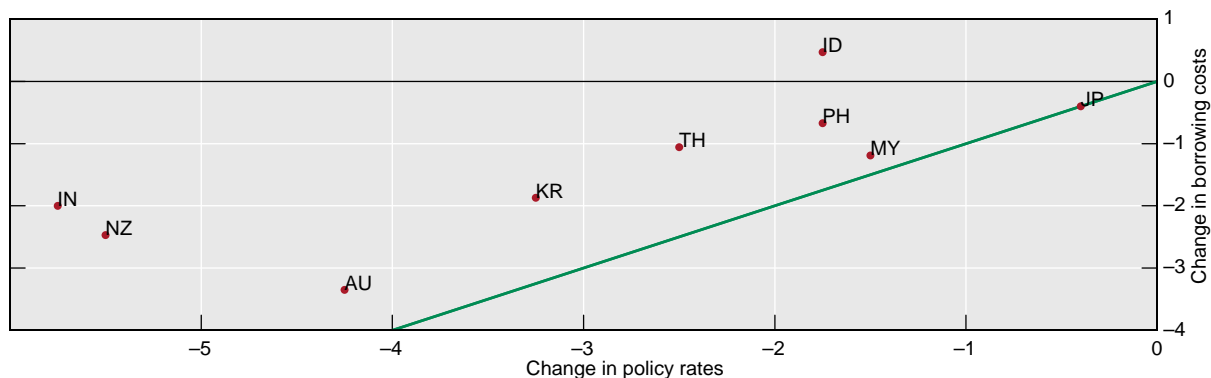
The immediate impact of easing monetary conditions has also been attenuated by persistent financial headwinds, resulting in rising risk premia, liquidity pressures and structural lags in pass-through to borrowing rates (Graph II.1.4). For example, by some measures pass-through from policy rate cuts to borrowing costs has been very limited in India, New Zealand, the Philippines and Thailand, and corporate borrowing costs have actually risen in Indonesia. By contrast, in China, where the central bank influences deposit and lending rates more directly, and in the Philippines, policy rate cuts have been largely matched by falls in corporate borrowing costs. In Australia, where bank lending is predominantly at floating interest rates, cash rate reductions have been passed on to end-borrowers, especially households, relatively quickly. In economies with more fixed-term funding (Indonesia) or lending (New Zealand), delayed pass-through is expected to continue to put downward pressure on borrowing costs in coming months.

Broad money growth has remained robust across the region, even in the immediate aftermath of the Lehman bankruptcy. Rapid growth in deposits, supported by deposit guarantees, has supported growth in domestic credit, which has in turn substituted for declining external credit in the face of severe pressures in some foreign credit markets. The rapid growth of credit in China and Indonesia, however, has raised questions about whether monetary policy conditions may be becoming too accommodative.

Central banks are assessing the desirability of further rate cuts. In lieu of further policy rate reductions, some central banks have been trying to influence the shape of the yield curve at the longer end through their communication policies. Japan, Korea and New Zealand, for example, have been communicating their respective views that policy rates are likely to remain low for an extended period.

Three tentative lessons might be drawn from the experience in Asia and the Pacific. First, it was not clear that explicit inflation targeting central banks had it any easier than non-inflation targeting central banks in controlling inflation, boosting confidence or stimulating economic activity. Private sector inflation expectations appeared to remain fairly well anchored across the region (Filardo and Genberg (2009)).

Graph II.1.4
Incomplete pass-through from policy rates to borrowing costs¹



AU = Australia; ID = Indonesia; IN = India; JP = Japan; KR = Korea; MY = Malaysia; NZ = New Zealand; PH = Philippines; TH = Thailand.

¹ The horizontal axis represents change in the official policy rate or its proxy, and the vertical axis the change in borrowing costs. For borrowing costs, the following have been used: Australia, average actual lending rate; Indonesia, base lending rate; India, average prime lending rate; Japan, prime lending short-term – middle rate; Korea, loans to corporations rate; Malaysia, base lending rate of commercial banks; New Zealand, business base lending rate; the Philippines, average quoted lending rates of commercial banks; Thailand, average MLR of commercial banks registered in Thailand. Changes are measured between the end of August 2008 and April 2009 for Korea and Malaysia; May 2009 for Australia, India, Indonesia and New Zealand; and 17 June 2009 for Japan, the Philippines and Korea. The green line represents 1:1 pass-through.

Source: Datastream; national sources.

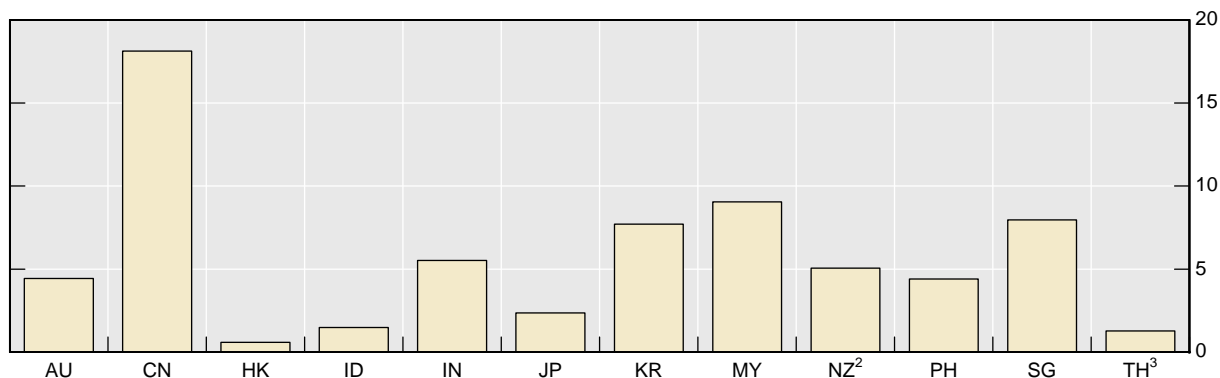
Second, monetary policy during a crisis – even if the epicentre is far away – may require a fundamentally different tactical approach than during periods when the monetary policy environment would be considered more normal. An emerging consensus prior to the crisis was that central banks should react to changing economic conditions gradually, in small steps and in a forward-looking fashion. The pattern of policy rate hikes in the region as inflation pressures were building in 2006–07 reflected behaviour largely consistent with such a view. However, in late 2008, central banks in the region and elsewhere took actions that were large and aggressive. Some of the motivation for the cuts reflected a deteriorating outlook of the most likely path for inflation and economic activity. But the size and swiftness of the rate cuts also reflected a consideration of the tail risks: the need at times to take “insurance” against low-probability, high-impact outcomes using monetary policy. The aggressive response reflects the fact that tail risks can develop very quickly.

Third, the monetary policy response in the region also highlighted the desirability of coordinating monetary and fiscal policy responses. The countercyclical fiscal response has indeed been impressive (Graph II.1.5), and effective, in helping to stabilise the freefall in economic activity and to boost confidence in financial markets. While much of the fiscal stimulus is still in the pipeline, central banks in the region have had to condition their policy responses and, going forward, their exit strategies on the size of the fiscal stimulus and nature of the lagged impact on the economies. The potential for future leveraged booms or other large external shocks to the region (for example, from the sudden unwinding of persistent global imbalances) and the effective conduct of fiscal policy in the current crisis highlight the importance of attention to monetary-fiscal coordination.

Graph II.1.5

Announced size of fiscal stimulus relative to 2008 GDP¹

In per cent



For an explanation of the economy abbreviations, see Graph I.3.

¹ Data up to April 2009; some announced stimulus plans may be spread over multiple years. ² 2007 GDP number used as a denominator. ³ Not including infrastructure spending plans of THB 1.43 trillion over the 2010–12 period.

Source: IMF; Reuters News; UNESCAP.

II.1.3 Challenges for central banks

Looking forward, central banks in the region face several challenges. As financial markets normalise and economies recover, the timing and pace of stimulus will require a familiar balancing act, but with greater complexity. The effectiveness of monetary policy frameworks may need revisiting, particularly in terms of countercyclical prudential policy, as economies become more financially open. Finally, the adequacy of reserves will need to be reconsidered based on experience during the crisis, and the mechanisms put in place for providing foreign currency liquidity, as bilateral swaps and multilateral reserve pooling arrangements being developed become available.

Exit strategies

As tentative signs of stabilisation and recovery emerged in 2009, Asia-Pacific central banks naturally turned to questions about when best to exit from their very accommodative policy stances, and balance the risks of withdrawing too much liquidity too soon against inadvertently leaving policy rates too low for too long.

The nature of the exit strategies reflects the dual motivations for expansionary policy in late 2008. The sharp cuts in policy rates, along with the adoption of other exceptional monetary policy measures since last September, were largely motivated by spillovers from the international financial crisis to both financial markets and economic activity in the region. This therefore suggests a two-pronged exit strategy, with one based on normalisation of regional financial systems and the other on the cyclical position of the macroeconomy.

As market conditions improve and financial headwinds abate, the first prong of the strategy would emphasise the need for central banks to withdraw the portion of the accommodative measures put in place to counter the unusual stresses in financial markets. Some of these measures were designed to be temporary, for example guarantees that have ceased to be used after risk premia have declined. Others may remain in place as part of the reform of the overall monetary policy framework. Still others will need to be withdrawn once markets return to normal and the orderly functioning of the monetary transmission mechanism is restored.

The second prong of the exit strategy would address the countercyclical aims of monetary policy. Conventionally, the narrowing of the output gap and upward pressure on inflation would lead to a normalisation of policy rates. The presence of monetary policy lags suggests the need to be pre-emptive. This part of the strategy might also emphasise a speedier unwinding of policy rate cuts, as macroeconomic tail risks associated with the crisis dissipate.

In assessing the need for the reversal of policy measures, several special factors associated with the international financial crisis complicate matters.

First, the long and variable lags of monetary policy are likely to be particularly difficult to assess, owing to the nature of financial and macroeconomic developments since September 2008 in Asia and the Pacific. Financial headwinds in the region have been sufficiently strong and variable to compromise the reliance on historical relationships to calibrate the likely impact of monetary policy. As a result, the effectiveness of policy rates in stimulating domestic demand and ensuring an adequate flow of credit to all segments of the economy may continue to vary with changes in risk appetite and market liquidity.

Second, the monetary, fiscal and financial policy environment has been unusually complex as a result of the plethora of government policy initiatives adopted over the past year, the range of additional proposals in the pipeline, and uncertainty regarding announcement effects and implementation lags.⁵ These initiatives include those being made domestically, regionally and internationally. Without a more orchestrated sequencing of policy actions, a central bank may find it more difficult than usual to time its withdrawal of stimulus.

Third, the possibility of an asynchronous international recovery puts Asia-Pacific economies at risk of volatile capital flows. If an Asia-Pacific unwinding of monetary policy were to lead the rest of the world, the resulting higher regional interest rates could attract strong capital inflows, including those associated with carry trades. Given the surfeit of global liquidity, these flows could be quite strong and disruptive.⁶

Finally, there are important questions about the specific criteria that central banks in the region might apply when calibrating the timing and speed of the exit strategy. On the financial side, measures of financial system health would be natural candidates. They would include the soundness of the banks (for example, non-performing loans, leverage, capital adequacy and CDS spreads) and the level of turmoil in financial markets (bid-ask spreads, deviations of covered interest parity, turnover and volatility). There are significant difficulties, however, in defining benchmarks for normalisation of risk appetite, such as CDS spreads, from historical data; if there had been a significant underpricing of risk in the pre-crisis period, then equilibrium spreads today would be higher than the historical experience in the 2000s. How high is an open question.

On the macroeconomic side, key indicators for exit strategies include the evolution of inflation relative to (implicit and explicit) inflation targets and output gaps. In measuring output gaps in the current environment key uncertainties arise in assessing whether the fallout from the international financial crisis has led to a one-off shift in potential output and a slowdown in the trend growth rate of (multi-factor) productivity which would reduce potential growth rates of economic activity in the future. The one-off shift may have come about from obsolescence of existing capital in response to changing secular demand patterns. The

⁵ See Hannoun (2009) on the trade-off between fiscal stimulus and sustainability.

⁶ In a model-based evaluation of Chile and New Zealand, Medina et al (2008) estimate that the bulk of variation in external capital flows is explained by foreign shocks. McCauley (2008) discusses measures used in Asian countries to moderate capital flows into Asia in the period preceding the crisis and implications for domestic financial systems. Chai-Anant and Ho (2008) examine the effects of foreign investors' transactions on market returns and exchange rates in six emerging Asian economies.

flattening of trend productivity could result from structural adjustments that might be needed as economies, especially in the region, search for new sustainable growth frameworks for the future.

In either case, if potential output turns out to be much lower than expected in the near term, and hence output gaps less negative, monetary policy will need to be less accommodative, and some central banks may even find themselves somewhat behind the curve with respect to inflation. Additional complications would arise if the slower trend productivity growth raised questions about the appropriate steady state (ie natural) real policy rate. These considerations suggest that central banks face considerable challenges in interpreting forward-looking indicators that reflect such potential structural shifts and calibrating the appropriate policy stance going forward.

Balance sheet considerations arising from the central bank responses in the region to the international financial crisis also feature in the exit strategies. Central banks have various alternatives to drain reserves out of the market. One tactic could be to sell back some of the lower-quality assets that were originally purchased in order to remove them from private sector balance sheets. However, feeding these assets back into markets could be problematic, especially if the associated market segments remain skittish. Alternative means to drain reserves include issuing central bank bills, paying interest on reserves (or equivalently raising the return on deposit facilities), reverse repos and raising reserve requirements. By setting an appropriate return on some of these alternatives, headline policy rates can respond to changing economic and financial conditions more gradually and smoothly while still draining excess liquidity from the financial system.

One final set of issues arises from considerations of how to communicate the exit strategies to the public. In particular, how important is it for central banks to announce the criteria for their exit strategy? Early announcement may be seen as tying the hands of policymakers, and hence effectively constraining the room for manoeuvre during this period of elevated uncertainty. Central banks may be wary of such constraints, especially when there appears to be a premium placed on keeping all options open. In addition, central bank statements on exiting run the risk of being misinterpreted by the markets; if judged as being premature, these statements could undermine fragile business and market confidence. Such statements might also be perceived as running afoul of government efforts to talk up the economy and financial markets, and could inadvertently result in press reports of internal disagreements when unity of purpose appears so critical.

However, telegraphing the intentions of the central bank well in advance might yield benefits by influencing public expectations.⁷ Clear criteria for exiting can help to anchor expectations in a way supportive of central bank efforts in the current policy environment. Prior to the criteria being met, for example, longer-term interest rates are more likely to remain low if the central bank is perceived to have pre-committed to low policy rates. Then, as conditions improve and the preannounced criteria are expected to be met, credit conditions will naturally firm as the private sector bids up longer-term interest rates in anticipation of a rise in short-term policy rates. With the markets reinforcing the intentions of the central bank, then, central banks would be able to adjust policy rates in a more gradual and smooth fashion, with less concern about the possible need to reverse decisions.⁸

⁷ See Filardo and Guinigundo (2008), García-Herrero and Remolona (2008) and Sahminan (2008) on the effect of central bank communication on expectations in Asia Pacific countries.

⁸ Such by-products of a preannouncement strategy were evident in the Japanese experience as the Bank of Japan was exiting from its quantitative easing (QE) policy earlier in the decade. In the Japanese case, the initial announcement of a zero inflation criterion for exiting QE led markets to a significant lengthening of the expected duration of a zero interest rate environment while deflation persisted. As deflationary pressures faded, markets began bidding up the longer end of the yield curve, thereby reducing the likelihood of an

Monetary policy frameworks

Recent years have witnessed greater interest and determination by central banks in controlling inflation in the region.⁹ However, exchange rate misalignments associated with periods of sustained capital inflows remain a source of concern because of their impact on inflation and economic growth, and fears that the inflows may suddenly stop or reverse, leading to stress in local banking systems.¹⁰

A key question going forward is how to maintain a primary focus on inflation in a context where concerns about financial stability, potential volatility of international capital flows and variability of economic growth are also seen as important policy objectives. What should monetary policy frameworks look like if they are to reflect the wide range of trade-offs that central banks face? The answer depends on how central banks perceive their responsibilities beyond strict control of inflation. A few stylised approaches may illuminate the key issues.

At one extreme is a view that central banks may need to compartmentalise their policy priorities. A lexicographical approach provides a succinct way to summarise this perspective (Fischer (2008)). According to this view, central banks would target inflation, and only when inflation was under control would they take countercyclical actions intended to smooth output. Likewise, only when inflation and output stability were achieved would central banks entertain issues associated with exchange rates, capital flows and financial stability.

An alternative approach is to smoothly trade off output and inflation stabilisation, while emphasising key risks associated with auxiliary goals for a range of relevant policy horizons. One could interpret the fact that most central banks in the Asia-Pacific region have adopted inflation targets over the medium term as consistent with this view that strict inflation control at all horizons is not paramount, but rather that there are a range of concerns that need to be addressed.

Finally, central banks find themselves in a somewhat awkward position when a failure on the part of other authorities to adequately address regulatory or external issues results in a crisis (Filardo (2009)). At that point, central banks may have a comparative advantage in addressing the ensuing crash, using both monetary policy tools and the lender of last resort function. However, doing so may lead to problems of moral hazard that the central bank would prefer to avoid.^{11,12}

In considering appropriate monetary policy frameworks for the future, it is clear that one size does not fit all. On the contrary, a broader implication from the wide range of policy experiences in Asia-Pacific is that monetary policy strategies may have to be tailored to each central bank depending on the nature of the economic environment. Important factors to consider include: whether the economy is a commodity producer; the degree of exposure to food price shocks; exposure to volatile international capital flows; the ability of the domestic financial system to absorb such shocks; openness and the role of the exchange rate in the

eventual overshoot, while allowing short-term rates to remain low in order to address lingering short-term macroeconomic concerns.

⁹ See, for example, Ho and Yetman (2008).

¹⁰ See Committee on the Global Financial System (2009).

¹¹ In some respects, this motivation is one justification for central banks taking on the responsibility of lender of last resort. But recent central bank behaviour raises the practical question of whether the central bank should instead be lender of first resort, or somewhere in between.

¹² Notwithstanding this concern, the role of countercyclical regulatory policy, in both moderating bubbles and supporting the financial system during crises, is increasingly recognised (see Borio and Shim (2007)).

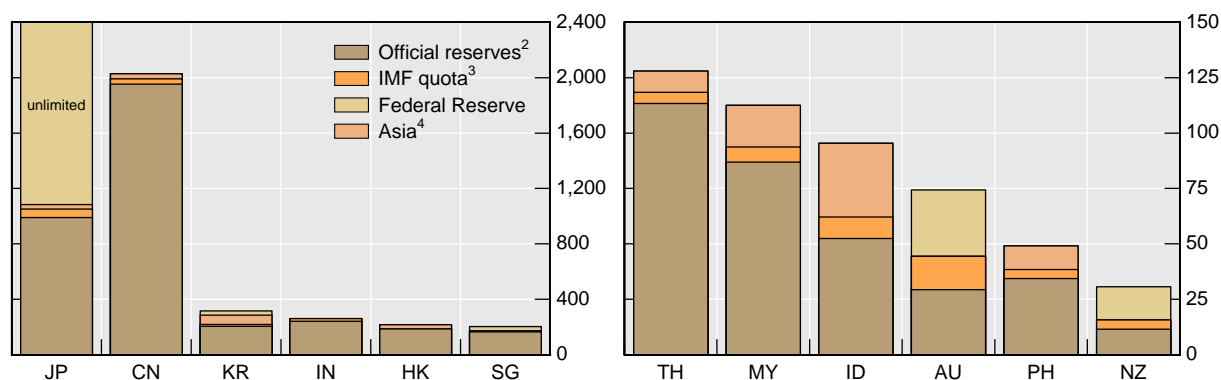
inflation process.¹³ These factors are furthermore likely to change over time, implying that monetary policy strategies cannot be static, even if price stability remains the main objective of policy.

Foreign exchange reserves

Issues arising from the build-up of international *reserve stocks* (Graph II.1.6) in the Asia-Pacific region before the international financial crisis have been widely debated. Initially the build-up sought to achieve full coverage of short-term external debt, but then well exceeded that level.¹⁴ The excess was argued by some to be justified by the vulnerability of external portfolio liabilities to withdrawal, potential under-measurement of external debt (as seen with foreign branches of Korean corporates during the Asian crisis) and as a confidence booster in the face of risk aversion, particularly for lower-rated economies. An alternative view was that the additional build-up was a side effect of attempts to resist exchange rate appreciation, as a means to improve trade competitiveness, implying that reserves may be inefficiently high.

Graph II.1.6

Reserves and foreign currency swaps¹



For an explanation of the economy abbreviations, see Graph I.3.

¹ In billions of US dollars. ASEAN swaps net to zero. ² As of March 2008; excludes SDRs, the reserve position in the IMF and gold. ³ Based on traditional 300% cumulative limit. More recent operations in eastern Europe have been as large as 12 times the quota (Latvia), so available liquidity may be underestimated here, especially for smaller economies. ⁴ Bilateral foreign currency swaps in place among Asian economies and the ASEAN Swap Arrangement (ASA). Does not include Japan's recently announced emergency fund of \$60 billion equivalent in yen funding.

Sources: IMF; national data.

The international financial crisis illustrated just how valuable ample reserves can be during turbulent times. For example, the substantial withdrawal of portfolio investment from open and liquid markets such as Korea even before the Lehman bankruptcy reinforced the need for reserves beyond short-term external debt. Also, with strains in international financial markets having persisted for almost two years, even one year's short-term debt coverage began to look inadequate in some countries such as Korea, despite substantial exchange rate depreciation.¹⁵

¹³ See Devereux and Yetman (2009) on the endogeneity of exchange rate pass-through and Khundrakpam (2007) on the evolution of exchange rate pass-through to domestic prices in India.

¹⁴ Ho and McCauley (2008) examine the domestic financial consequences of reserve accumulation in Asia.

¹⁵ One use of reserves during such times is to offset outflows; see Ma and McCauley (2008).

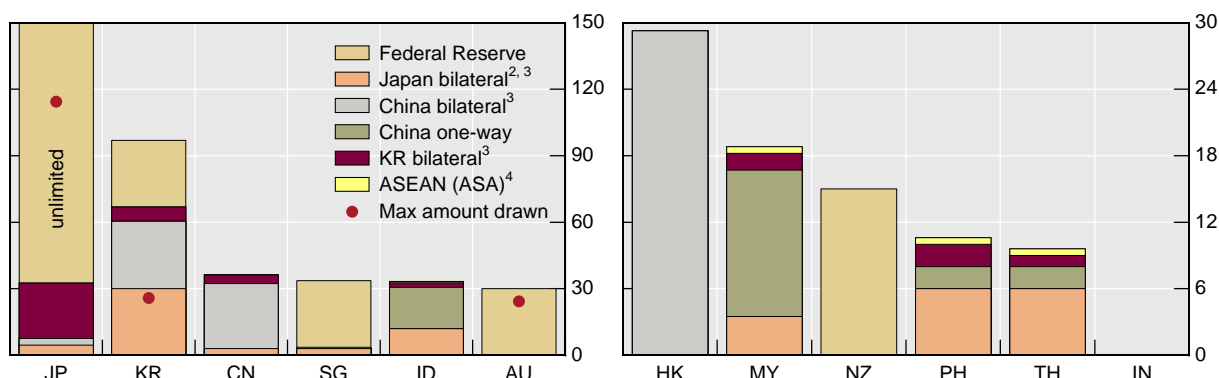
Reserve stocks also played an important role in maintaining orderly foreign exchange markets during the crisis, particularly as US dollar liquidity dried up. In some economies (Korea and the Philippines), foreign exchange reserves were used successfully to provide foreign currency liquidity to the banking system, partially mitigating the effects of the capital withdrawal and foreign currency liquidity pressures. One indicator of the underlying importance of reserve adequacy was the apparent success of bilateral swap lines in boosting confidence in financial markets, especially in economies with large external positions.

In some countries, however, the absence of large reserves did not seem to be an impediment. In particular, for countries with internationalised currencies and well developed financial markets, the use of financial derivatives to manage short-run foreign currency exposures proved helpful, as illustrated by Australia and New Zealand. High sovereign credit ratings probably contributed to the success of their strategy.

Questions nonetheless remain about the appropriate level of reserves in future. One key consideration is the impact of various institutional changes related to foreign exchange availability initiated during the crisis, not least the enhanced bilateral and multilateral swap lines and the new IMF funding facilities (Graph II.1.7).

Graph II.1.7

Bilateral and multilateral swaps¹



For an explanation of the economy abbreviations, see Graph I.3.

¹ In billions of US dollars; maximum withdrawal. CMIM will encompass many but not all of these swaps. ² Does not include the recently announced yen-denominated \$60 billion equivalent fund. ³ Bilateral swaps in place, some in US dollars, some in local currencies. Excludes other bilateral swaps shown. ⁴ Refers to swaps among ASEAN members.

Sources: BoJ; IMF; Bloomberg; national data; BIS calculations.

Enhanced swap lines might reduce the incentive for the economies involved to increase their individual reserves. For example, the Chiang Mai Initiative Multilateralisation (CMIM), expected to be operational by end-2009, will allow member countries (Association of Southeast Asian Nations (ASEAN) plus China, Japan and Korea) to draw from 50% (for larger countries) to 500% (for smaller countries) of their contribution to a \$120 billion multilateral reserves pooling arrangement. The CMIM is likely to be particularly valuable for lower-rated economies for which swap lines are substantial relative to reserves. These economies are also more likely to lose access to foreign currency when markets are stressed.

The impact of the new IMF facilities on reserve levels is less clear. In October 2008, the IMF Board approved a quick-disbursing Short-term Lending Facility (SLF)¹⁶ and, in March 2009,

¹⁶ By February 2009, the IMF had provided exceptionally large loans to eastern European countries based on SLF, amounting to 1,200% of quota in the case of Latvia, compared to the 100% annual and 300% cumulative limits on normal facilities.

introduced the Flexible Credit Line (FCL). This new facility makes funds available without conditionality and as a precautionary instrument for economies meeting pre-set qualification criteria. In principle, the existence of such a pool of funding from outside the region should reduce the incentive for any one economy to accumulate reserves. However, as of May 2009, no major Asia-Pacific economy had used the new facilities, perhaps reflecting the adequacy of domestic reserve supplies, the effectiveness of bilateral swap arrangements to meet the prospective needs and lingering concerns about the potential stigma associated with IMF borrowing.

The more comfortable level of foreign reserve capacity in the region, from both outright reserve holdings and access to swap lines and IMF loans, has implications for the desirability of continuing export-led growth strategies and, by extension, exchange rate flexibility. A by-product of export-led growth strategies in the region has been a build-up of reserves, especially for those authorities that manage the exchange rate and have resisted appreciation pressures associated with capital inflows. Going forward, the reduced incentives to build ever larger reserve positions and the vulnerability of increasing reliance on exports for growth illustrated by the crisis may shift sentiment towards greater exchange rate flexibility.

Increased exchange rate flexibility would result in both costs and benefits for economies.¹⁷ Excessive exchange rate volatility could adversely affect growth, while also reducing global protectionist proclivities from outside the region vis-à-vis charges of exchange rate manipulation, for example. More importantly for central banks, increased exchange rate volatility may increase the effectiveness of domestic monetary policy by allowing greater control of inflation and increased focus by policymakers on domestic, rather than external, demand.

II.2 Development of financial markets

The state of development of financial markets in Asia and the Pacific helped to mitigate the initial impact of the international crisis on the region. The region was fortunate in that its financial markets were more developed than they had been at the time of the 1997–98 financial crisis, yet less developed than those in the United States and Europe. A key question for policymakers is how to realise the benefits offered by further development of their financial systems while managing vulnerabilities of their economies to external shocks transmitted or amplified by financial markets.

II.2.1 Impact of the crisis

The development of local financial markets, particularly bond markets, was viewed as a high priority by authorities in the Asia-Pacific region following the 1997–98 financial crisis. It was widely agreed that well functioning financial markets could help to reduce economies' vulnerability to currency and maturity mismatches (see eg Asia-Pacific Economic Cooperation (1999)). Various national and regional initiatives, including the Asian Bond Market Initiative (ABMI) and the Asian Bond Fund (ABF), were implemented to identify and remove impediments to the issuance and trading of local currency bonds.¹⁸

Supported by these initiatives, the depth and breadth of Asia-Pacific financial markets improved greatly during the decade following the 1997–98 crisis. This was especially true for government securities markets, where many issuers succeeded in extending the maturity of

¹⁷ One trade-off is between bilateral and multilateral exchange rate stability; see Fung et al (2009).

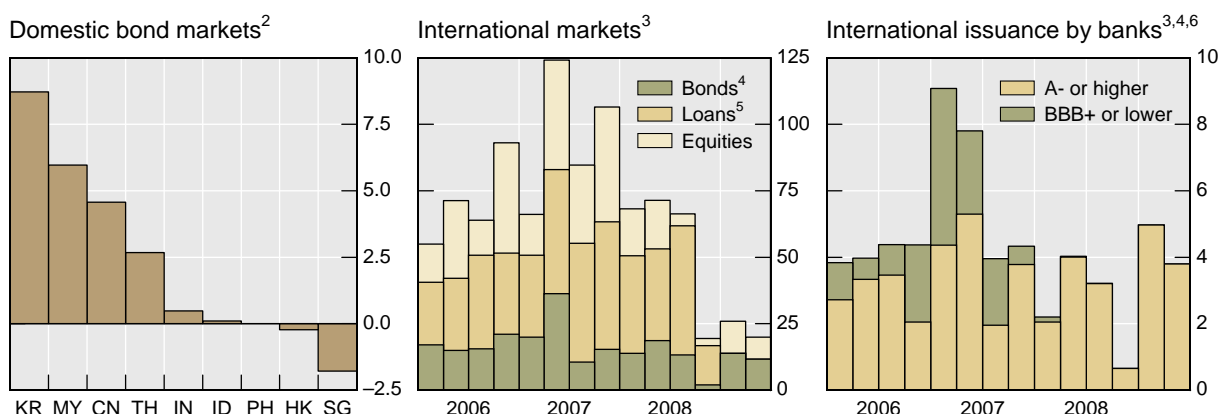
¹⁸ For a discussion of ABF2, see Ma and Remolona (2005).

their offerings, diversifying their investor base and boosting secondary market trading. Corporate bond markets also expanded significantly, led by high-quality borrowers such as quasi-government entities. For example, in Singapore, the outstanding stock of corporate bonds rose from 15% of GDP in 1998 to 31% in the mid-2000s. In the Malaysian private debt securities market, the share of turnover accounted for by the five most actively traded entities fell from 97% in 1998 to 34% in 2006 (Chan et al (2009)). Across the region, the increase in issuance and trading volumes was accompanied by a broadening of the types of instruments available, including Islamic securities, asset-backed securities and various derivatives.

As a result of this progress, by 2007 Asia-Pacific borrowers enjoyed a greater diversity of funding sources than a decade earlier. This diversity enabled borrowers to reduce currency and liquidity risks, for example by tapping long-term local currency markets instead of participating in foreign currency markets. Furthermore, the diversity left borrowers less vulnerable to disruptions experienced in any one market. Local currency securities markets could better fulfil their role as a “spare tire”, as they remained open to borrowers when other funding sources were not available. Indeed, in 2008 many Asia-Pacific banks and corporations that faced refinancing difficulties in foreign currency bond markets were able to turn to local currency bond markets. In particular, in Korea, Malaysia, China and Thailand financial and non-financial corporations alike raised sizeable amounts in local currency bond markets in 2008 (Graph II.2.1, left-hand panel).

Graph II.2.1

Corporate issuance in domestic and international markets¹



For an explanation of the economy abbreviations, see Graph I.3.

¹ Issuance by financial and non-financial corporations, including state-owned enterprises, based in non-Japan Asia. ² Net issuance in 2008 in onshore markets of bonds and money market instruments by residents of the specified territory, as a percentage of GDP. Calculated as the annual change in amounts outstanding. ³ Gross issuance in offshore markets by nationals of non-Japan Asia, in billions of US dollars; includes domestic bonds marketed to offshore investors. ⁴ Debt securities with an original maturity of more than one year. ⁵ International syndicated credit facilities. ⁶ Disaggregated by issuer ratings from Fitch.

Sources: Bloomberg; Dealogic; Fitch Ratings; Thomson Reuters; national data; BIS.

These benefits did not extend to lower-quality borrowers, however. Markets for lower-quality corporate bonds, ie those with credit ratings below single-A, remain underdeveloped across the region (Black and Munro (2009)). Even the yen-denominated market, which is by far the largest corporate bond market in the region, is not accessible to many lower-quality borrowers. The chief reason for this situation is that there does not appear to be any investor demand for lower-rated bonds denominated in Asia-Pacific currencies. Many institutional investors have internal guidelines that limit their investments to highly rated securities. Such guidelines could reflect perceived inadequacies in corporate reporting practices in the region,

which make it difficult for investors to assess the creditworthiness of potential issuers (Gyntelberg et al (2006)).

Consequently, low-quality borrowers in the region have remained dependent on banks and foreign currency bond markets. In late 2006 and the first half of 2007, when risk spreads were close to all-time lows in international capital markets, Asia-Pacific firms took advantage of the very favourable financing conditions to raise substantial amounts of new funds (Graph II.2.1, centre panel). After risk spreads in US dollar and euro credit markets soared in the second half of 2007, during Phase 1 of the crisis, some of these firms lost access to international markets. International bond issuance by low-rated borrowers essentially ceased in late 2007 (Graph II.2.1, right-hand panel). Asian banks were among those who saw their access to international markets deteriorate, and they were therefore not in a position to fill the funding gap lower-quality corporate borrowers suddenly faced. Many such borrowers struggled to refinance their foreign currency liabilities, and some were left with little choice but to reduce the size of their balance sheets.

Prior to the crisis, structured credit markets had begun to develop in Asia and the Pacific as a way to match local investors' preference for highly rated debt with local issuers' average credit quality (Remolona and Shim (2008)). Structures based on mortgages and consumer finance assets were the first to develop, but their main contribution was to enhance the liquidity of the underlying assets rather than the credit quality. Structured financial products backed by corporate debt hold more promise as a way to ease market access for lower-quality borrowers. Through diversification, such structures can in principle reduce the credit risk associated with holding low-rated debt. The Asia-Pacific region has lagged well behind the United States and Europe in the development of structured credit markets. In retrospect, this was fortunate. Most Asia-Pacific banks were not in the habit of originating assets for securitisation and, therefore, the collapse of virtually all structured credit markets in mid-2007 did not have a significant impact on their balance sheets (see Section II.3.1). The impact was greater in the few Asia-Pacific economies where structured credit markets were more developed, notably Australia and Japan. However, even in these two economies the impact was limited to banks' liquidity positions; their creditworthiness did not suffer because securitisations were backed predominantly by higher-quality assets, mainly prime mortgages. In consequence, these banks were not exposed to the "toxic" structured products held by many US and European institutions.

The underdevelopment of structured credit markets in Asia and the Pacific was indicative of the underdevelopment of financial derivatives markets more generally (Loretan and Wooldridge (2008)). Derivatives markets in the region are small and illiquid compared to their counterparts in Europe and the United States. Only a few segments function well. For example, Korea has a large bond futures market, and Hong Kong, New Zealand and Singapore have large foreign exchange (FX) swap markets. Australia and Japan currently are the only two Asia-Pacific economies where derivatives of all kinds are widely traded.

The small size of most Asia-Pacific derivatives markets limited the potential losses to counterparties in 2007-08. As a result, counterparty risks and the systemic consequences of the failure of a large derivatives dealer were less of a concern in Asia and the Pacific than in other regions. Of course, the small size of the derivatives markets also limited their ability to provide significant possibilities for hedging risk and reduced the options available to borrowers and investors for managing their risk exposures.

An important reason derivatives markets in the region are underdeveloped is the imposition of constraints on activities in which non-residents are permitted to engage or, more precisely, constraints on residents' ability to transact with non-residents. Many Asia-Pacific economies maintain controls on cross-border financial transactions as well as on foreign exchange transactions that make it difficult to trade the currency offshore, and consequently reduce the heterogeneity of market participants. It is no coincidence that the currencies not subject to

exchange controls – the yen and Australian, Hong Kong, New Zealand and Singapore dollars – have the most liquid derivatives markets (Tsuyuguchi and Wooldridge (2008)).

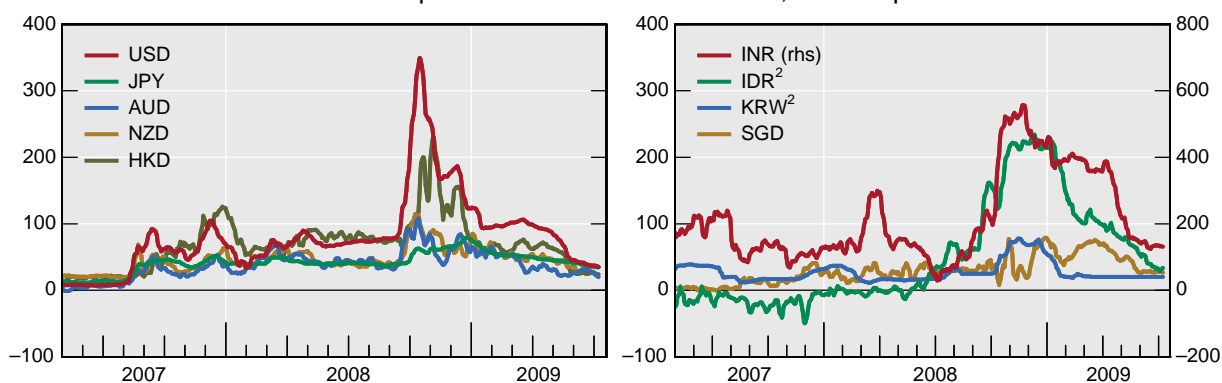
Restrictions on transactions with non-residents are usually intended to insulate domestic financial markets from disruptions occurring abroad. This goal was achieved to a large degree during Phase 1 of the crisis, but to a far lesser degree during Phase 2, ie after the Lehman Brothers bankruptcy in mid-September 2008. In late 2007 and the first half of 2008, the more open markets of the region were also those most affected by disruptions in the unsecured US dollar-denominated money markets. Banks' efforts to tap alternative sources of term funding caused the spread between interbank rates and expected policy rates to rise noticeably in the currencies of Australia, Hong Kong, Japan and New Zealand as early as August 2007 (Graph II.2.2, left-hand panel). In other Asia-Pacific markets, short-term interest rates were initially largely unaffected by the turmoil in US and European money markets.

However, after the dislocations in US dollar markets persisted and then intensified during Phase 2, even relatively closed financial markets in Asia and the Pacific experienced pressures. Money market spreads soared across the region (Graph II.2.2). Banks with maturing US dollar liabilities were compelled to either sell local currency assets or seek to borrow dollars from local sources. The closed, segmented nature of some money markets potentially exacerbated spillovers during this phase by impeding the flow of scarce funds. In many economies cross-border credit to foreign banks' affiliates fell by less than credit to unaffiliated borrowers in late 2008, and so pressures to sell local currency for US dollars and other foreign currencies tended to be greater in those economies where foreign banks are not important participants in the financial system.

Graph II.2.2

Asia-Pacific money markets¹

Libor-OIS spreads unless otherwise noted, in basis points¹



AUD = Australian dollar; HKD = Hong Kong dollar; INR = Indian rupee; JPY = Japanese yen; KRW = Korean won; MYR = Malaysian ringgit; NZD = New Zealand dollar; SGD = Singapore dollar; USD = US dollar. All currencies except INR are plotted against the left-hand scale.

¹ Three-month onshore interbank rate minus three-month overnight index swap rate; five-day moving average. ² One-month onshore interbank rate minus policy rate; five-day moving average.

Sources: Bloomberg; Datastream.

II.2.2 Policy responses and their impact

The response of Asia-Pacific authorities to spillovers from US and European markets to local financial markets varied considerably across the region. Prior to mid-September 2008, authorities outside Australia, Japan and New Zealand saw little cause to take special action to stabilise local markets. This changed after the bankruptcy of Lehman Brothers, with many

authorities intervening in markets. Of course, the nature of the interventions varied according to the severity of market stresses and the structure of the financial system.

One common response was foreign exchange market intervention. Following a long period of reserve accumulation, reserves in most Asia-Pacific economies fell in the second half of 2008, in some cases by more than 25%. Hong Kong and Japan are notable exceptions because, in contrast to the rest of the region, they experienced large capital inflows during this period. Where reserves declined, there were two main explanations for the decline: intervention to stabilise foreign exchange markets, and the provision of US dollar funding to local firms facing difficulties tapping dollar markets directly.

The scale of intervention to stabilise foreign exchange markets depended very much on the exchange rate regime. While Asian exchange rates are generally more flexible today than prior to the 1997–98 crisis, some float more freely than others. In Australia, Japan and New Zealand, at one extreme, the authorities refrained from attempting to moderate the adjustment of their currencies during both Phases 1 and 2 of the crisis. Hong Kong is at the other extreme: the authorities intervened heavily to prevent the exchange rate from appreciating beyond the strong side of the target band. The response of authorities in other Asia-Pacific economies lay somewhere in between.

In those economies with more flexible exchange rates, heightened volatility and worries about possible feedback effects on occasion prompted the authorities to intervene. During Phase 2 in late 2008, unmet demand for foreign currency plus dealers' scaling-back of their market-making activities increased the frequency of price "gapping". In addition, sudden exchange rate depreciations led domestic borrowers unable to roll over foreign currency liabilities to buy US dollars to meet their maturing liabilities, thereby exacerbating downward pressures on the exchange rate. In these circumstances, intervention was sometimes deemed warranted to restore order in foreign exchange markets, including in the Australian and New Zealand dollar markets.

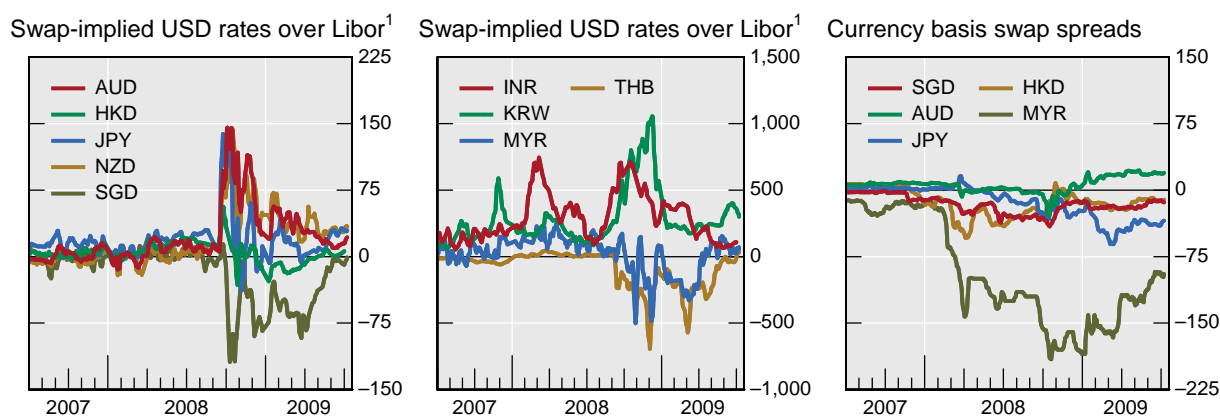
The disorder in some foreign exchange markets was closely linked to the disruptions in US dollar funding markets, as Asia-Pacific residents with maturing dollar liabilities were unable to roll them over and instead had to sell local currencies to reduce their dollar-denominated debt. Consequently, most authorities in the region established facilities to lend foreign currency (mainly dollars) to residents experiencing difficulties in accessing dollar-denominated funding markets. Many mobilised their own reserves, but a few borrowed foreign currency from other central banks, particularly the Federal Reserve, and onlent the funds to local residents. Such loans were typically collateralised, sometimes by foreign currency assets, as in the case of the Philippine central bank's dollar repo facility, but more often by local currency assets, through foreign exchange swaps. Indonesia, Korea and Hong Kong swapped, or announced their readiness to swap, part of their official reserves. Australia, Korea and Japan engaged in FX swaps with the Fed and established facilities to onlent the US dollar funds to local borrowers.

The willingness of central banks in the Asia-Pacific region to lend US dollars directly to domestic borrowers contributed significantly to alleviating resident borrowers' dollar funding difficulties. The spread between the FX swap-implied US dollar rate and dollar Libor, which should be close to zero if covered interest parity holds, spiked up in September and October 2008, but declined steadily in late 2008 and early 2009, during Phase 3 (Graph II.2.3, left-hand and centre panels). Conditions were slower to improve in those segments of foreign exchange markets in which central banks were not active, such as markets for longer-term cross-currency swaps (Graph II.2.3, right-hand panel).

Graph II.2.3

Deviations from covered interest parity

Spreads, in basis points



¹ Spreads between US dollar interbank rates implied by covered interest parity and three-month US dollar Libor. Implied rates are calculated from forward and spot exchange rates against the US dollar and interbank rates. Five-day moving averages.

Sources: Bloomberg; Datastream.

In addition to intervening in foreign exchange markets, some central banks modified their operations in local money markets. Funding pressures and concerns about counterparty credit risk caused the demand for safe, liquid local currency assets, including central bank assets and government securities, to increase substantially, especially after September 2008. Central banks responded by extending the maturities of central bank financing available to banks, widening the pool of collateral eligible for discretionary operations and standing facilities, and broadening the range of counterparties. The central banks of Australia and Japan modified their operating procedures along these lines in late 2007, while those of Korea, New Zealand and Chinese Taipei did so after Lehman's bankruptcy. In China, India, Indonesia and the Philippines, the central bank sought to accommodate increased demand for liquid assets by lowering reserve requirements (see Section II.1.2).

Owing in part to these actions, by the second quarter of 2009 money markets across the Asia-Pacific region had stabilised. Some appeared to function more or less normally, although in many markets there were questions about what should be considered normal. Market participants underpriced risks in the lead-up to the crisis. Therefore, a return to pre-2007 market conditions is not necessarily desirable. Uncertainty about what should be regarded as normal is adding to the difficulties central banks face when they consider appropriate exit strategies from their current policies (see Section II.1.3). Clear communication with market participants can ease the withdrawal of central bank support, as in Hong Kong, where in March 2009 the monetary authority announced the cancellation of some temporary measures and the institutionalisation of others. The design and pricing of liquidity facilities can also ease the eventual exit, as in Australia, where in the first part of 2009 demand for the Reserve Bank's term deposit facility gradually declined to zero.

Other local markets in which some authorities intervened included mortgage-backed securities (MBS), corporate bonds and equities. The usual justification for doing so was to improve liquidity conditions and thereby mitigate the risk of downward spirals in asset prices. The Australian government engaged in direct purchases of MBS, the issuance of which in Australia had all but ceased after August 2007. Even so, as of mid-2009 issuance was still a fraction of what it had been before the onset of the crisis. The Bank of Japan began direct purchases of commercial paper in early 2009, helping to contain increases in corporate borrowing rates. Authorities across the region restricted or banned short sales of equities in September and October 2008, usually of financial stocks but in some economies of all

stocks, and some maintained the restrictions even when equities rallied in March and April 2009. The overall impact on equity prices of these restrictions was unclear and, as of mid-2009, numerous initiatives were in progress to review the regulatory approach to short selling.

II.2.3 Implications for the future

Going forward, a key policy challenge will be to strengthen the resilience of financial markets in general and money and over-the-counter (OTC) derivatives markets in particular. The breadth and severity of the deterioration in market liquidity during the crisis surprised many, and while financial markets were not necessarily a source of shocks, they were an important propagator. Reforms to trading and settlement systems could help to strengthen markets' capacity to absorb shocks.

One concern is the functioning of money markets, especially markets for short-term collateralised lending. Collateralised markets such as the repo and FX swap markets are usually the most resilient in the face of disruptions to other markets. However, the crisis demonstrated that even collateralised markets can be vulnerable to disruptions when trading conditions in related markets deteriorate. Options for strengthening money markets include broadening the range of assets that might serve as repo-worthy collateral and encouraging the development of triparty repos.¹⁹ Furthermore, modifications in monetary policy operating procedures could help central banks to cope with episodes of impaired money market functioning. The Committee on the Global Financial System (2008) recommends having systems in place that allow central banks to conduct operations with an extensive set of counterparties and against a broad range of collateral, redesigning standing facilities in ways that reduce any stigma associated with borrowing directly from a central bank, establishing swap lines among central banks and other mechanisms to facilitate the international distribution of funds, and enhancing communications with market participants and the media.

Another concern is the functioning of OTC markets, especially credit derivatives markets. OTC markets, as opposed to organised exchanges, offer benefits in terms of flexibility and innovation. As OTC markets can offer products tailored to the individual needs of customers, they have grown rapidly over the past two decades. However, counterparty risk is managed bilaterally and therefore can be greater than in markets where trades are cleared centrally. Also, OTC markets are opaque because their decentralised nature makes it difficult to collect market-wide information about trading activity, prices and exposures. To mitigate potential systemic risks, the Financial Stability Forum (2008) urged market participants to put in place a central counterparty (CCP) for clearing OTC credit derivatives and to achieve more robust operational processes in OTC derivatives markets. A CCP is expected to reduce counterparty and operational risks and increase transparency. However, measuring the impact of its introduction is difficult because market participants presently have many different forms of bilateral netting arrangements, some of which allow cross-product netting, which would not be possible with an instrument-based CCP. A CCP for credit default swaps became operational in the United States in early 2009. There are initiatives to set up others in the United States, Europe and Asia in the near future.

A third concern is the participation of foreigners in local financial markets. Closer integration with foreign markets can bring many economic benefits. At the same time, it can also introduce additional sources of shocks. Even so, insulating local markets from foreign

¹⁹ In a triparty repo, an agent stands between the security lender and cash provider and physically controls the securities offered as collateral. The original counterparties remain as principals to the transaction, but the agent – typically a custodial bank – manages the collateral, making substitutions when necessary, monitoring risk and collecting payments. For a discussion of repo markets during the crisis, see Hördahl and King (2008).

influences does not necessarily enhance their stability. The presence of foreign financial institutions might serve as a catalyst for reductions in transactions costs and the development of new products; the most open markets also tend to be the most developed. Moreover, foreign market participants can add diversity, which can be an effective means of promoting stability. A heterogeneous investor base, with a range of different views and risk preferences, increases trading activity and hence market liquidity. It also enhances the informational efficiency of financial markets. For example, on the basis of their extensive empirical research centred on financial markets in Thailand, Gyntelberg et al (2009a, 2009b) find that foreign investors' equity market flows convey private information to market participants and that these flows are not explained simply by reactions to exchange rate movements. Chai-Anant and Ho (2008) observe that, while foreign investors often move in or out of markets in unison, at other times they have a stabilising effect. September 2001 was one period when foreign investors showed more optimism in the prospects for Asian equities than did domestic investors. Financial integration can pose risks to financial stability, but these risks – and the trade-off between the risks and the benefits of greater integration – differ depending on the stage of market development. Therefore, the appropriate policy approach to cross-border financial integration is likely to differ across economies.

II.3 Financial stability

II.3.1 Impact of the international crisis on the financial system in Asia and the Pacific

Banks in Asia and the Pacific weathered the crisis far better than their counterparts in the United States and western Europe. They were relatively immune to the financial turmoil in Phase 1 of the crisis. Even after the sharp deterioration in global financial conditions and economic prospects since September 2008, banks in the region appear to have a comfortable level of earnings and capital buffers to absorb possible near-term losses.

Resilience of the banking system in Asia-Pacific

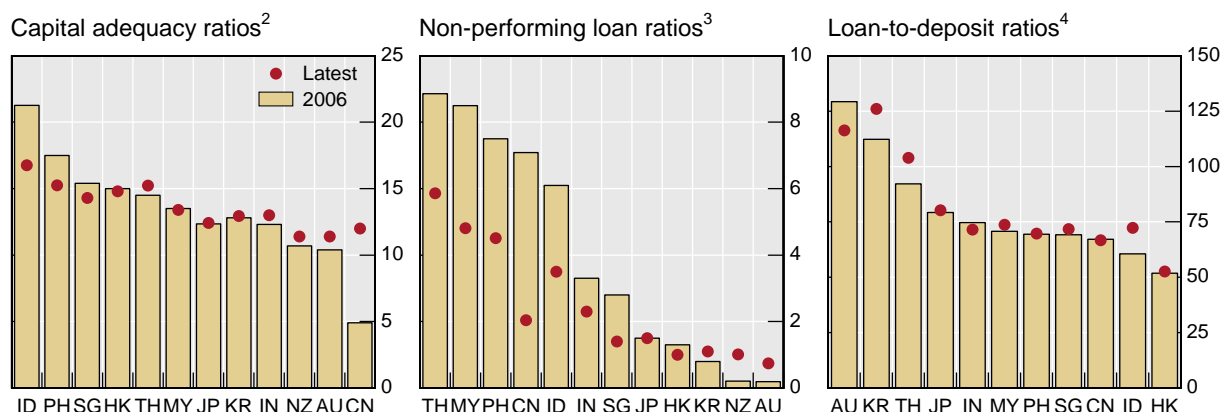
Financial intermediation in most Asia-Pacific economies has been traditionally dominated by the banking sector.²⁰ Therefore, the continuing soundness of the banking system is crucial for financial sector stability and economic growth in Asia-Pacific economies.

The resilience of banks in the region has been a bright spot during the international financial crisis. Since the inception of the crisis, banking systems in the United States and western Europe have posted losses exceeding \$1 trillion, and loan quality has deteriorated significantly. In contrast, banks in Asia and the Pacific have remained strongly capitalised without incurring substantial losses (Graph II.3.1, left-hand panel). The ratio of non-performing loans to total loans has declined in most Asian-Pacific economies, or otherwise has remained at very low levels (Graph II.3.1, centre panel).

²⁰ The equity and bond markets in the region have witnessed rapid developments in the past decade (see Section II.2.1).

Graph II.3.1

Soundness of Asian banking systems¹



For an explanation of the economy abbreviations, see Graph I.3.

¹ In per cent. ² Total capital as a percentage of total risk-weighted assets. In Australia, Hong Kong SAR, Japan, Korea, Malaysia, New Zealand, Singapore and Thailand, the definition of risk-weighted assets changed during the period under review due to transition towards Basel II. ³ Non-performing loans as a percentage of total loans. For Australia, non-performing assets over total assets; for Japan, non-performing loans over total credit. ⁴ Total loans as a percentage of total deposits.

Sources: IMF; Bloomberg; CEIC; national data.

An important factor accounting for the resilience of banks in the region is their conventional business model. On the liability side of the balance sheet, deposits are the main funding source, while wholesale funding plays a limited role except in Australia, Korea and New Zealand. On the asset side, bank lending is typically originate-to-hold, and investments in complex innovative financial instruments have been kept at a low level. As a consequence, banks in Asia and the Pacific went through Phase 1 of the crisis almost unscathed, whereas US and western European banks posted substantial losses from these financial products. More importantly, the adoption of the conventional business model implies that in the Asia-Pacific region, risk management and supervisory frameworks are able to keep pace with business practices. Conversely, in the United States and western Europe, the transition to the “originate-to-distribute” business model was associated with distortions in incentives²¹ and played an instrumental role in the increased vulnerabilities of their financial systems.

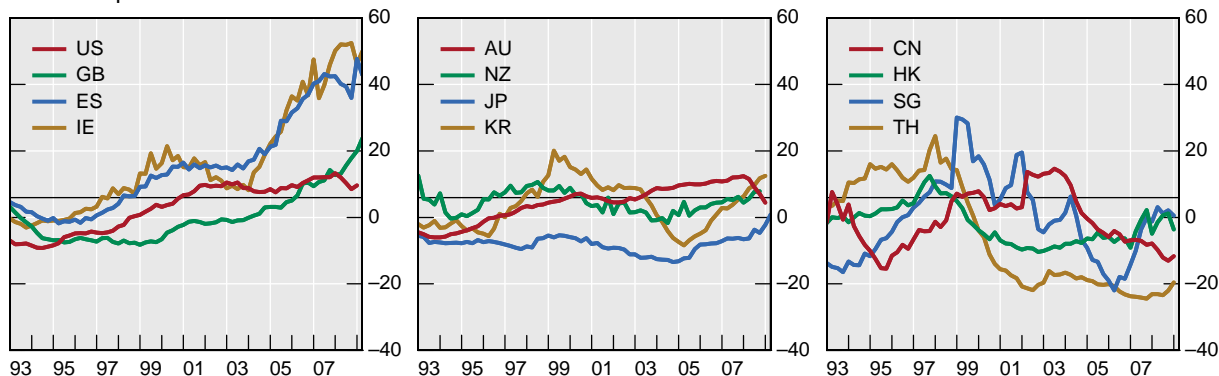
The relatively benign developments in credit and asset markets in most Asia-Pacific economies also contributed to the resilience of their banking systems. House price growth was quite diverse in the region, but was modest overall compared to the rapid growth observed in the United States and western Europe in the past decade. In Japan, Indonesia, Malaysia, the Philippines and Thailand, housing markets declined sharply in the previous boom-bust cycle and have not recovered since then. On the other hand, China, Hong Kong, Korea and Singapore all experienced an acceleration of housing price growth in the mid-2000s. Partly explaining the strong growth in these markets, housing prices were significantly undervalued at the beginning of the crisis either as a consequence of the Asian financial crisis (eg in Hong Kong, Korea and Singapore) or due to delayed market developments

²¹ The distortion is exemplified in excessive risk-taking and lax risk monitoring, among others. See Knight (2008) for further discussion.

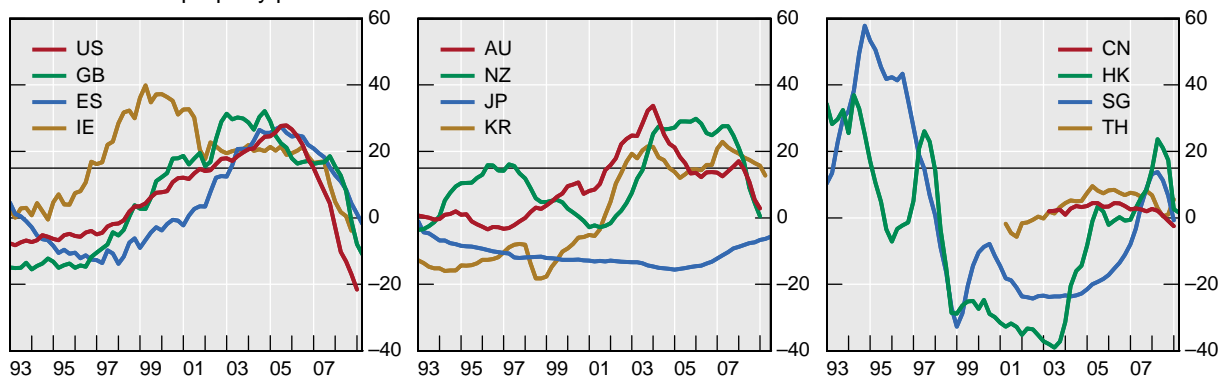
(eg in China).²² Australia and New Zealand experienced substantial increases in bank credit and house prices in the early 2000s, but the pace had begun to moderate well before the current crisis.

Graph II.3.2
Gap measures¹ in credit and housing markets

Domestic private² credit to GDP



Real residential property prices



AU = Australia; CN = China; ES = Spain; GB = United Kingdom; HK = Hong Kong SAR; IE = Ireland; JP = Japan; KR = Korea; NZ = New Zealand; SG = Singapore; TH = Thailand; US = United States.

¹ The gap measure is defined as the deviation (in relative terms) of a variable, either the ratio of private sector credit to GDP or the inflation-adjusted house price index, from its trend. The trend is calculated using the Hodrick-Prescott filter based on historical data. The thin horizontal lines plot the threshold values to predict banking crises as described in Footnote 21 in this section. ² Refers to total credit for China, Hong Kong SAR, Singapore and Thailand.

Sources: CEIC; Datastream; national sources; BIS calculations.

Following an approach developed within the BIS, Graph II.3.2 plots the gap measures that reflect credit and asset market imbalances in eight Asia-Pacific economies and four non-Asia industrialised economies.²³ Taken at face value, signs of vulnerabilities began to emerge in

²² Glindro et al (2008) show that there was little evidence of housing bubbles at national levels in these economies. However, in major cities or the luxury end of the market in these economies, house prices were significantly above their fundamental values and the irrational component was noticeable.

²³ Borio and Lowe (2002a, 2002b) define imbalances in the credit and real estate markets using "gap" measures, ie the deviations of the variables of interest from their long-term trends. Using combined criteria that (i) the credit gap (based on the ratio of private sector credit to GDP) exceeds 6%; and (ii) either the real estate gap exceeds 15% or the equity gap exceeds 60%, can successfully predict a high proportion (around 70%) of

the United States, the United Kingdom, Spain and Ireland several years before the international financial crisis. By contrast, evidence of financial imbalances was rather limited in the region, except for Australia and New Zealand in the years before the current crisis, and Hong Kong and Korea more recently. Nevertheless, housing market corrections in Australia and New Zealand have remained orderly and have not generated stresses for their banking systems. Two factors helped to explain this benign outcome. First, mortgage lending in these economies followed conventional practices, ie subprime lending and mortgage product innovations were rather limited. Second, mortgage borrowers benefited from large reductions in debt service due to the almost complete pass-through of policy rate cuts to mortgage rates. Hence, mortgage defaults have remained at low levels.

Spillovers since the failure of Lehman Brothers

For most Asia-Pacific economies, the failure of Lehman Brothers in September 2008 marked a turning point. It became highly costly, if not impossible, for Asian borrowers to access international capital markets (see Section II.2.1). Foreign banks, which continued to face heavy balance sheet pressure during this period, chose to scale back lending to the region. Domestic banks were also facing intensifying pressure, due not only to the deteriorating performance of the real economy in the region but also to a general loss of confidence and heightened risk aversion in financial markets.

As part of their strategy to adjust their balance sheets, international banks reduced lending activity in the region substantially in Phase 2 of the crisis. As shown by the BIS consolidated banking statistics, foreign claims by banks from major industrialised economies to non-Japan Asia fell dramatically in the second half of 2008 (Graph II.3.3, left-hand panel). In the fourth quarter alone, foreign claims on emerging Asia dropped by 12% to \$870 billion, with US- and UK-headquartered banks accounting for roughly half of the decline. By type of claim, the decline in cross-border loans was most remarkable.²⁴ In general, the percentage drop in cross-border loans tended to be smaller in those host countries with greater foreign bank participation, probably reflecting strategic long-term orientation and business commitment (Graph II.3.3, right-hand panel).

The retreat of foreign banks from the Asia-Pacific region provides domestic banks with an opportunity to expand their operations and fill the gap in products and services. However, risks in the region have intensified as the crisis has deepened and spillover effects have become apparent. One example is the increase in credit default swap (CDS) spreads for major banks in the region in September–October 2008, implying that market confidence as it relates to the strength of Asian banks weakened. This was largely driven, however, by the demand for higher compensation for bearing the payoff uncertainty (ie default risk premium) and for facing liquidity constraints (ie liquidity risk premium).²⁵ During the same period, the likelihood of a systemic failure, as measured by the co-movement of banks' equity returns, also increased substantially (Graph II.3.4). After the strong interventions taken by government authorities, the stresses in the financial sector have eased significantly and returned to pre-Lehman levels.

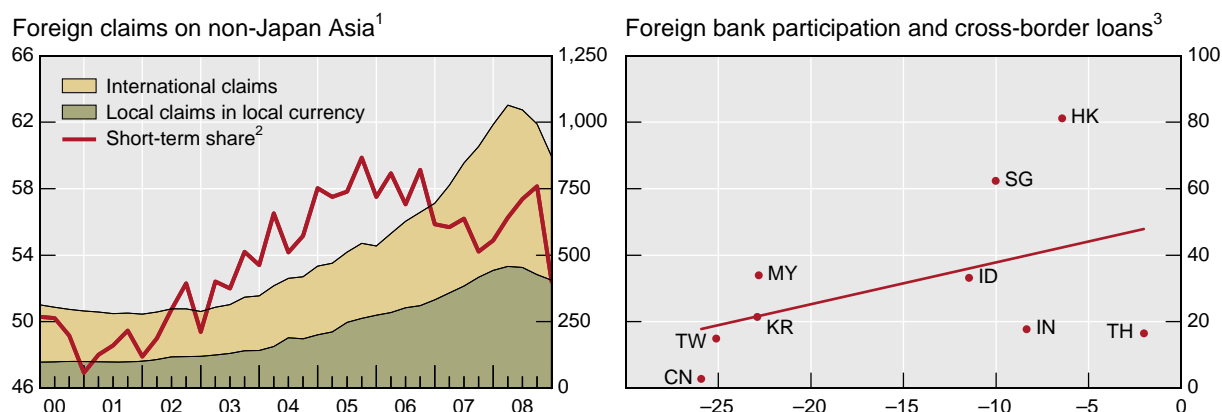
banking crises that will occur in the next two years (see Borio and Drehmann (2009)). Graph II. 3.2 does not show the gap measures in the equity markets because they were below the 60% threshold value in these economies in recent years (except in China and Korea in 2007).

²⁴ The drop in local claims in local currency extended by foreign offices was largely due to the dollar appreciation effect.

²⁵ See Huang et al (2009a, 2009b) and Kim et al (2009).

Graph II.3.3

Retreat of foreign banks from non-Japan Asia



¹ By banks headquartered in Austria, France, Germany, Italy, Japan, Netherlands, Spain, the United Kingdom and the United States. Foreign claims are defined as the sum of international claims (cross-border claims in all currencies and foreign currency claims extended locally by foreign offices) and locally claims in local currency extended by foreign offices. Shaded areas are billions of US dollars (rhs); solid lines are shares, in per cent (lhs). ² Share of short-term claims in total international claims. ³ The horizontal axis refers to the percentage change in cross-border loans of BIS reporting banks vis-à-vis resident banks in the economies shown; Q4 2008 over Q3 2008. The vertical axis refers to the share of foreign-owned banks in total assets of the banking system; Q4 2008, in per cent.

Sources: IMF; BIS.

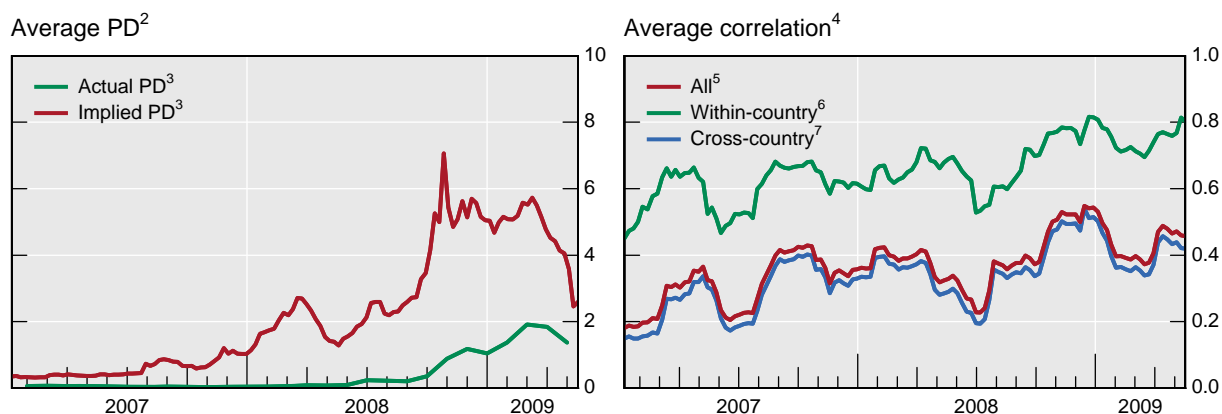
II.3.2 Policy responses and their impact

In response to the crisis, authorities in Asia and the Pacific have taken various policy measures mainly designed to achieve the following goals: (1) mitigating spillovers to the financial sector; and (2) avoiding a credit crunch that could induce or exacerbate a recession. Taken together, we can classify these policy measures into three categories: (1) liquidity and solvency assistance; (2) the purchase of distressed assets and the suspension of mark-to-market accounting rules; and (3) credit policies designed to mitigate a credit crunch.²⁶

The first set of measures is intended to address shocks to financial institutions and avoid financial distress. Beginning in September 2008 when several western European countries implemented blanket guarantees covering bank deposits and other debts, many Asia-Pacific economies followed suit, by introducing a blanket guarantee on deposits, increasing the deposit insurance coverage amount or expanding the set of eligible deposits protected by deposit insurance. Australia, Korea and New Zealand, in order to facilitate access by banks to international financial markets, also provided state guarantees on non-deposit wholesale liabilities.

²⁶ Shim and von Peter (2007) provide an overview of available policy measures to mitigate distress selling and asset market feedback, which includes most of the measures discussed here.

Graph II.3.4

Measures of systemic risk¹

¹ The sample comprises 23 major banks in China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Singapore and Thailand. ² Weighted averages of individual banks' probabilities of default (PD), in per cent. ³ "Actual" PDs are based on Moody's KMV EDF data, which provide an estimate of *actual* one-year default rates for individual banks. "Implied" PDs, also known as the *risk-neutral* default rates, are derived from USD-denominated CDS spreads (see Tarashev and Zhu (2008)). Both PDs are forward-looking measures, but implied PDs are typically higher than actual PDs in that they also incorporate a default risk premium component, which compensates for bearing the risk in payoff uncertainty, and a liquidity premium component. ⁴ Three-month backward-looking equity return correlations. ⁵ Average of all pairwise correlation coefficients. ⁶ Average of pairwise correlations between two banks that are from the same economy. ⁷ Average of pairwise correlations between two banks that are from different economies.

Sources: Bloomberg; Markit; Moody's KMV.

Many central banks in the region expanded local currency liquidity support to help banks cope with funding problems. Measures have focused on extending the maturity of borrowing from the central bank (Australia, Chinese Taipei, Hong Kong, India, Indonesia and New Zealand), broadening the eligibility of collateral for lending by central banks (Australia, Hong Kong, Japan, Korea and New Zealand) and broadening participation (India, Korea). Central banks also provided banks with liquidity assistance in foreign currency, especially US dollars, as described in Section II.2.2.

In still other cases, governments injected capital directly into financial institutions. The scale and scope of capital injections by governments in Asia and the Pacific have been much smaller than those by the US and western European governments (Graph II.3.5). Also, capital injections by governments in the region were largely made to state-owned banks, with the objective of expanding lending to SMEs and the trade sector, whereas capital from governments in the United States and western Europe was most often provided to large private financial institutions.²⁷

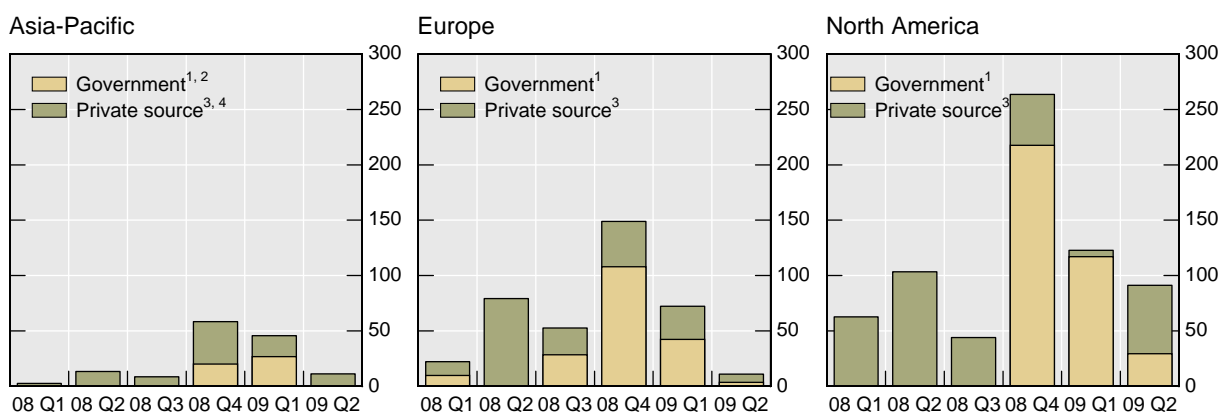
The second set of measures, purchasing assets and suspending mark to market accounting rules, helped to mitigate the impact of the crisis on the financial statements of banks. The Bank of Japan purchased company shares and bonds held by financial institutions. Korea Asset Management Corporation purchased bad loans worth KRW 1.8 trillion in 2008, and will set up a restructuring fund of up to KRW 40 trillion to buy substandard assets in 2009.

The financial crisis has forced authorities to reconsider the use of fair value accounting in illiquid markets. In September and October 2008, the International Accounting Standards

²⁷ For a discussion on the recapitalisation of state-owned banks by the Chinese government before 2006, see Ma (2007).

Board (IASB) and the accounting standard setter in the United States relaxed mark to market rules for transactions in distressed markets. In the Asia-Pacific region, Japan subsequently adopted similar measures, while Indonesia and the Philippines, facing a bond market collapse in October 2008, modified their accounting standards to permit the reclassification of assets held at fair value into amortised cost categories and the rebooking of previously incurred losses. Malaysia also allowed financial institutions to reclassify non-derivative securities on a cost value basis. Suspension of mark to market rules during a market collapse can temporarily strengthen reported balance sheets of financial institutions holding distressed assets and prevent distress selling and the realisation of losses.²⁸

Graph II.3.5
Sources of capital raised by financial institutions
In billions of US dollars



¹ Includes capital injections by the government into state-owned financial institutions. For Europe and North America, also includes capital injections by parent companies. ² Actual capital injection completed for China and Korea; plans to inject capital announced in Q1 2009 for India and Japan. ³ Public offerings, strategic buyers, sovereign wealth funds and private placements. ⁴ Raised by selected banks, brokers and insurance companies in Australia, China, Chinese Taipei, Hong Kong SAR, Japan, Korea and Singapore.

Sources: Bloomberg, Fitch ratings, national sources, BIS calculations.

The last set of measures was introduced to facilitate the supply of credit, particularly to lower-rated SMEs as they tend to suffer disproportionately during a credit crunch. To wit, Hong Kong and Malaysia introduced credit guarantee schemes for SME loans, while Korea expanded the provision of credit guarantees to SMEs through the two existing government agencies. Despite these and other efforts, real domestic credit growth slowed substantially in Australia, Hong Kong, India, Indonesia, Korea, New Zealand and Singapore in 2008 compared to 2007. On the other hand, Malaysia, the Philippines and Thailand exhibited stronger credit growth in 2008 and early 2009 than in 2007.

It should be noted here that the current crisis has highlighted the importance of the government's capacity to provide assistance to financial institutions in the form of liquidity provision, liability guarantees or capital injections. This has strengthened the notion that banks' risk depends on sovereign risk. Given that the financial sector in Asia and the Pacific is relatively sound and resilient, too much emphasis on the government's bailout capacity

²⁸ The IASB issued for public comment an exposure draft on fair value measurement in late May 2009. The proposals incorporate recent guidance on fair value measurement published by the US accounting standard setter and address valuation issues arising in markets that have become inactive.

might have the unintended consequence of increasing the incentives for greater risk-taking by financial institutions.

Box II

Measuring the impact of deposit and debt guarantee measures

Guarantees provided by governments to financial institutions have been a key element of the policy response by Asia-Pacific economies. One way to look at the impact of the expansion of deposit and debt issuance guarantees is to examine the reaction of banks' CDS spreads to the announcement and implementation of these measures.

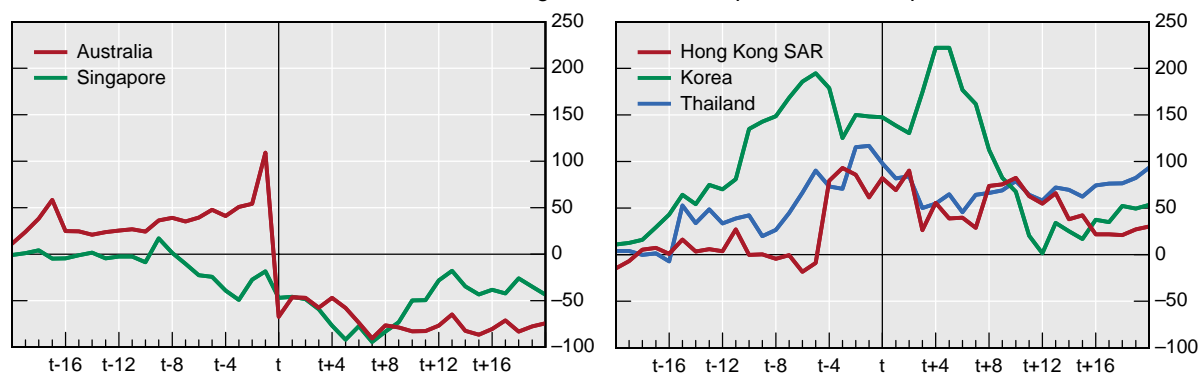
We use an event study methodology following King (2009). In order to determine the net effect of the guarantee measures, we first use the historical relationship between an individual bank's CDS spread and a corresponding CDS index for one year up to the bankruptcy of Lehman Brothers, and then extract the abnormal changes in the CDS spreads of individual banks. Graph II.3.6 shows the cumulative average abnormal changes in CDS spreads of banks in each economy for the 20 trading days preceding and following the date when the measures were taken. In Australia and Singapore, CDS spreads for major banks dropped substantially, even after adjusting for their co-movement with the market, and stayed low after the announcement of deposit and debt issuance guarantees. In contrast, in Hong Kong, Korea and Thailand, the announcement appeared to be less effective after adjusting for the movement of their banks' CDS spreads explained by the market.

Note that Australia and New Zealand did not have any formal deposit insurance system until they introduced a blanket deposit protection system in October 2008, while Chinese Taipei, Hong Kong, Malaysia and Singapore already had a partial deposit guarantee scheme before they introduced a temporary blanket guarantee. Indonesia and the Philippines, on the other hand, increased the protection limit substantially, but not to the point of issuing a blanket guarantee. In the case of Australia, the strong impact of the guarantee measures is partly explained by the introduction of both the blanket guarantee on deposits and debt issuance guarantee on the same day and partly by relatively large wholesale liabilities.

Graph II.3.6

Impact of deposit and debt guarantee announcements on CDS spreads

Cumulative abnormal changes in bank CDS spreads, in basis points



"t" is the date of announcement of policy measures. For Australia, blanket deposit guarantee and debt issuance guarantee. For Hong Kong SAR, Singapore and Thailand, blanket deposit guarantee. For Korea, debt issuance guarantee. Six banks for Australia, three for Hong Kong SAR, eight for Korea, three for Singapore and three for Thailand. The linear relationship between a bank's CDS spread and a market benchmark is calculated over the period between 21 September 2007 and 12 September 2008. For banks in Australia, the iTraxx Australia index is used for the market benchmark. For banks in Hong Kong SAR, Korea, Singapore and Thailand, the iTraxx Asia ex-Japan IG index is used.

Sources: Markit; BIS calculations.

II.3.3 Implications for regulation and prudential supervision

Steps taken by authorities in Asia and the Pacific thus far have helped to stabilise markets and boost confidence. However, these actions have been generally short-term in nature and domestic in orientation. In the medium term, exit strategies for the various stabilisation programmes will need to be implemented, and in the longer term institutional frameworks for the oversight and stability of financial systems should be considered. Work being conducted by various domestic and international authorities on proposed structures and frameworks that could enhance financial stability may serve as an appropriate starting point. This section considers the implications of key initiatives for Asia and the Pacific.

Implementation of exit strategies for government guarantees

Since last October, authorities in Asia and the Pacific have taken a number of measures in an attempt to maintain the stability of the financial system. These steps have generally taken the form of enhanced deposit protection schemes and debt guarantees. While the length of the crisis remains uncertain, the exit timing of these measures was in some cases announced at the time of their implementation, as summarised in Table II.3.1.

Table II.3.1

Exit timing of measures taken in Asia and the Pacific

	AU	HK	ID	KR	MY	NZ	PH	SG	TW	TH
Deposit protection	Oct 2011	Dec 2010	No sunset	–	Dec 2010	Oct 2010	No sunset	Dec 2010	Dec 2009	Aug 2011
Debt guarantee	Uncertain ¹	–	–	June 2010	–	Uncertain ²	–	–	–	–

For an explanation of the economy abbreviations, see Graph I.3. TW = Chinese Taipei.

¹ Once market conditions have normalised. ² When market conditions in the key funding markets have returned to relative normality for a sustained period.

The introduction and withdrawal of blanket guarantees of deposits is not new to the region. In response to the Asian financial crisis in the late 1990s, Indonesia, Japan, Korea, Malaysia and Thailand put in place blanket guarantees of deposits. However, each economy took a rather different approach to exiting from this policy measure. Korea removed its blanket guarantee at the end of 2000 as scheduled, but with a significant increase in the coverage limit to maintain depositor confidence. Japan introduced a blanket guarantee in 1996 with the intention of withdrawing it in 1999, but later decided to extend the guarantee until 2002. Indonesia and Thailand gradually lowered the coverage amounts over almost 10 years. These episodes demonstrate that the circumstances in each economy will significantly influence the timing and structure of the exit strategy. In the context of the current crisis, given that specific exit dates for the blanket guarantees have already been announced, it will be important to make sure that the implementation schedule is credible by restoring the health of the banking system and, if necessary, strengthening the regulatory and supervisory framework. The more interconnected financial markets in the region may warrant effective

coordination across jurisdictions in terms of exit timing and the new levels of limited coverage, so that the potential disruptions in capital flows can be kept to a minimum.²⁹

The issues regarding the phase-out of debt guarantees are more subtle. The removal of debt guarantees needs to be gradual and predictable. Also, pricing of debt guarantees should be close to market rates and risk-based, so that their removal will not adversely affect the market once the situation returns to normal. In addition, given that debt guarantees were adopted by a number of economies inside (Australia, Korea and New Zealand) and outside the region in October and November 2008, the removal of guarantees in one economy earlier than others may lead to differential funding conditions across banks. This aspect of the exit strategies may warrant greater dialogue among economies.

Implications for the international reform measures in Asia and the Pacific

The Financial Stability Forum (re-established in April 2009 as the Financial Stability Board (FSB)) assumed a leading role in coordinating the actions of national and international bodies aimed at strengthening financial systems to address the weaknesses that contributed to the crisis. Detailed recommendations were issued by the Financial Stability Forum in April 2008 in the following areas which lie at the centre of the international response to the crisis: (1) strengthening of prudential oversight of capital, liquidity and risk management; (2) enhancing transparency and valuation; (3) changing the role and uses of credit ratings; (4) strengthening the authorities' responsiveness to risks; and (5) developing robust arrangements for dealing with stresses in the financial system. Since then, many of these actions have been implemented by international financial institutions, global standard setters, national authorities and the financial industry. In April 2009 the FSB issued further recommendations, guidelines and principles in the areas of reducing procyclicality, modifying compensation systems at financial institutions to prevent excessive risk-taking and enhancing cross-border crisis management. The reform measures and recommendations should be largely completed by end-2009, with a few actions extending into 2010. While all of the international reform measures are important, some are more relevant to Asia and the Pacific than others, such as strengthening macroprudential policy tools, implementing Pillar 2 of the Basel II Framework, developing an effective liquidity risk management framework and identifying potential home-host issues in the region.

An overarching theme of the international recommendations is the importance of the macroprudential approach to regulation and supervision to supplement the more traditional, firm-level microprudential approach. As illustrated in Table II.3.2, authorities in Asia and the Pacific have, over the years, implemented some measures to marry macro- and microprudential supervision. Nevertheless, authorities will need to devote further resources and expertise to fully develop suitable tools to address systemic vulnerabilities arising from excess liquidity, leverage, risk-taking and systemic concentrations across the financial system. They will also need to devise tools to mitigate procyclicality stemming from risk measurement, capital regulation, provisioning rules, accounting rules and other sources. There is growing support for a countercyclical capital charge that would require financial institutions to build up defensive buffers in good times that could be drawn down in bad times, and work is underway to design a framework for determining the level and cyclical sensitivities of capital requirements (BIS (2009)).

²⁹ On 22 July 2009, the Hong Kong Monetary Authority, Bank Negara Malaysia and the Monetary Authority of Singapore announced the establishment of a tripartite working group to map out a coordinated strategy for the scheduled exit from the full deposit guarantee by the end of 2010 in their respective jurisdictions.

Table II.3.2

**Pre-emptive prudential and monetary measures
taken against credit booms in Asia**

	Prudential instruments					Monetary instruments	
	LTV	Capital	Provision	Exposure limit	Lending criteria	Credit limit	Average reserve requirement
China	2001, 2005, 2006				2004		2003, 2004, 2006, 2007–08
Hong Kong SAR	1991, 1997			1994–98		1994	
India		2005, 2008, 2009	2005, 2006, 2007	2006	2007	2003	2004, 2006, 2007–08
Korea	2003, 2006–08				2006		2006
Malaysia	1995–98	2005		1997–98	1995		1994–98
Thailand	2003				2004–05		

LTV = loan-to-value ratio; Capital = capital requirements; Provision = loan provisioning rules; Credit limit = limit on credit growth; Lending criteria = limits on debt repayment-to-income, debt repayment-to-debt or credit line-to-income ratio; Exposure limit = credit exposure to a sector. The years indicated refer to the timing of the introduction of the measure. A year after a dash refers to the timing of the lifting or relaxing of the measure.

To maintain confidence in the banking system, implementation of Basel II and maintenance of adequate capital buffers for banks should remain a priority. At present, all of the major economies in Asia and the Pacific have either implemented Basel II in its entirety, are in the midst of a phased implementation process or are planning to implement it in the near future (Table II.3.3). That said, the financial crisis has clearly illustrated that Basel II is more than a set of rules or quantitative measures; rather, it is a process that ensures capital adequacy with respect to an institution's overall risk profile.³⁰ This process, which is largely captured in the Supervisory Review Process, or Pillar 2, of the Framework, requires an assessment of all material risks facing an institution and that capital be held above regulatory minimums. The qualitative aspects of Pillar 2 will present challenges to many central banks and supervisory authorities in the region.

In contrast to previous financial crises, the lack of funding liquidity at major global financial institutions has played a central role in the current crisis. In response, central bank operational frameworks should be sufficiently flexible to allow the use of a variety of tools and instruments in the face of illiquidity, either among institutions or markets. Similarly, supervisors must have the capacity to assess liquidity risk management in financial institutions. In the region, the supervision of liquidity risk is still emerging, with many jurisdictions in the process of developing appropriate prudential metrics and processes. For example, in June 2009 the Reserve Bank of New Zealand released a new prudential liquidity policy for banks, which establishes various balance sheet requirements and disclosure obligations intended to make banks more resilient to short- and long-term funding shocks.

³⁰ See Borio and Zhu (2008) for further discussion.

Table II.3.3

Timetable for the implementation of Pillar 1 of Basel II¹

1 January unless otherwise noted

	Credit risk			Operational risk		
	Standardised approach	Foundation IRB	Advanced IRB	Basic indicators approach	Standardised approach	Advanced measurement approaches
Australia	2008	2008	2008	2008	2008	2008
China	Not permitted	2010–13 ²	2010–13 ²	Undecided	Undecided	Undecided
Hong Kong SAR	2007	2007	2008	2007	2007	Not permitted
India	2008–09 ³	2012–14	2012–14	2008–09 ³	2012–14	2012–14
Indonesia	2009	2010 ⁴	2010 ⁴	2009	2010 ⁴	2011 ⁵
Japan	2007 ⁶	2007 ⁶	2008 ⁶	2007 ⁶	2007 ⁶	2008 ⁶
Korea	2008	2008	2009	2008	2008	2009
Malaysia	2008	2010	2010	2008–10 ⁷	2008–10 ⁷	Undecided
New Zealand	2008	2008	2008	2008	2008	2008
Philippines	2007 ⁸	2010	2010	2007 ⁸	2007 ⁸	2010
Singapore	2008	2008	2008	2008	2008	2008
Chinese Taipei	2007	2007	2008	2007	2007	2008
Thailand	2008 ⁴	2008 ⁴	2009 ⁴	2008 ⁴	2008 ⁴	Not permitted

¹ Pillar 1 refers to minimum capital requirements. ² Permitted only for internationally active banks; banks can implement an IRB approach as early as 31 December 2010 but must implement one by 31 December 2013. ³ 31 March 2008 for Indian banks with a foreign presence and foreign banks operating in India; 31 March 2009 for all other banks. ⁴ 31 December. ⁵ 30 June. ⁶ 31 March. ⁷ 2008 for banks that are adopting the standardised approach for credit risk; 2010 for banks that are adopting an IRB approach for credit risk. ⁸ 1 July.

The international financial crisis has also had an important impact on the landscape and direction of the financial sector in Asia and the Pacific. The retreat of foreign banks from the region implies that, at least in the near term, the role of foreign banks will decline and domestic banks may fill the gap. As regional banks are expected to expand their presence in the region, partly replacing the large international banks, it is important to recognise potential home-host issues related to regulation and safety net provisions. Also, a potential growth of regional financial institutions into large and complex financial institutions requires close monitoring of systemic risk.

Finally, the causes and spillovers of the international crisis may spark a discussion about the trade-offs associated with financial liberalisation. While there is a consensus about the benefits of deregulating financial markets, liberalisation can also be costly in terms of increased susceptibility to external financial crises. To balance this trade-off, it is crucial that financial liberalisation, particularly in the context of financial innovation, should be accompanied by the appropriate framework of sound financial regulation, targeted towards ensuring adequate levels of risk management, prudential buffers and transparency.

**Annex:
Overview of measures announced by Asia-Pacific authorities since September 2008**

A1: Changes in macroeconomic policies

	Monetary policy		Fiscal stimulus package
	Change in policy rate (in basis points)	Other measures	
Australia	-425 cumulative: -25 (2/09/08), -100 (7/10/08), -75 (4/11/08), -100 (2/12/08), -100 (03/02/09), -25 (07/04/09)		AUD 10.4 bn = 1% of GDP (10/08); AUD 42 bn (13/02/09)
China	-216 cumulative: -27 (15/09/08), -27 (8/10/08), -27 (29/10/08), -108 (26/11/08); -27 (22/12/08)	Cumulative change in reserve requirements: -200 for large banks: -50 (8/10/08), -100 (26/11/08), -50 (22/12/08) -400 for other banks: -100 (15/09/08), -50 (8/10/08), -200 (26/11/08), -50 (22/12/08)	RMB 4 trn = 13% of GDP, over two years (9/11/08)
Chinese Taipei	-237.5 cumulative: -12.5 (26/09/08), -25 (09/10/08), -25 (30/10/08), -25 (10/11/08), -75 (12/12/08), -50 (08/01/09), -25 (19/02/09)	-75 change in reserve requirements (18/09/08)	TWD 180 bn, comprised of 123 bn in subsidies and tax cuts and the remainder in infrastructure spending (11/09/08); TWD 83 bn in shopping vouchers (18/11/09); TWD 859 bn investment spending and TWD 1.1 trn corporate financing over four years (20/04/09)
Hong Kong SAR	na	-300 bp cumulative change in Base Rate: -150 (09/10/08), -50 (30/10/08), -100 (17/12/08) Calculation method for the HKMA's base rate changed on 08/10/08: first "leg" is changed from fed funds target rate (FFTR) + 150 bp to FFTR + 50 bps; second leg – average of five-day MAs of o/n and one-month HIBORs – suspended until the end of March 2009. After the FOMC's decision in December 2008 to adopt a 25 bp range for the federal funds rate instead of a single number, HKMA announces it will set the base rate at 50 bp above the lower end of the FOMC's target range. Second leg re-instated as of 01/04/2009, ie the base rate is now the higher of (i) the (lower end of the FOMC's range for the) FFTR + 50 bp and (ii) the average of five-day MAs of o/n and one-month HIBORs.	5.2% of GDP (cumulative through 26 May 2009)

A1: Changes in macroeconomic policies (cont)

	Monetary policy		Fiscal stimulus package
	Change in policy rate (in basis points)	Other measures	
India	Repo: -425 cumulative: -100 (20/10/08), -50 (3/11/08), -100 (08/12/08), -100 (05/01/09), -50 (05/03/09), -25 (21/04/09) Reverse repo: -275 cumulative: -200 (02/01/09), -50 (05/03/09), -25 (21/04/09)	-400 cumulative change in reserve requirements: -250 (24/10/08), -50 (25/10/08), -50 (03/11/08), -50 (17/01/09)	INR 1860 bn = 3.5% of GDP (October 2008, December 2008, February 2009)
Indonesia	-225 cumulative: +25 (04/09/08), +25 (07/10/08), -25 (04/12/08), -50 (07/01/09), -50 (4/02/09), -50 (04/03/09), -25 (03/04/09), -25 (05/05/09), -25 (03/06/09), -25 (03/07/09)	-158 change in reserve requirements (09/10/08)	IDR 73.3 trn = 1.4% of GDP (13/01/09)
Japan	-40 cumulative: -20 (31/10/08), -20 (19/12/08)		JPY 5 trn = 1% of GDP (30/10/08); JPY 15.4 trn = 3% of GDP (10/04/09)
Korea	-325 cumulative: -25 (10/09/08), -75 (27/10/08), -25 (07/11/08); -100 (11/12/08); -50 (09/01/09); -50 (12/02/09)		Government spending increase: KRW 16 tr = 1.6% of GDP (in 2008), KRW 17.7 tr = 1.7% of GDP (in 2009) Tax cut: KRW 35.3 tr = 3.4% of GDP (during 2008–2012)
Malaysia	-150 cumulative from Nov 08 to Feb 09: -25 (24/11/08); -75 (21/01/09); -50 (24/02/09) to 2% (and maintained as of May 2009)	-300 cumulative: -50 (24/11/08), -150 (21/01/09), -100 (24/02/09); Statutory Reserve Requirement (SRR) adjusted downwards from 2% to 1% effective 1 March 2009 to further reduce the cost of intermediation.	MYR 7 bn = roughly 1% of GDP (10/08); aimed at offsetting the shortfall in private sector demand and reinvigorate private spending; focused on small-scale construction, maintenance of social infrastructure and public amenities and development projects, including building of low- and medium-income housing, plus measures to boost consumption. MYR 60 bn in spending, tax incentives and other measures over the next two years (10/03/09); includes wide-ranging measures to support domestic demand and strengthen growth capacity: 15 bn of fiscal spending, 25 bn for guarantee funds, 10 bn for equity investment, 7 bn for private finance initiatives and 3 bn for tax incentives.

A1: Changes in macroeconomic policies (cont)

	Monetary policy		Fiscal stimulus package
	Change in policy rate (in basis points)	Other measures	
New Zealand	-575 cumulative: -25 (25/07/08), -50 (11/09/08), -100 (23/10/08), -150 (04/12/08), -150 (29/01/09), -50 (12/03/09), -50 (30/04/09)		NZD 7 bn = 4% of GDP, over two years (27/11/08)
Philippines	-200 cumulative: -50 (18/12/08); -50 (29/1/09); -25 (05/03/09), -25 bp (16/04/09), -25bp (28/05/09), -25 bp (09/07/09)	2% reduction in reserve requirements (14/11/08)	PHP 330 bn for quick-disbursing infrastructure, agriculture and social expenditure
Singapore	na	Slope of target band for SGD changed to neutral from modest and gradual appreciation (10/10/08). April 2009 policy statement further shifted to modestly weaker currency stance.	2009/10 fiscal year includes a SGD 4.9 bn (USD 3.2 bn) drawdown of the fiscal reserve to partly fund the SGD 20.5 bn (USD 13.6 bn) fiscal stimulus package and the deficit of 3.5% of GDP.
Thailand	-250 bp cumulative (since October 2008): -100 (03/12/08); -75 (14/01/09); -50 (25/02/09); -25 (08/04/09)		THB 116.7 bn (USD 3.33 bn) package to provide a THB 2,000 monthly living allowance to low-income earners, school subsidies, promotion of rural small enterprises, free electricity and water for small households and property tax cuts (13/01/09). THB 1.43 trn "Strong Thailand" package for 2010-12, most of which will be spent on infrastructure projects (17/03/09).

A2: Liquidity assistance in local currency

	Extend the maturity of operations	Expand eligible collateral	Other changes in operating procedures
Australia	Frequency of six- and 12-month repos was increased to daily (08/10/08).	Accept RMBS and ABCP of related parties (08/10/08).	Term Deposit Facility with one- and two-week maturities introduced to absorb liquidity (24/09/08); restrictions on substituting collateral within an existing repo removed (08/10/08).
China			Financial institutions facing short-term liquidity problem receive help to borrow from the interbank market.; bilateral currency swap arrangements with six economies total RMB 650 bn (see Annex A3); government plans pilot cross-border trade settlement programme in CNY between Hong Kong SAR and five cities in mainland China (08/04/09), later signed (29/06/09); for the first time, foreign banks permitted to sell renminbi-denominated bonds outside (in Hong Kong, 19/05/09) and inside mainland China (03/06/09).
Chinese Taipei	Maximum maturity of the repo facility extended to 180 days, from 30 days (26/10/08).		Access to repo facility expanded to include all securities firms and insurance companies, transacting via eligible dealers (26/10/08).
Hong Kong SAR	Maximum maturity of borrowing from the HKMA's standing facility increased on 30/09/08 from o/n to three months. This measure was allowed to lapse as of 30/03/09.	USD assets accepted under the same conditions as HKD collateral (30/09/08). This measure was allowed to lapse as of 30/03/09.	Costs of borrowing from the HKMA's standing facility reduced (30/09/08); plan announced to make term funding available, against repo collateral or through FX swaps, upon request and if deemed necessary by the HKMA (30/09/08); strengthened HKMA's lender of last resort framework by including FX swaps as one of the basic instruments to provide LOLR support and expanding the definition of eligible securities for repos to include foreign currency securities of acceptable ratings (26/03/09).
India			A special two-week repo facility was introduced, through which banks can borrow to lend to mutual funds to meet redemptions (14/10/08); special refinance facilities for financial institutions; reduction in the statutory liquidity ratio from 25% to 24%;. Corridor for overnight interest rates narrowed from 200bp to 150bp (03/11/08)
Indonesia	Two-week repo operations introduced (09/10/08).		Corridor for overnight interest rates narrowed from 200 bp to 100 bp (04/12/08).

A2: Liquidity assistance in local currency (cont)

	Extend the maturity of operations	Expand eligible collateral	Other changes in operating procedures
Japan	Providing up to JPY 1.225 trn at 0.1% through 03/04/09 – previously only overnight funds had been offered at such low rates.	Accept corporate debt rated BBB– or higher (until 30/04/09), previously A– (2/12/08); debt instruments issued by real estate investment corporations (22/01/09); government-guaranteed dematerialised commercial paper (19/02/09); bonds issued by the US, UK, German and French governments (22/05/09)	Expansion of the securities lending facility (14/10/08, 19/02/09); increase in the frequency and size of CP repo operations (14/10/08); expansion of JGB purchases through repos (14/10/08); introduction of the complementary deposit facility (31/10/08); introduction and expansion of special funds-supplying operations to facilitate corporate financing (02/12/08, 19/12/08, 19/02/09); increased JGB purchases from JPY 14.4 trn per year to 16.8 trn (19/12/08) and later 21.6 trn (18/03/09); introduction of outright purchases of CP (19/12/08, 22/01/09) and corporate bonds (22/01/09, 19/02/09).
Korea	91-day repos introduced (9/1/09)	Bonds issued by banks and special entities accepted (27/10/08); public corporation bonds accepted (09/12/08).	Interest began to be paid on bank deposits in the central bank (03/12/08). Liquidity support for construction companies (10/08) and importers and exporters (12/08). Additional liquidity support for shipbuilders (31/04/08). Twelve additional securities firms eligible counterparties for repo operations (11/12/08). Reverse mortgage scheme expanded: minimum age lowered and maximum loan amount increased (18/02/09).
New Zealand	Term Auction Facility introduced to provide three-, six- and 12-month funding up to NZD 2 bn (07/11/08).	Bank bills accepted (23/08/07), All AAA-rated locally registered bonds (07/05/08) and (temporarily) unrated RMBS (9/10/08) accepted. Further extension of the range of collateral (17/12/08).	Reintroduction of central bank bills, not issued since 1999 (07/11/08). Application of the graduated haircut regime to all securities eligible for domestic liquidity operations (17/12/08).
Philippines			Reclassification of financial assets (vis mark to market) in line with IAS amendments (31/10/08); liberalisation of rediscounting guidelines and increasing rediscounting budget (2/03/2009)

A3: Liquidity assistance in foreign currency

	Swap facility with Federal Reserve to provide US dollars against local currency		Other measures
	Maximum amount	Drawn	
Australia	\$10 bn (24/09/08), increased to \$30 bn (29/09/08)	Yes	
China			<p>Bilateral swap arrangements: RMB 180 bn / KRW 38 trn with Korea (12/12/08); RMB 200 bn / HKD 227 bn with HKMA (20/01/09); RMB 80 bn / MYR 40 bn with Malaysia (08/02/09); RMB 20 bn / BYR 8 trn with Belarus (11/03/09); RMB 100 bn / IDR 175 trn with Indonesia (23/03/09); RMB 70 bn with Argentina (29/03/09).</p> <p>Multilateral swap facility: ASEAN+3, total \$120 bn. China commits 32%.</p> <p>China made plans to lend foreign exchange to financial institutions running short of foreign currency liquidity.</p>
Hong Kong SAR			Bilateral swap line with mainland China of RMB 200 bn / HKD 227 bn (20/01/09).
India			RBI made available to banks a FX swap facility, raised the interest rate ceiling on non-resident Indian deposits, relaxed the all-in cost ceiling for external commercial borrowings, and permitted systemically important non-bank financial institutions to raise short-term foreign currency borrowings; regulations on borrowing by banks from their overseas branches eased (15/10/08); RBI more than tripled (to INR 347 bn) the funds it makes available for banks to refinance export credit and increased the export credit refinance limit for commercial banks from 15% to 50% of outstanding export credit (16/11/08).
Indonesia			Maximum maturity of IDR-USD FX swaps with BI was extended to one month from seven days (14/10/08); reserve requirements on foreign currency deposits lowered to 1% from 3% (14/10/08); limit on foreign borrowing by banks of 30% of capital abolished (9/10/08); arrangement of \$5.5 bn standby loans from the World Bank, the ADB, Australia and Japan (02/02/09); Expansion of bilateral currency swap arrangement with Japan from \$6 bn to \$12 bn (21/02/09); USD 3.5 bn contribution to the expanded Chiang Mai Initiative (22/02/09); bilateral swap line with China of RMB 100 bn / IDR 175 trn (23/03/09).
Japan	\$60 bn (18/09/08); increased to \$120 bn (29/09/08); increased to an unlimited amount (13/10/08); reciprocated (up to JPY 10 trn; 06/04/09).	Yes	Expansion of bilateral KRW-JPY swap line with BoK from \$3 bn to \$20 bn equivalent, effective until end-April 2009 (12/12/08); expansion of bilateral currency swap arrangement with Indonesia from \$6 bn to \$12 bn (21/02/09).

A3: Liquidity assistance in foreign currency (cont)

	Swap facility with Federal Reserve to provide US dollars against local currency		Other measures
	Maximum amount	Drawn	
Korea	\$30 bn (29/10/08); extended to end-October 2009 (4/02/09).	Yes	Competitive auctions for KRW-USD FX swaps between the BOK and banks introduced (17/10/08); BOK makes up to \$30 billion of its reserves available to lend to local banks (19/10/08). Expansion of bilateral KRW-JPY swap line with BoJ from \$3 bn to \$20 bn equivalent, effective until end-April 2009. Established KRW-CNY swap line of RMB 180 bn equivalent, effective for three years (12/12/08).
Malaysia			PBC and BNM establish a bilateral currency swap arrangement, designed to promote bilateral trade and investment for economic development of the two countries. Arrangement will provide RMB 80 bn/MYR 40 bn; the effective period of the arrangement will be three years, and could be extended by agreement between the two sides.
New Zealand	\$15 bn (29/10/08)	No	
Philippines			Repo facility introduced by the BSP for USD-denominated Philippine government bonds (23/10/08); exclusion of mark-to-market losses from computation of 100% foreign currency deposit cover (31/10/08).
Singapore	\$30 bn (29/10/08); extended to end-October 2009 (04/02/09).	No	

A4: Guarantees and recapitalisations

	Government guarantees for liabilities of authorised institutions		Credit guarantee policies	Government injections of bank capital
	Customer deposits	Other liabilities		
Australia	Guarantee introduced for an unlimited amount until October 2011 (12/10/08), for a fee for deposits above AUD 1 mn (28/11/08).	Debt securities with maturities up to five years, for a fee of 70–150 bp (12/10/08).	Government will temporarily guarantee state-issued debts (25/03/09).	
China				Huijin, the investment arm of Chinese government, injects USD 19 bn into the Agricultural Bank of China (06/11/08). Capital injection later increased to USD30 bn (02/09).
Chinese Taipei	Guarantee increased from TWD 1 mn to 3 mn (06/10/08), then increased to an unlimited amount until December 2009 (07/10/08).			
Hong Kong SAR	Guarantee increased from HKD 100,000 to an unlimited amount and coverage expanded to deposits with restricted licensed banks and deposit-taking companies, effective until December 2010 (14/10/08).		LegCo approved enhancements to the SME Loan Guarantee Scheme (28/10/08) and a time-limited Special Loan Guarantee Scheme for more general business use (14/11/08).	Government introduced a new Contingent Bank Capital Facility to make capital available to banks (14/10/08).
India				Government announces intention to raise capital in state banks from 9% to 12% with no clear time frame (23/10/08). Government announces injection of INR 200 bn into state banks and INR 250 bn into non-bank finance companies (09/01/09).
Indonesia	Maximum guarantee increased from IDR 100 mn to 2 bn (12/10/08).			

A4: Guarantees and recapitalisations (cont)

	Government guarantees for liabilities of authorised institutions		Credit guarantee polices	Government injections of bank capital
	Customer deposits	Other liabilities		
Japan	Existing guarantee unchanged at JPY 10 mn for ordinary and time deposits and an unlimited amount for payment and settlement deposits.			<p>Government proposes increasing the limit on official injections of capital in banks (30/10/08).</p> <p>Bank of Japan announces purchases of up to JPY 1 trn of stock rated BBB or higher held by financial institutions (03/02/09).</p> <p>Government announces plans to inject JPY 121 bn into three regional banks (13/03/09).</p> <p>BoJ announces the provision of subordinated loans to banks (17/03/09, 10/04/09).</p>
Korea	Existing deposit insurance of KRW 50 mn expanded to include foreign currency deposits (03/11/08).	External debt issued between October 2008 and June 2009, with maturities up to three years; capped at \$100 billion (19/10/08). Guarantee on FC debt extended by six months to end-2009 and to include maturities up to five years (29/4/2009).		<p>KRW 1.65 trn into in three government banks: Korea Development Bank, Korea EXIM Bank, Industrial Bank of Korea (16/12/08).</p> <p>Korea EXIM bank's capital doubled from KRW 4 trn to KRW 8 trn to facilitate trade finance (30/1/09). Cash injection in five state-run financial institutions (2/1/09).</p> <p>An additional KRW 800 bn injected (30/1/09).</p> <p>The government plans to launch two funds: a KRW 40 trn Restructuring Fund to buy troubled loans and corporate assets; and a KRW 20 trn Bank Recapitalisation Fund to inject capital into banks by purchasing preferred stock. The corporations behind the two funds will issue government-guaranteed bonds (27/03/2009). BOK provided KRW 3.3 trn in loans to Korea Development Bank to support the Bank Recapitalisation Fund (30/03/09).</p>

A4: Guarantees and recapitalisations (cont)

	Government guarantees for liabilities of authorised institutions		Credit guarantee polices	Government injections of bank capital
	Customer deposits	Other liabilities		
Malaysia	Guarantee increased from MYR 50 mn to an unlimited amount until December 2010 and expanded to include deposits in foreign currencies (16/10/08).		The central bank announces the establishment of a MYR 2 bn (USD 555 mn) SME Assistance Guarantee Scheme (SAGS) (23/01/09).	
New Zealand	Guarantee for retail deposits introduced until October 2010 (12/10/08), later capped at NZD 1 mn per depositor per institution (22/10/08).	All newly issued senior unsecured negotiable or transferrable debt securities, for a fee, issued by financial institutions with an investment grade credit rating and substantial NZ borrowing and lending operation (01/11/08).		
Philippines	Maximum deposit insurance increased from PHP 250,000 to PHP 500,000 (effective 1/06/2009) and permanent deposit insurance fund upgraded from PHP 3 bn to PHP 24 bn (09/12/08).			
Singapore	Guarantee increased from SGD 20,000 to an unlimited amount until December 2010 and expanded to include deposits in foreign currencies (16/10/08).		Special Risk-Sharing Initiative launched that includes New Bridging Loan Programme and Trade Finance Schemes (loan insurance scheme + trade credit insurance programme) (22/01/09).	
Thailand	Planned reduction of the existing unlimited guarantee postponed to August 2011 from 2009 (28/10/08).		THB 30 bn credit guarantee programme initiated by the government and the BOT to support SMEs	THB 12 bn capital injection for three state financial institutions (Small Business Credit Guarantee Corp., Export-Import Bank of Thailand, and Small and Medium Enterprise Development Bank of Thailand) to support lending

A5: Support for equity and other asset prices

	Restrictions on short sales of equities	Other measures
Australia	Ban on naked shorts (19/09/08), later made permanent; temporary ban on covered shorts (21/09/08), lifted for non-financial equities (19/11/08) and for financial stocks (25/05/09) after two extensions (21/01/09, 05/03/09).	Government will purchase at least AUD 4 bn worth of AAA-rated RMBS (26/09/08) and up to AUD 8 bn (13/10/08).
China		Number of foreign institutions approved to invest in Chinese securities increased (13/09/08); transactions tax of 0.1% removed for purchases of equities (18/09/08); government fund Central Huijin purchases shares in three major banks (23/09/08); foreign banks allowed to trade corporate bonds in the interbank market (09/01/09).
Chinese Taipei	Banned for selected equities (21/09/08).	Incentives introduced for financial holding companies to buy back their own shares (08/09/08); transactions tax for equities reduced to 0.15% from 0.3% until March 2009 (10/09/08); agreement with mainland China to facilitate cross-Straits financial services (26/04/09).
Hong Kong SAR	Decided to uphold the uptick rule and double the penalties for the failed settlement of short-selling transactions (26/09/08)	
India		Controls (imposed in October 2007) on foreign investment in structured equity products eased (06/10/08); limit on portfolio investment in local corporate debt doubled to USD 6 bn (15/10/08); later increased to USD 15 bn (02/01/09); relaxation in risk weights and provisioning requirements was permitted as a counter-cyclical measure.
Indonesia	Banned (29/09/08); extended to 30/04/09 (06/01/09).	Jakarta stock exchange closed for three days (08/10/08); mark to market accounting for banks' bond portfolios temporarily suspended (09/10/08); buybacks of government bonds announced (29/10/08).
Japan	Ban on naked shorts until 31/03/09 (28/10/08); extended to 31/07/09 (24/03/09).	BoJ announced plans to purchase JPY 3 trn of commercial paper (19/12/08, 22/01/09), as well as plans to purchase JPY 1 trn of corporate bonds (22/01/09, 19/02/09). BoJ suspended sales of its equity holdings (14/10/08) and resumed purchases of equities held by financial institutions (3/02/09).
Korea	The Financial Services Commission prohibited short-selling on borrowed stocks listed on the KRX (01/10/08). Lifted the ban on non-financial stocks (01/06/09)	Tax incentives introduced for investors to hold mutual funds for longer periods (19/10/08); government guarantees for 60–70% of the value of MBS backed by unsold new homes (10/08); government agency announces plans to buy unsold new homes up to KRW 2 trn via reverse auction (10/08); regulators establish a KRW 10 trn fund to purchase corporate bonds issued by local firms (13/11/08).
Malaysia		To boost the stock market, the government injected MYR 5 bn into special-purpose vehicle Value Cap Sdn Bhd for investment in undervalued companies (22/10/08).

A5: Support for equity and other asset prices (cont)

	Restrictions on short sales of equities	Other measures
Philippines		Regulations on banks' reclassification of assets held at fair value temporarily eased, in line with amendments by the IASB (23/10/08).
Singapore	To deter naked short selling, increased penalties for failed trade to 5% of the value of trade, with a minimum penalty of S\$1,000 (25/09/08).	
Thailand		Thailand plans to ease taxation rules to support the development of an Islamic bond market that enables local companies and banks to tap new investors (25/02/09).

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Development of financial markets in Asia and the Pacific: the international financial crisis and policy challenges

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1. Introduction

The crucial link between economic progress and vibrant/resilient financial markets has never been put in a sharper relief than during the current credit crisis. I will take up the question of the development of the financial markets in Asia and the Pacific in the context of the recent developments in credit markets as they have important lessons for the policymakers in this region in thinking about their developmental efforts. To this end, I will identify below some of the key characteristics of the current financial crisis (mid-August 2007 until now) and raise a few questions that the policymakers may wish to address in the context of developing financial markets.

First, the bursting of the housing price bubble and the near-collapse of banks and major financial institutions in the shadow banking system in the Western economies has choked the supply of credit and has brought about a period of recession in many nations in the global economy.² This has served to underscore the critical link that exists between the health of capital markets and the health of the real economy in developed economies. This is clearly one central issue in thinking about financial markets development in Asia and the Pacific. In this context, I would pose the following question.

Q1 – What is the nature of the link between development of financial markets and economic development in this region? How can this link be made stronger, resilient and more robust?

Second, the near-collapse of major financial institutions, besides resulting in massive aggregate losses to stockholders, and major layoffs, has also led to a huge transfer of wealth from the tax payers to the creditors of banks and financial institutions.³ The extensive infusion of capital by the tax payers has raised the question of moral hazard – banks and financial institutions take excessive risks in good times. If the risks translate to profits, then in such future good times the managers of banks and financial institutions capture most of the economic rents, leaving inadequate capital to buffer negative shocks if and when bad times materialise later. On the other hand, if the risks translate to financial distress, (ie bad times) they simply turn to the central banks (discount windows, standing facilities and other facilities hastily arranged to shore up weak and failing financial institutions) and the governments (ie taxpayers) to bail them out. The conventional argument for such costly bailouts is that the lending and deposit-taking activities of banks and financial institutions are too crucial to the vitality of economic growth and stability, and that the actual bankruptcy of a major bank can be too destabilising. The bankruptcy of Lehman Brothers is usually cited to bolster this

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² The drop in housing values and equity prices has also significantly dampened household consumption and curtailed the demand for credit further.

³ See Veronesi and Zingalis (2008).

argument.⁴ (Creditors to banks can threaten the bank with a protracted and costly bankruptcy of major banks that may serve to destabilise economic growth.) These observations form the basis for my next set of questions.

Q2 – How should policymakers in Asia and the Pacific think about designing and modifying the capital structure of banks/financial institutions, and how should they design policies for insolvencies of banks/financial institutions?

As noted, the managers of banks and financial institutions may try to capture significant economic rents during good times and rely on central bank's facilities and accommodative policies in bad times. From the perspective of policymakers in Asia and the Pacific, these developments also raise the following set of questions.

Q3 – What can be done so that banks and financial institutions transfer capital from good times to bad times voluntarily? If such a voluntary transfer is not credible or is ineffective, how can policymakers help make that process happen through public policy measures?

Third, one underlying theme is the extent to which “asset price bubbles” were created by too accommodative central bank policies, and whether central banks should be active in attempting to pro-actively and pre-emptively strike with bold policy actions before asset price bubbles go out of control. This possible policy initiative is in contrast to a stance in which the central banks step in after the bursting of an asset price bubble. The housing price bubble in the United States and its recent and spectacular bursting has certainly reinvigorated this discussion in policy circles. In a recent presentation, Dudley (2009) has argued that central banks may want to make it their business to pro-actively deal with asset price bubbles, despite the challenges posed in the identification of the correct time to intervene and in the designing of the tools that the central bankers may need to fight asset price bubbles. In the context of financial markets development in Asia and the Pacific, we should not lose sight of the 1997 Asian crisis, which was tied to asset price bubbles in some of the countries in the region. The debilitating consequences of that crisis from the perspective of economic development have already been documented.⁵ IMF (1998) identified “a build-up of overheating pressures, evident in large external deficits and inflated property and stock market values” as one of the probable causes. The question for the policymakers in this context is the following:

Q4 – What should be the role of policymakers in dealing with asset price bubbles? What tools and legislative authority are needed for central banks to effectively deal with asset price bubbles?

I will return to these questions in the final section of the paper and offer some perspective. Let me first begin by quickly summarising the critical functions that financial markets play both in the allocation of capital over time and across different types of investors/borrowers as well as their importance to central banks and governments in the conduct of monetary and fiscal policies.

⁴ Lehman Brothers declared bankruptcy in September 2008, which led to major dislocations in financial markets and extensive actions/interventions from central banks.

⁵ IMF Staff, “The Asian Crisis: Causes and Cures”, *Finance and development*, June 1998, Volume 35, Number 2.

1.1 Importance of financial markets to economic growth

The importance of liquid and deep financial markets to economic development can hardly be overemphasised.⁶ At a very broad level, financial markets are the venues where borrowers and lenders interact, and capital is raised for real investments and then gets reallocated among investors. In addition, governments and central banks may have a vested interest in developing liquid financial markets for the conduct of their fiscal and monetary policy implementation. For example, the presence of active markets for repurchase agreements and the availability of an extensive over-the-counter (OTC) dealer network allow central banks to efficiently increase or decrease the money supply to meet monetary policy goals. In a similar way, the ability of governments to borrow on a sustained basis by issuing sovereign debt securities is based on the presence of an active OTC dealer market, through which the dealers bid in government auctions of debt securities and then distribute the securities in active and liquid secondary markets.

In order for important economic activities such as the capital allocation process, monetary policy implementation and government borrowing to take place efficiently, economies must continue their efforts to develop financial markets. These efforts must be expended along multiple dimensions, as the development of deep and liquid financial markets depends on a number of factors, including, regulatory policies, fiscal and exchange rate policies, bankruptcy code/laws, trade-patterns, infrastructure for trading and intermediation (financial and informational), access to markets for global investors and issuers, and incentives for financial innovation.

I will illustrate briefly how these factors influence the development of financial markets. A regulatory framework that enforces strict corporate governance and disclosure policies, and strong investor protection will, *ceteris paribus*, tend to stimulate financial market development. In the context of the 1997 Asian crisis, the IMF has noted as a possible contributor to the crisis a lack of credible corporate governance and political uncertainty, which was a factor in foreign lenders refusing to roll over short-term debt. This in turn put downward pressure on currencies and equity prices. A fiscal policy whereby governments routinely access financial markets to borrow, instead of relying on state-owned (and controlled) banks as captive investors in government debt, will tend to encourage the development of a government bond market and provide a credible benchmark (government yield curve) for the rest of the credit market. Another example would be a policy that either implicitly or explicitly empowers the banking system to be the sole (or the primary) lender. This will end up inhibiting the growth of alternative credit markets such as commercial paper or corporate bonds. In the same vein, tightly managed exchange rate policies will inhibit the growth of a liquid foreign currency market where the domestic currency can be traded. The absence of a well specified bankruptcy code and its enforcement will cause bond investors to shy away from investing in corporate bonds or to demand an excessive premium for holding corporate debt. A well designed bankruptcy code attempts to balance the rights of creditors with those of debtors. Such a code will maximise the total value of the claims when the company enters into bankruptcy proceedings. Moreover, the code should also penalise corporate borrowers for not honouring their contractual obligations by providing credible access to borrowers' assets. Trade patterns can often motivate the development of one sector of financial markets in favour of another. Export-driven economies with significant foreign currency earnings have an added incentive to access and develop financial markets for foreign currency-denominated

⁶ In this context, a liquid market is one in which the following properties hold: (i) transaction costs and bid-offer spreads are typically low, (ii) search time for evaluating and settling trades is low (in other words trades can be done in a timely fashion), and (iii) market impact costs are low – ie large trades have only a limited impact on market prices. In a deep market, market impact costs for even very large trades will be low. Some futures contracts come close to the ideal of deep and liquid financial markets.

debt securities. On the other hand, economies that primarily depend on domestic consumption often develop innovative institutions for tapping pools of local currency savings. An example of infrastructural support in financial intermediation will be the development clearing and settlement systems that are so vital to the development of financial markets. Governments also have a critical role in setting policies that ensure that valuation-relevant information is disclosed promptly to potential investors through the enforcement of policies on disclosure requirements and insider dealing. Access to financial markets by global issuers and investors can promote thriving capital markets. Finally, regulatory policies must carefully balance the need to preserve and promote incentives for financial innovation with the need to prevent excessive risk-taking in financial markets.

The foregoing (illustrative) discussion suggests that the question of developing financial markets needs to be addressed with some sensitivity to the idiosyncratic economic circumstances of the country (such as its trade flows, exchange rate regimes, etc) as well as to the legal framework within which markets operate.

Table 1
Factors influencing financial markets development

Factors	Manner in which factors influence financial markets development
1. Regulatory framework	<ul style="list-style-type: none"> • Corporate governance • Investor protection • Disclosure requirements • Insider trading • Market surveillance • Underwriting standards/bank supervision
2. Fiscal and exchange rate policies	<ul style="list-style-type: none"> • Captive (nationalised) banks to hold debt • Auctions to sell sovereign debt – government benchmarks – active primary and secondary government bond markets • Controlled exchange rates
3. Legal framework and bankruptcy code	<ul style="list-style-type: none"> • Integrity of contract enforcement • Transparent ownership of assets such as residential and commercial properties • Bankruptcy code that leads to efficient outcome in financial distress and provides correct incentives ex-ante. This can have huge consequences for the development of corporate bond markets
4. Trade patterns	<ul style="list-style-type: none"> • An export-oriented economy has greater incentives to access and develop foreign currency debt instruments • An economy driven by domestic consumption may have innovative and informal credit markets to tap pools of local currency capital
5. Infrastructure for trading and intermediation	<ul style="list-style-type: none"> • Developing settlement and clearing systems • National and international standards for accounting/auditing statements • Developing and enforcing standards for investment advisors and other intermediaries
6. Access to global issuers and investors	<ul style="list-style-type: none"> • Access to global issuers allows foreign currency markets to develop within the country • Access to global investors generates global portfolio flows that move in and out of the country
7. Incentives for financial innovation	<ul style="list-style-type: none"> • Light touch regulation tends to promote innovation as well as excessive risk-taking • Tough regulation can lead to stagnant financial markets

In this context, Table 1 summarises the foregoing discussions and highlights some of the key dimensions through which each of these factors impinge on the development of financial markets. The purpose here is to highlight the multi-pronged nature of development efforts – some at the highest macro level and some at the level of basic infrastructure of the financial markets. As noted in a number of papers cited in this paper, many countries in Asia and the Pacific are well on their way to implementing such multi-pronged policies to promote the growth of liquid financial markets.

In thinking about the development of financial markets, it is also important to ensure that local financial (credit, savings, etc) markets, which have withstood the test of time, are also allowed to evolve and develop further. This perspective is useful, as in many developing countries innovative financial markets have developed, evolved and thrived over many decades. Any push towards developing financial markets must take cognisance of these markets and how overall welfare will be affected if financial development were to occur at the expense of such markets. On this point, a recent paper by Allen, Chakrabarti, De, Qian, and Qian (2008) has argued that both China and India have been able to register significant growth rates even though, by Western standards, the level of investor protection and the quality of legal institutions in these countries could bear improvement. In part, this has been possible because of a high savings rate and innovative and informal relationship-based credit markets (such as trade credit, company deposits, and other non-bank financing arrangements) that have been able to provide the necessary capital to borrowers to promote economic growth.

Next, I will begin by summarising some of the desired properties that well-functioning financial markets should possess.⁷ I will then describe the structure of financial markets in Western economies with a view to exploring the lessons that Asian and Pacific economies may draw from the experience of Western economies. One striking feature of financial markets in the Western economies is the fact that markets with different levels of transparencies co-exist with varying levels of regulation. This will be followed by a review of how various crises over the past several decades have shaped the evolution of these financial markets. Finally, I outline some proposals for the development of financial markets in Asia and the Pacific.

2. Desired properties of financial markets⁸

One of the most desired properties of a well functioning financial market is the notion of transparency. The International Organisation of Securities Commissions (IOSCO) defines the transparency of a market as the widespread availability of information relative to current opportunities to trade and recently completed trades.⁹ We may classify transparency into pre-trade transparency and post-trade transparency. Pre-trade transparency is helpful to potential buyers and sellers in a financial market in obtaining the best possible price for the transactions contemplated. Post-trade transparency is helpful to players who have already transacted in financial markets to assess the effectiveness of the execution.

⁷ These properties have been the focus of market microstructure literature in the field of finance.

⁸ Part of this discussion that follows in section 2 is drawn from Sundaresan (2005).

⁹ International Organization of Securities Commissions: IOSCO Objectives and Principles of Securities Regulation.

2.1 Pre-trade information

Pre-trade information that potential investors would like to have includes (i) firm (live) bid prices and (live) offer prices and the quantities that the market maker is willing to transact. The availability of such information allows investors to observe the prices at which specified quantities of securities can be bought or sold; and (ii) in multiple dealer markets (as in sovereign or corporate bonds), pre-trade transparency information will require the consolidation of bid prices and offer prices as well as the quantities associated with those prices across all market makers (or as many market makers or dealers as possible). The existence of effective consolidation mechanisms serves to reduce the search costs to potential investors by providing them, in one screen, with a complete picture of trading opportunities, not with just one dealer but with multiple dealers. This, in turn, promotes overall transparency.

2.2 Post-trade information

Relevant post-trade information that investors would like to know includes the prices and the volume of all individual transactions that have actually taken place in the market at the time a potential investor is contemplating a trade. The post-trade transparency of a market determines the information that investors will have about most recent trades and will help them evaluate the quality of execution of trades relative to recently concluded trades. Once again, the existence of effective consolidation mechanisms serves to reduce the search costs to potential investors by providing them with a complete picture of recently completed buy and sell orders with various dealers and the quality of trade execution. In a market where pre-trade and post-trade transparency is poor, information about the prevailing buying interest or prevailing selling interest or quality of recently completed trade executions is costly and time-consuming to acquire. As a result, prices will not efficiently reflect all the buying and selling interests that are present in the market. This may lead to poor trade execution; investors may receive or pay prices that are not necessarily the best available prices in the market.

A desirable goal in developing financial markets in Asia and the Pacific should be to ensure the greatest possible pre-trade and post-trade transparency. A transparent market promotes informational efficiency.¹⁰ While there is considerable debate in the academic literature as to whether the financial markets are “efficient” in the sense of reflecting rapidly all available information, the best that policymakers can do is to pursue policies that make financial markets as transparent as possible.¹¹ Such policies in turn have the potential of making financial markets as close to being efficient as is possible in practice.

The importance of transparency in financial markets in helping to dampen crisis in financial markets has been noted in the context of Asian financial crisis by an IMF staff report (1998), which cites lack of transparency as a possible contributor to the crisis.

“Problems resulting from the limited availability of data and a lack of transparency, both of which hindered market participants from taking a realistic view of economic fundamentals”.

While promoting transparency in financial markets should be an integral part of market development, the next section will argue that markets with differing levels of transparency often co-exist, catering to a spectrum of investors and entrepreneurs.

¹⁰ See Fama (1965, 1970) and Samuelson (1965).

¹¹ See Grossman and Stiglitz (1980) who provide a powerful argument as to why markets may never be fully efficient.

3. A classification of financial markets in western economies and their evolution

Financial markets in the western economies (defined to include United States, the United Kingdom and western Europe) have developed rapidly. In these markets, global institutional borrowers can raise billions of dollars (or other chosen currencies) of capital at a short notice and institutional investors can invest and reallocate their savings as needed. Both end-investors and issuers use these markets to apply their risk-return assessments in their investment and issuance strategies. These markets have evolved over a period of time and have assumed broadly three basic forms.

- Centralised markets such as the New York Stock Exchange-Euronext, Chicago Mercantile Exchange etc.
- Decentralised over-the-counter (OTC) markets such as Treasury debt markets, corporate debt markets, mortgage-backed securities, interest rate swap markets, credit default swaps markets etc.
- Private and less-regulated markets such as private equity, venture capital, private placements, hedge funds, etc.

Each of these markets can be compared along multiple dimensions of contractual safeguards and features of underlying securities. Table 2 provides a comparison of these markets along selected dimensions.

Table 2

A classification of financial markets

Type of financial markets	Clearing house and settlement guarantees	Marking to market and collateral	Secondary market liquidity	Customisation versus standardisation	Market transparency
Centralised markets	√	√	Typically high	Highly standardised	Typically very high
OTC markets	X With some exceptions	X With some exceptions	Typically low	Can be customised to the needs of investors	Typically moderate to low
Private and less-regulated markets	X	X	Typically poor	Highly customised	Typically very poor

Centralised markets have flourished over time and they have vigorously embraced the emergence of digital technology. Common clearing agreements across geographically dispersed exchanges have extended trading hours and enhanced global participation. One of the hallmarks of centralised exchanges is the clearing house which stands between the buyer and seller, guaranteeing the integrity of all transactions. It is a matter of record that this market organisation has withstood time after time major financial crises such as the stock market crash of 1987, Asian crisis of 1997, LTCM/Russian default of 1998, and the ongoing credit crisis, which began in mid-2007. While centralised markets have been resilient, the contracts that are traded in these markets tend to be standardised, and may not always suit the needs of institutional investors and issuers in global markets. This has led to the evolution of OTC markets or dealer markets. Most fixed income securities markets are

organised as OTC markets. Dealers act as market makers by purchasing the debt securities from borrowers (issuers) such as the U.S. Treasury and corporations and then sell the securities to investors such as pension funds, insurance companies, and the like. This process occurs in primary markets. Once the securities are issued, they trade in secondary markets, where the ownership of these securities merely exchanges hands without generating new capital or funds. Most of the trading in secondary markets in fixed income markets occurs through the OTC structure and their relative success in attracting global capital may be attributed to the following underlying institutional features: availability of well capitalised dealers with an extensive distribution network, provision of anonymous trading and matching services by inter-dealer brokers (IDB), availability of funding markets such as the markets for repurchase agreements with clearing house and settlement safeguards, ability to hedge risk by trading in futures contracts on government debt securities etc. Electronic screen-based trading capabilities have dramatically improved the transparency of equity and fixed income markets.¹²

Privately placed securities, venture capital and private equity markets do not have the transparency of centralised markets or other OTC markets, but they provide the necessary risk capital for start-up firms, small and medium scale firms. The observed contractual structure and the resulting opacity is an endogenous outcome of the discussions between the risk-capital supplier and the firms or entrepreneurs. Each category of the financial markets play an important function in the development of the economy and their diversity is a reflection of the strength of the capital market's ability to provide risk capital to a spectrum of firms/entrepreneurs with projects of varying risk-return rewards.

Financial markets development over the past several decades has been influenced in an indelible manner by the crises that have occurred over this period and also by enlightened actions by some financial regulators. Gudmundsson (2008) explores how the current financial crisis might shape the development and regulation of financial markets. He predicts that "the future financial sector can be expected to be smaller and operate with higher capital and liquidity than before the crisis." Gudmundsson (2008) and others in policy circles have argued for the following changes in the development of financial markets in the foreseeable future.

- Higher capital and liquidity buffers for banks.
- Simpler and commoditised products as opposed to complex structured credit products, backed by clearing houses and settlement safeguards.
- Pruning the securitisation (originate-to-distribute) model to capture its insights but avoiding excessive risk-taking and extensive distribution. Ensuring that the originating bank's skin is in the game of securitisation.¹³
- Greater transparency to regulators and possible restrictions on leverage or risk-taking by interconnected financial institutions.¹⁴

Many of the changes that have occurred in the financial markets development in the western economies over the past few decades have resulted from both financial market crises and the actions of self-regulatory bodies and regulators. Let me highlight a few below to suggest how crises can help in sharpening the focus on what needs to be done to make the markets more resilient.

¹² See, Barclay Michael, Hendershott Terence, and Kotz Kenneth (October 2006). Automation versus Intermediation: Evidence from Treasuries Going Off the Run. *Journal of Finance*, LXI (5).

¹³ See Dudley (2009).

¹⁴ See the Turner report, for example and recent proposals for reform from the United States Treasury.

Table 3

Some examples of market developments

Event/Causes	Market Development
1. Bid-rigging by Salomon Brothers in two-year Treasury note auction.	Treasury eventually moves to single-price auction after experimenting with both discriminatory and uniform price auctions.
2. Lack of transparency in corporate debt markets.	SEC institutes TRACE mechanism to include transaction prices of corporate bonds in Bloomberg and enhance market transparency.
3. Fails in repo agreements.	Penalty of 300 basis points for failing in repo agreements.
4. AIG – CDS protection triggers.	Clearing house and cash auctions for CDS.
5. Run in shadow banking system.	Money market guarantees. Credit market facilities by the Fed.
6. Settlement and clearing problems.	FICC in the United States. Major initiatives in European Union.

4. A perspective for developing financial markets in Asia and the Pacific

A number of papers have documented the developments that have taken place in Asia and the Pacific and the challenges faced by the countries in these regions in the process of developing their financial markets.¹⁵ The background paper on financial markets in Asia and the Pacific by Filardo, George, Loretan, Ma, Munro, Shim, Wooldridge, Yetman, and Zhu (2009) provides a comprehensive survey of the developmental efforts that have been agreed upon and implemented by the nations in this region. In addition, the efforts promoted by BIS and the People's Bank of China have also resulted in a concerted drive to develop corporate bond markets in this region.¹⁶ With the time and effort that these economists have invested at the ground level, many important initiatives have been taken. I offer some proposals here, which are more at a policy level. Hence the proposals outlined in this section of my paper must be viewed in the context of these developmental efforts that are already in progress.

This said, let me now return to the questions that I posed in section 1 in the context of financial market development.

Q1 – What is the nature of the link between developments of financial markets and economic development in this region? How can this link be made more robust?

In some developing countries in Asia and the Pacific a significant fraction of households has no access to banks and financial markets. Many of these households rely on informal credit markets as they are too poor to be depositors in the formal banking system and for the same

¹⁵ See the papers by Ma and Remolona (2005), Remolona and Shim (2008), Loretan and Wooldridge (2008), and Tsuyuguchi and Wooldridge (2008).

¹⁶ See, BIS Papers No 26, Developing corporate bond markets in Asia, Proceedings of a BIS/PBC seminar held in Kunming, China on 17–18 November 2005.

reason do not qualify as borrowers in the formal banking system. In order to make the link between financial markets and economic development stronger, initiatives must be taken to make these informal credit markets stronger and safer and to extend their reach to a wider range of households. By informal credit markets, I mean non-bank financial institutions, credit unions, micro-finance institutions, NGOs, village banks, etc.¹⁷ In addition, small and medium scale firms often rely on relationship-based lending arrangements such as trade credit. Any financial development strategy must include this sector, where the poorest section of the society participates as an integral part. The current financial arrangements that small and medium scale firms rely on should also be taken into account in future developmental efforts.

Q2 – How should policymakers in Asia and the Pacific think about designing and modifying the capital structure of banks/financial institutions, and how they should design policies for the insolvencies of banks/financial institutions?

The costly bail-outs of large financial institutions such as Citibank, Bank of America, AIG and several major banks in the United Kingdom raise two key policy issues for Asia and the Pacific, namely the. “Too big to fail” and. “Too interconnected to fail” doctrines. More broadly, the recent experience raises the thorny question of how financial market development policies should address the insolvency of such financial institutions. This question also cuts to the design of the capital structure of banks and other major financial institutions. In the current crisis, most of the recapitalisation for failing banks came from taxpayers. The creditors, who could threaten bankruptcy, did not have to write down their claims voluntarily. In a recent presentation the President of the New York Fed has suggested the possibility of issuing bank debt that automatically converts to equity once the stock price falls below a certain level.¹⁸ To quote Dudley (2009):

“Capital requirements are one area where I think we could adjust the rules in a way to improve incentives. For example, imagine that we mandated that banks had to hold more capital, but that the added capital could be in the form of a debt instrument that only converted into equity if the share price fell dramatically. What would this do? It would change management’s incentives. Not only would management focus on generating higher stock prices, but they would also worry about risks that could cause share prices to fall sharply, resulting in dilution of their share holdings.

Debt convertible into equity on the downside would also be helpful in that it would be a dampening mechanism – equity capital would be automatically replenished, but only when this was needed.”

In fact, the proposal made by Dudley is not new. Flannery (2002) made such a proposal, which he called reverse convertible debt. Such proposals will ensure that the first port of call for capital infusion in bad times will be the creditors of the bank and not the tax payers.¹⁹ The reverse convertible debt proposal advocated by Flannery in effect achieves the debt for equity swap agreements under financial distress, which typically occur in many non-financial company bankruptcies under the aegis of Chapter 11. Innovative design of debt can eliminate the spectre of a costly bank or institutional failure and also secures a capital infusion from creditors before public monies are allocated to the banks. A criticism of this approach is that the bank debt will be more expensive to issue as rational investors would

¹⁷ See *The Economics of Microfinance*, by Beatriz Armendáriz and Jonathan Morduch, M.I.T. press, (2005) and *Microfinance: Emerging Trends and Challenges*, edited by Suresh Sundaresan, Edwin Elgar Publishing, (2009).

¹⁸ Dudley: *Lessons Learned from the Financial Crisis*, Remarks at the Eighth Annual BIS Conference, Basel, Switzerland.

¹⁹ The proposal came in a SSRN working paper in 2002.

demand a higher coupon to buy bank debt with mandatory conversion to equity in bad times. This increased cost is however borne by the bank in good times, and the design is simply a transfer payment from good times to bad times. In other words, the bank is relieved of the costs of financial distress and coupon obligations in bad times when the debt converts to equity. In exchange it must pay a higher coupon in good times.

Q3 – What can be done so that banks and financial institutions transfer capital from good times to bad times voluntarily? If such a voluntary transfer is not credible or is ineffective, how can policymakers help make that process happen through a public policy measure?

One way to address this question is to “lean against the wind” by requiring that the capital and liquidity requirements of banks and financial institutions should be related to the state of the economy. Banks should accumulate greater and greater capital/liquidity buffers in good times (by perhaps decreasing the proportion of profits that is paid out to managers and shareholders) and then utilising these accumulated buffers in bad times. One potential difficulty with this approach is that capital comes in many forms and they differ in their opacity/transparency. Tier 1 capital is clearly more transparent than Tier 3. Any rules that one uses to risk-weight these tiers of capital are necessarily very subjective.

Another way is to formally set up a public policy framework that recognises that banks and other financial institutions which have access to emergency lending facilities at the central bank in bad times must pay for that privilege in good times. This idea is already employed in the context of other public policy arenas. Corporations with defined-benefits (DB) plans do pay a premium to the Pension Benefits Guarantee Corporation (PBGC) in good times so that the employees of the sponsoring corporations get some measure of guarantee that their pensions will be protected by the PBGC should bad times occur and the sponsoring corporation goes bankrupt. Likewise, banks pay a premium to the FDIC for the FDIC insurance that the depositors enjoy. In these two examples there is a clear recognition that banks and corporation should pay in good times to cover the costs of any future bad times.

The welfare costs to the tax payers of facilities such as discount window, standing facilities, and the willingness of central banks to accept a broader menu of collateral and broader terms of lending must be assessed ex-ante. In formal terms, we can characterise the privilege of being able to borrow at the discount window and the standing facilities at potentially very attractive terms as an option that banks enjoy. These options are exceptionally valuable to the banks as they can be exercised precisely when their very survival is threatened. These options are currently not paid for by the banks and are implicitly (and explicitly, during this crisis) borne by the taxpayers. One public policy option is to effectively price out these options and charge the banks/depository institutions on a periodic basis. This will transfer from the banking sector in a credible way capital that can be held in custody for use in future bad times. A number of issues, including the so-called stigma associated with borrowing at the discount window, must be taken into account in evaluating such a policy option. Tirole (2006) has suggested that the government provision of these institutions has some social benefits in reducing the liquidity premium in markets, but their welfare costs in relation to the benefits captured by the banks is worthy of closer look.

Q4 – What should be the role of policymakers in dealing with asset price bubbles? What tools and legislative authority are needed for central banks to effectively deal with asset price bubbles?

Dudley (2009) has argued that a case can be made for central banks to be actively involved in managing asset price bubbles when the economy expands at an accelerated rate. Effectively Dudley (2009) makes three points:

- First, large asset price bubbles may not be that difficult to identify.
- The use of short-term interest rates as a tool to manage asset price bubbles may be, in itself, insufficient. Other items in the central bank’s toolkit should be explored.

- If no tools are currently available, new tools must be devised to address asset price bubbles.

An objection that is frequently made to this approach is that, in practice, it is difficult to identify when the peak of the asset price bubble has been reached. One mitigating factor is that the markets have developed to a point that we have price signals that are available on a higher frequency basis to make this judgment. For example, the availability of CDS spreads indicates when the credit spreads are dangerously tight.²⁰ In a similar way, ABX spreads indicated just how risky some sectors of the asset-backed securities markets were well before the onset of the credit crisis.

There is some published evidence that suggests that the Reserve Bank of India took pre-emptive actions to prevent the overheating of some sectors of the economy in India.²¹ Among the measures cited in the source included the following: banning the use of bank loans for the purchase of land and permitting only construction loans; curtailing securitisation and off-balance sheet liabilities; and increasing capital requirements on commercial real estate loans.

In designing their future developmental efforts in Asia and the Pacific, policymakers must take note of the near-failure of almost all major financial intermediation in the western financial markets during the crisis and the unparalleled intervention to salvage the banks and other financial institutions by governments, coordinated rescue efforts by central banks and other institutions such as the FDIC. In some respects, the western banking system looked quasi-nationalised during the crisis period and not unlike some of the banking systems in Asia and the Pacific.

It would be worthwhile to examine the policy flaws that in large part have led to the credit crisis so that the future developmental efforts in Asia and the Pacific can avoid those pitfalls.

- The underwriting standards that allowed banks and other financial institutions to originate subprime mortgage loans point clearly to the need for much stronger standards for loan originators in Asia and the Pacific, so that loans only go to borrowers who have the ability to meet the contractual payments associated with mortgages.
- The originate-to-distribute model and the simultaneous growth of collateralised debt obligations, with mortgages, and mortgage-related securities as the underlying collateral, have resulted in the global distribution of leveraged subprime positions. In part, the success of this distribution depended on two factors: first, the willingness of investment banks and other financial institutions to distribute securities in which they themselves had very little stake. Second, the actions by credit rating agencies to certify that such securities were of high credit quality. These actions pose several challenges to policymakers in Asia and the Pacific. First, how should one define standards on credit quality and the liquidity profile of the universe of securities that investors in Asia and the Pacific should evaluate for investment purposes? Second and more broadly how should the process of securitisation and the resulting disintermediation of loans and credit be managed in Asia and the Pacific to prevent in future the type of meltdown of the asset-backed securities markets that has occurred in the United States?

Finally, it should be said that the central banks are primarily organised/geared towards providing emergency funding to banks in times of crisis. This model was sufficient when

²⁰ CDS stands for credit default swaps.

²¹ Joe, Nocera, "How India Avoided a Crisis, *New York Times*, 20 December 2008.

banks were the sole if not the primary source of lending in the economy. Over the last several decades a significant amount of credit disintermediation has taken place. In fact, the onset of the credit crisis was heralded by the inability of off-balance sheet vehicles such as SIVs to issue asset-backed commercial paper as members of the shadow banking system such as money market mutual funds refused to roll over short-term commercial paper, effectively triggering a run on the shadow banking system. The tools at the disposal of central banks were not adequate to the task of meeting this run. This should serve as a warning signal to policymakers in Asia and the Pacific in designing appropriate institutions and facilities within the central banks that will allow the central banks to effectively deal with the shadow banking system if and when a crisis arises.

5. Conclusion

Much progress has been made in the development of financial markets in Asia and the Pacific. The current credit crisis has exposed significant flaws in the way in which financial markets are organised, regulated and capitalised. This paper summarised some of the policy implications for the future development of financial markets.

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Why issue bonds offshore?

Susan Black and Anella Munro¹

1. Introduction

Bond markets in almost all currencies are becoming more internationalised (Table 1).² Internationalisation of bond markets should increase the financing options available to borrowers and increase the range of assets available to investors. Competition from offshore markets may motivate or help to focus improvements in domestic markets such as strengthening of domestic market infrastructure, improving investor protection and removing tax distortions that hinder domestic market development. Swap-covered foreign currency borrowing can be a powerful means of raising domestic currency funding, overcoming the currency and maturity mismatches for many emerging market economies³ and a factor widely agreed to have exacerbated the Asian crisis.

Against these benefits come the risks associated with financial openness and sudden shifts in capital flows, and the risk that offshore markets may draw liquidity away from the domestic market. The former are well covered in the literature, and increasingly the risks associated with currency and maturity mismatch are well hedged in the region. However, risks to the domestic bond market are perhaps particularly relevant for Asian countries in the light of the many initiatives to develop domestic debt markets since the Asian crisis. If liquidity tends to concentrate in bond markets, development of a large offshore market in the local currency may be a concern. From the borrower's point of view local currency debt raised offshore may be as good as domestic debt. From a market point of view, there are likely to be important network externalities associated with reduced liquidity onshore, less scope for development of a lower-grade market in domestic currency, more limited availability of collateral for domestic markets and restricted access for domestic investors.

The literature on international bond markets focuses on three main aspects of the debt issuance decision: hedging/risk management, cost incentives to issue in foreign currency, and bond market characteristics that motivate offshore issuance such as size, payment structure and tenor.

The risk management literature⁴ focuses on issuance by non-financial firms and mainly applies to foreign currency borrowing which is naturally hedged against foreign currency income. The predominance of financial issuers in international bond markets, however, means that this strand of the literature, while an important motivation for some firms, covers a relatively small part of the market. A large literature on covered interest parity (CIP)

¹ Susan Black is from Reserve Bank of Australia and Anella Munro from Bank for International Settlements. We are grateful for helpful suggestions from Philip Wooldridge, for comments from participants in seminars at the Bank for International Settlements; and for research assistance from Clara Garcia. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank for International Settlements or the Reserve Bank of Australia.

² We use "internationalised" to mean issuance of local currency bonds in offshore markets, issuance in the local currency by non-residents (on or offshore) and non-resident investment in domestic bond markets. In this paper we focus more on the issuer (as opposed to investor) side of bond markets.

³ Often referred to as "original sin" (Eichengreen and Hausmann, 1999).

⁴ For example see Allayannis and Ofek (2001), Kedia and Mozumdar (2003), Geczy, Minton and Strand (1997), Graham and Harvey (2001) and Siegfried et al (2007).

suggests that deviations in cost incentives for bond issuance are actively arbitrated.⁵ McBrady and Schill (2007) link deviations from CIP and proxies for uncovered interest parity to the bond issuance decision, looking at “opportunistic” issuance by internationally active borrowers with no foreign currency funding requirements. They conclude that internationally active borrowers issue (swap-covered) foreign currency bonds to lower their funding costs and conclude that such borrowers actively arbitrage deviations from CIP and proxies for uncovered interest parity among major currencies.

Focussing on issuance costs rather than deviations from interest parity, Peristiani and Santos (2008) look at the costs of issuing bonds in the US domestic bond market and eurobond market. They find that costs in the US market have declined, but costs in the Euromarket have declined by more and are now lower. They relate the lower Euromarket costs to the growing share of offshore issues by US firms.

Other studies focus on or include bond market characteristics. This literature overlaps substantially with cost incentives: the benefits of bond issuance in overcoming differences in markets or market access, or in aligning desired funding with investors’ preferences, tend to be reflected in lower funding costs. Baker et al (2002) look at the decision to issue short or long-term debt, finding that firms tend to issue long-term debt when the relative costs are expected to be less. Faulkender (2005) analyses the decision to issue fixed or floating rate debt, and whether firms are hedging or timing the market. He finds that firms respond to market conditions in an effort to lower funding costs; firms are more likely to lock in a lower fixed rate as the yield curve flattens and vice versa. Siegfried et al (2007) study the choice of currency by non-financial companies, finding that it is motivated by cost minimisation, hedging, the desire to establish a broader investor base and regulatory barriers. Munro and Wooldridge (2009) consider motivations for obtaining domestic currency funding through swap covered foreign currency borrowing as opposed to borrowing in domestic currency directly. They find that foreign currency issuance by Asia-Pacific residents tends to be lower rated, longer term and larger in size than non-resident issuance in Asia-Pacific currencies, consistent with the notion that swap-covered foreign currency borrowing provides Asia-Pacific issuers with access to larger, more liquid, lower-grade and longer-term markets. Issuance by non-residents in the domestic currency meets investor demand for high-grade local currency assets.

This paper examines the onshore/offshore bond issuance decision by non-government residents of five Asia-Pacific countries. We consider a variety of potential motivations for offshore bond issuance, including: risk management; price arbitrage; the benefits of tapping offshore markets with different characteristics (liquidity, diversity, risk); accessing non-resident investors, regulatory and non-regulatory barriers to foreign investment in the domestic market; and funding diversification. We consider some of these motivations empirically using a large sample of unit record data for bonds issued by residents of Australia, Hong Kong, Korea, Japan and Singapore that covers issuance in both the domestic and offshore markets irrespective of issuance currency. A probit model links the decision to issue offshore to proxies for the benefits from doing so. The study supports the notions that (i) deviations from covered interest parity are actively arbitrated by residents of minor currency areas, as well as by internationally active borrowers as established in the literature; and (ii) issuers appear to benefit from access to larger, more diverse offshore markets. While price incentives are likely to be common to issuers from major and minor

⁵ See Taylor (1987) and Peel and Taylor (2002) for studies of short-term covered interest parity. Deviations from CIP in longer term markets tend to be small on average (Popper, 1983), suggesting either that bond issuers are arbitraging cost differentials or that swap spreads are adjusting. In longer term markets, deviations can be significant and persistent relative to short-term markets, even accounting for transactions costs (Fletcher and Taylor 1996).

currency areas, residents from smaller markets may tap larger offshore markets for other more structural incentives such as overcoming market incompleteness. Indeed those structural benefits are likely to drive cost incentives and draw issuers from major markets into the domestic market. Against the potential benefits of using offshore markets, we consider the risks associated with offshore issuance including concentration of liquidity away from the domestic market and exposures highlighted by the recent financial crisis. Consideration of the wider international bond market provides context for discussion of domestic debt market development in the Asia-Pacific region.

Offshore markets may complement domestic market development, helping to focus improvements in domestic infrastructure, diversifying the overall local currency market, establishing a minor currency asset class, and providing an alternative means of resolving currency and maturity mismatch. Offshore markets may, however, provide a substitute to and draw liquidity away from the domestic market. In Hong Kong and New Zealand, the offshore market in local currency bonds rivals or exceeds the domestic market. Anecdotal evidence, however, suggests that policy can have a significant effect on the onshore-offshore choice in local currency. Weak infrastructure, a poor legal or information environment, weak domestic savings or taxes may drive issuance offshore. A lack of stable savings supply or borrowing demand may lead to illiquidity in the domestic market. Looking forward, we consider the potential for concentration of liquidity in the domestic currency market on- or offshore against segmentation of the two markets serving different needs, and the scope for integrated global markets.

The remainder of the paper is organised as follows. Section 2 provides an overview of bond issuance by Asia-Pacific residents and in Asia-Pacific currencies. Section 3 considers potential motivations for issuing bonds offshore. Section 4 assesses these propositions using unit record bond issuance data for Australia, Hong Kong, Japan, Singapore and Korea. Section 5 discusses the risks of offshore bond issuance and lessons from the recent crisis. Section 6 concludes.

2. Asia-Pacific bond issuance

Outstanding bonds issued by Asia-Pacific residents are shown in Figure 1. The tendency for non-government borrowers⁶ to issue bonds offshore varies markedly across countries in Asia-Pacific (Table 1).⁷ Countries can be broadly grouped into those where a significant proportion of bonds is issued offshore (Australia, Hong Kong, New Zealand, Philippines and Singapore) and those where offshore bond issuance is a small share of overall issuance (China, Indonesia, India, Japan, Korea, Malaysia and Thailand).⁸

It is useful to think of offshore issuance by residents in the following segments: (i) local currency issuance offshore, (ii) foreign currency issued offshore which is (a) swapped into

⁶ Although government bonds account for a large share of domestic issuance in many Asian countries, our focus is on non-government entities that make a commercial decision whether to issue a bond onshore or offshore. Government issuance is likely to take into account other factors such as its role in the development of the domestic market and providing a liquid domestic benchmark.

⁷ We consider “onshore” to represent bonds issued in the local or domestic market of the country in which the issuer resides, and issued in accordance with the regulatory jurisdiction and market conventions of that country (for example, prospectus or product disclosure requirements) regardless of the currency of the bond or the residency of the investor. “Offshore” covers all bonds that were not issued onshore.

⁸ Focusing on the share of issuance can mask the size of offshore borrowings; for example, the size of the offshore Japanese and Korean bond markets are large (more than US\$100 billion) though the domestic markets are much larger.

domestic currency, (b) naturally hedged against export income and (c) uncovered (Figure 2 depicts the bond market from an issuer's perspective). There is a distinct segregation between currency and market for Asian bond issuance: onshore issuance is almost entirely in local currency, while offshore issuance is mostly in foreign currency. Foreign currency issuance is concentrated in US dollars, although euro-denominated issuance has been gaining share since 1999. The share of local currency bonds issued offshore is low across Asia-Pacific countries, with the exception of Japan.⁹

For some countries, such as Australia and New Zealand, it is common to raise foreign currency funding offshore and swap the proceeds into local currency as a substitute for issuing domestic currency bonds directly. More than 80% of foreign currency liabilities in those countries are hedged with financial derivatives (Becker et al, 2005 and Statistics New Zealand, 2008).

The ability to swap foreign currency funding into domestic currency depends on the availability of a swap counterparty. The swap counterparty is typically a non-resident issuing domestic currency debt such as the World Bank (but generally with no use for domestic currency funding). In contrast to residents, whose issuance of local currency bonds is highly concentrated onshore, non-residents tend to issue local currency offshore (for example, a non-resident issuing New Zealand dollars in the Eurobond market) as shown in Table 2 and Figure 3. This is particularly the case in more open financial systems (such as Hong Kong, Japan, Singapore and New Zealand); non-resident issuance in these currencies is substantial and mostly takes place offshore. Australia is an exception among the more open economies, with larger non-resident issuance onshore (Kangaroo bonds) than offshore. At the other extreme, for some countries, such as China and Malaysia, the local currency is not traded offshore.

Foreign currency debt that is not hedged with financial instruments is often naturally hedged against foreign currency income, for example by exporters. Where foreign currency debt is not hedged with foreign currency income or financial derivatives, but used to fund domestic currency assets implies currency mismatch. Uncovered foreign currency borrowing is a financing structure that has declined significantly after the Asian crisis and is not discussed in detail here.

3. Motivations for offshore issuance

In this section potential motivations for issuing bonds offshore are considered under the general headings of hedging/risk management, price arbitrage, market completeness; barriers to non-resident investment in the domestic market and funding diversification. There can be a large degree of overlap among these groups. For example, benefits stemming from access to more liquid or diverse markets likely drive cost incentives to fill gaps in markets. In a liquid and complete market with inter-market capital mobility, there should be no scope for price arbitrage as prices can adjust to new information without trading. In the bond markets closest to this ideal, such as the US market, price differences are estimated to be arbitrated away relatively quickly.¹⁰ Where arbitrage involves a less liquid market, arbitrage opportunities may be relatively persistent. Moreover, motivations that stem from persistent differences in market characteristics, for example absence of a low-grade debt market in one

⁹ Our focus here is the issuer side of bond markets. It is worth noting that there are substantial non-resident holdings of local currency bonds in some domestic debt markets in the region, which is an alternative means of borrowing directly from non-residents in local currency.

¹⁰ Popper (1983), Fletcher and Taylor (19960).

currency, may lead to persistent patterns of cross-border issuance, to maintain equal funding costs across markets. Offshore issuance in any one country may be driven by a combination of these factors, or others we have overlooked, for different reasons at different times.

Risk management

It is well known that firms with foreign exchange income may issue bonds denominated in a matching currency to provide a natural hedge for those cash flows. While this is a motivation to issue foreign currency bonds,¹¹ rather than to issue offshore per se, foreign currency bonds are typically issued either as foreign bonds in the market of the currency of denomination (eg Singapore dollar bonds in Singapore) or in the Eurobond market (centred in London and other European financial centres).

Issuance in a foreign currency to match foreign currency income is likely to be an important motivation for non-financial corporates, especially exporters. Issuance by corporate borrowers, however typically accounts for a small share (on the order of 10%) of total foreign currency issuance, with the bulk done by financial firms. Moreover, many residents borrowing offshore raise foreign currency funding that is swapped into local currency.¹²

Price Arbitrage

Banks often claim that they undertake opportunistic swap-covered foreign currency borrowing to lower their funding costs without taking on exchange rate risk.¹³ This type of borrowing itself should lead to a convergence of funding costs across markets consistent with CIP (local and foreign funding costs are equal once the cost of hedging exchange rate exposure is taken into account). Foreign currency issuance can affect both bond spreads and the cross-currency basis swap spread (quoted as the cost of swapping US dollars into another currency). The basis swap spread increases (decreases) in response to foreign currency issuance by residents (local currency issuance by non-residents), and in turn the decision by both residents and non-residents on where to issue is dependent on the cross-currency basis swap. Moreover, cost incentives for offshore issuance are not limited to (swap-covered) foreign currency borrowing: issuance offshore in local currency may also respond to cost differences between onshore and offshore markets.

A large empirical literature on CIP finds that deviations are small on average but can be large and persistent, particularly for longer-term markets. McBrady and Schill (2007) take the CIP literature a step further, linking choice of issuance currency for a sample of internationally active borrowers with no operational reason to borrow in foreign currency to covered interest “bargains”. They find that, covered “bargains” of between 4 to 18 basis points can be gained through opportunistic foreign currency bond issuance among major currencies. Here we explore that link in more detail including bond characteristics and macroeconomic factors as well as price incentives to issue in the chosen currency. These internationally active non-

¹¹ We use the term “foreign currency bonds” to describe bonds denominated in a currency different from that of the issuer’s residence and “local currency bonds” to describe bonds denominated in the same currency as that of the issuer’s residence.

¹² See Munro and Wooldridge (2009) for a discussion on the motivations for swap-covered foreign currency borrowing and the mechanics of this approach.

¹³ It is cheaper to raise local currency offshore than onshore when the spread to LIBOR that an issuer pays overseas plus the cross-currency basis swap premium they pay to a swap counterparty, is less than the spread to local currency LIBOR (or equivalent) that they would have paid in the onshore market.

resident borrowers are an important part of the picture, being the natural swap counterparties to resident issuance offshore in foreign currencies to obtain domestic currency funding.¹⁴

Market completeness

Issuers may borrow offshore to access more or less “complete” bond markets, where differences in liquidity, diversity or risk characteristics lead to relative cost differentials. More complete markets are more likely to develop where there is a large, relatively heterogeneous investor base with varied risk preferences and a range of derivatives to transform risk. In general, borrowers from less complete markets are likely to be able to lower funding costs by using more developed markets. Similarly, issuers from more complete markets may be able to fill gaps in less complete markets, for example by creating a low default risk asset where sovereign credit quality is relatively low. These differences between markets may enable issuers to lower their funding costs by issuing offshore in a more or less developed market and swapping the proceeds into local currency.

Underlying potential benefits from differences in market characteristics is a need to match investors’ preferences (liabilities) with borrowers’ funding needs (assets). The literature on preferred habitat¹⁵ considers the potential mismatch between investors’ liabilities and borrowers’ assets. For example, investors may prefer high-grade liquid assets while borrowers of varied credit quality may require funding for long-term projects. Premia offered to investors to buy bonds outside their desired risk classes may be ineffective in creating demand if supply and demand do not overlap at any price. Investors may ensure this by voluntarily creating barriers to investment in some asset classes, for example through mandates that restrict investments to high-grade bonds. This is often the case for managed funds in Australia, which tend to benchmark to a common, liquid, high-grade bond index. Swap-covered offshore borrowing provides a potential means of expanding the pool of savers and borrowers, increasing the scope for matching of assets and liabilities.

Some of the differences between markets that may give rise to benefits from issuance in offshore markets include:

- **Sub-investment grade bonds:** Low-grade markets are rare outside the United States and Euromarkets. In the absence of a developed domestic low-grade market, lower-grade borrowers may be able to access offshore markets while being limited to bank finance at home.¹⁶ Conversely, a high-grade non-resident counterparty may issue high-grade bonds in the domestic market to achieve lower costs for both parties. The availability of a liquid currency swap market will be important for offshore borrowing to be comparable on a risk-adjusted basis.
- **Longer tenors:** Longer-term markets tend to develop after shorter-term markets. The development of longer-term markets may be particularly slow in countries where investors avoid such investments due to a history of economic uncertainty or the sovereign benchmark yield curve is relatively short (Siegfried et al, 2007). In a relatively illiquid long-term market, issuance can be difficult or costly, particularly for lower-grade borrowers and for fixed rate bonds. Investors may also have a

¹⁴ Munro and Wooldridge (2009) explain that highly rated internationally active borrowers may be able to lower their funding costs by issuing in countries where there is a lack of AAA-rated bonds, reflecting a low sovereign ceiling or a small supply of government bonds.

¹⁵ See for example, Culbertson (1957), Modigliana and Sutch (1966), and Vayanos and Vila (2007).

¹⁶ See Hale and Santos (2008) on the progression from no access to funding to the sub-investment grade market to bank funding when the benefits of bank credit assessment overcome the intermediation cost, and ultimately to the investment grade bond market supported by a track record from bank borrowing.

preference for a particular tenor so as to match their liabilities, whereas borrowers may prefer a particular tenor to match their assets.

- Fixed rate bonds: The fixed-floating nature in a particular dimension of the domestic market may vary according to idiosyncrasies of market development. Differences in liquidity in the fixed and floating segments of two markets, or differences in the credit quality gap for fixed term funding may lead to price differentials and opportunities for arbitrage.
- Larger deal size and total volume: Issuers may also tap offshore markets with a larger investor base so as to issue larger bonds (eg jumbo bonds greater than US\$1 billion), thereby raising more funds for a given fixed cost of arranging a bond issue, or to cumulatively raise more funds than they would be able to onshore. If the domestic market is relatively small or illiquid, large volumes of issuance may lead to adverse price movements.
- “Exotic” bond structures: More complicated bond structures, such as structured bonds with step-up coupons, tend to develop in deep liquid markets before they are available in smaller markets. While more complex bonds are likely to be structured to meet investor preferences, their development may be limited by investors’ financial sophistication (particularly where the bond market is predominantly retail), by regulations constraining their use, or by a lack of a legal framework.
- Risk unbundling: From a non-resident investor’s perspective, buying bonds in another currency typically means taking on currency risk (a non-resident investor typically does not have local currency liabilities). Local currency bonds have exchange rate risk, interest rate risk and credit risk. Market participants suggests that investors generally prefer to take on credit risk separately from exchange rate risk,¹⁷ and that the markets for credit and currency risk are segmented. Risk unbundling may be particularly compelling if these risks are correlated (for example, during a crisis, domestic credit risk tends to rise while the currency depreciates). If two borrowers from different currency areas with much the same credit rating and characteristics each issue in the other’s currency and swap the proceeds, they provide local investors in both countries with new assets in terms of the combination of currency, market and credit risk.¹⁸ By unbundling risks for investors, issuers may be able to lower their funding costs. Risk unbundling provides a persistent motivation for offshore issuance, even among well developed markets.

If borrowers are seeking to issue types of bonds for which there is little demand or insufficient infrastructure onshore, then issuance is most likely to be in larger, more complete markets, consistent with concentration of offshore issuance in US dollars, followed by euros. As the local bond market develops over time the motivations for Asia-Pacific residents to issue offshore may ease. Some motivations for issuing in offshore markets, however, such as risk unbundling may persist even among developed markets. The volume of cross border issuance between the US and Euro area markets suggests that some motivations are highly persistent. Volumes have certainly not diminished.

¹⁷ See also, Herrera Pol (2004) who argues that strong demand for the World Bank’s (highly rated) issues of international bonds in minor currencies is explained in part by investors’ preference for taking on minor currency risk separately from credit risk.

¹⁸ Structured bond issues such as credit-wrapped bonds potentially provide an alternative means of transforming credit risk. These have been increasingly used in recent in more developed markets, but issuance has diminished sharply in the wake to the financial crisis in view of problems associated with complexity and the downgrades of the monolines that provided credit insurance.

The availability of hedging instruments and liquidity in derivatives markets, particularly foreign exchange derivatives, is an important factor in the ability of issuers to arbitrage price differentials, and in turn affects the onshore-offshore issuance decision and the internationalisation of bond markets more generally. For countries that do not have liquid FX derivatives markets, issuers may be unwilling to raise foreign currency offshore because of currency mismatch. If hedging instruments are unavailable, then foreign investors are likely to be deterred from participating in the domestic market also, as they are unable to hedge their risks (Takeuchi, 2006).

In principle, investors could hedge the risks in issuers' desired funding, rather than issuers transforming the risk characteristics of their funding by issuing in offshore markets or foreign currencies. Investors could transform currency and credit risks using foreign exchange and credit derivatives (eg currency forwards and credit insurance) which in turn requires the availability of a liquid derivatives markets. It is probably more cost efficient for the issuer to swap its foreign currency borrowings back to its local currency than for a number of individual investors to hedge for a few reasons. Most issuers are banks and are regular participants in wholesale derivatives markets. Typically, issuers are dealing in larger amounts than investors, who have a small investment in each bond issue. Mandates – imposed by investors or regulations – may also restrict the use of derivatives.

Domestic savings also appear to play an important role in the development and liquidity of the onshore market. Tyler (2005) and Cameron et al (2007) argue that weak domestic savings and the related slow growth in the funds management industry have contributed to slow growth in the New Zealand domestic corporate bond market, with most residents issuing offshore instead. In contrast, Battellino and Chambers (2005) argue that the introduction of a compulsory retirement savings system in Australia in the early 1990s significantly boosted the domestic pool of investment funds, contributing to the development of the onshore bond market.

Finally, capital and exchange controls can have a major effect on offshore borrowing. Many of the potential benefits to offshore issuance discussed above depend on the ability to swap foreign currency funding into domestic currency. For that to occur, residents must be allowed to issue foreign currency debt, non-residents must be allowed to issue domestic currency debt, and both must have access to foreign exchange derivatives markets. Even if these are allowed, but other restrictions limit liquidity in FX derivative markets, price incentives may quickly disappear as swap costs move against issuers in the absence of prearranged counterparties.

Barriers to non-resident investment onshore

Offshore issuance appears to be an important means of tapping foreign savings.¹⁹ Much of the previous discussion focused on benefits to issuers from issuing in a foreign market, which in turn may reflect access to a broader investor pool.²⁰ This section focuses on barriers to non-resident investment in the domestic market. Such impediments may include

¹⁹ The potential benefits of offshore issuance are also not restricted to countries with current account deficits. A country with no debt may have large gross assets and liabilities, whereby investors diversify by holding foreign assets and residents borrow from non-residents.

²⁰ Data from the Australian Bureau of Statistics indicate that foreign investors own around 20% of bonds issued by Australian non-government residents in the domestic market, and own almost all of bonds issued offshore by Australian residents.

regulatory barriers; information asymmetries; weak domestic infrastructure, information environment or legal environment.²¹

Regulatory barriers can affect foreign investors' ability to transact in the domestic (and offshore) market through capital and exchange controls. Non-residents have increasingly been allowed to participate as investors in regional markets as Asian countries have encouraged the development of domestic debt markets as a means of addressing the currency and maturity mismatches that were implicated in the 1997–98 Asian crisis.

Where non-resident investors are allowed to invest in the domestic market, in practice non-resident withholding tax has been a common disincentive to doing so. For example, Cameron et al (2007) argue that New Zealand banks and other issuers use offshore branches to issue bonds to avoid the "approved issuer levy".²² Similarly, in Korea, non-residents are exempt from withholding tax for Korean bonds denominated in foreign currency but not domestic currency.²³

Many aspects of domestic market infrastructure are important for attracting non-resident investment into the domestic market, including documentation requirements, the legal environment (bankruptcy proceedings), the information environment (opaque corporate governance or weak disclosure requirements)²⁴, accounting standards, settlement systems and distribution and marketing channels. Non-resident investors are also likely to be deterred if clearing and settlement systems are not internationally compatible (Park and Rhee, 2006).²⁵ Poor infrastructure, in turn, is likely to lead to illiquidity, particularly in lower-grade debt for which agency problems are more severe and the probability of default is higher. In response, investors may choose to buy bonds in more liquid offshore markets. Borrowers from a poor information environment may be able to signal that they are committing to higher standards by issuing offshore, which may lower their cost of funding and gain them access to foreign investors.²⁶ Following the Asian crisis, there has been a focus in many Asian countries on strengthening market infrastructure including streamlining documentation requirements, improving the legal and information environment, reducing settlement risk and integrating domestic and international settlement systems. Many of these initiatives are discussed in detail in BIS (2006).

Agency and information problems are likely to lead to home bias in portfolio holdings, particularly for lower-grade debt. Some countries have weak disclosure requirements, poor accounting practices, opaque corporate governance rules and concentrated ownership structures. Low-grade issuers may be able to lower their cost of funding by issuing in

²¹ Ideally, foreign investors would participate directly in the domestic market as well as buying bonds offshore; they can help to broaden the investor base, which in turn may broaden the diversity of bonds issued onshore, and improve liquidity (Takeuchi, 2006).

²² A 2% charge on the value of the security levied on debt that is exempt from the non-resident withholding tax.

²³ Asian Bonds Online <http://asianbondsonline.adb.org/korea.php>.

²⁴ Local investors tend to be better informed than foreign investors, which can contribute to a home bias. Bae, Stulz and Tan (2008) found that the earnings forecasts of local investors are more accurate than those of foreign investors.

²⁵ Battellino and Chambers (2005) detail the investment of market participants in improved market infrastructure, such as clearing and settlement systems, and in-house trading systems in the 1990s as an important factor in the development of the domestic bond market in Australia.

²⁶ Banks also play an important role in overcoming agency and information problems. For example, Hale and Santos (2008) find that firms with a record of high creditworthiness and low creditworthiness enter the public bond market (investment grade market and high yield market respectively) before firms with an intermediate reputation. Moreover a firm's relationship with investment banks in connection with private bond issues and syndicated loans may speed entry into the public bond market by allowing the firm to signal higher credit quality.

markets with greater creditor protection due to lower bankruptcy enforcement costs, especially for more complicated credit structures. Even if reporting standards are high in the domestic market, investors are more familiar with their home country issue requirements, such as the prospectus and settlement arrangements, and may have a preference for bonds issued in accordance with these. As a result, investors may hold a larger share of local assets in their portfolios than would be optimal in a well diversified portfolio. Stulz (1981) constructs a simple model of international asset pricing in which there is a cost associated with holding risky foreign assets and shows that investors will not hold some foreign assets, even if the return is increased slightly.²⁷ Moreover, local investors tend to be better informed than foreign (distant) investors. For example, for a sample of 32 countries, Bae, Stulz and Tan (2008) find that local analysts' earnings forecasts are more precise than those of analysts based in countries far from the company being analysed.

Government regulations can also create incentives to issue onshore or offshore by altering the costs of funding in different markets. For example, during the global financial crisis, many governments have introduced guarantees of bonds issued by banks, though the currencies covered differ across guarantee schemes. The currency coverage of the guarantee is likely to affect the onshore/offshore decision and in turn which offshore markets banks choose to issue into.²⁸ Central banks may also affect financing incentives through the collateral they accept in their lending operations, which is often restricted to high-grade bonds in domestic currency (which tend to be issued onshore). Bonds that are repo-eligible often trade at a premium, particularly during credit crises when liquidity is scarce which could draw issuance onshore (though other factors would also be at play during a crisis).²⁹ The actions of other central banks can also affect onshore/offshore decisions if bonds issued by non-residents are repo-eligible in some countries and not in other countries.

Funding diversification

Issuers may also issue offshore for funding diversification. Financial institutions in particular, may value from a diversified funding base and use a variety of funding sources and instruments (for example, bank bills, bonds, deposits and securitisation) as well as diversifying across markets. The desirability of maintaining a presence in a market may be part of an issuer's risk management strategy. If one market was closed, the issuer could still access the other markets.

If entities issue bonds in offshore markets to diversify their funding sources, then one would expect diversification among the currencies raised, but there is a bias toward more liquid markets with issuance concentrated in US dollar and euro markets. In practice, issuers may not have allowed for a scenario like the recent global financial crisis where the most liquid bond market – the US market – was at the centre of the disruption. Pre-crisis, few could have

²⁷ See also Stulz (2005) which discusses agency problems in the context of foreign investment and Alfaro et al (2005) which examines explanations for the Lucas paradox (the lack of capital flows from rich to poor countries) and finds institutional quality to be the most important.

²⁸ While for some countries (such as Germany, the US, Sweden and Australia), the guarantee applies to all currencies, for others the range of currencies is wide though restricted to the major currencies (for example, the New Zealand guarantee covers NZD, AUD, USD, EUR, GBP, CHF, JPY, HKD, and SGD, the UK covers EUR, USD, JPY, AUD, CAD, CHF) and for others it is limited to a few currencies or just the local currency (for example, Portugal is restricted to EUR, and the Netherlands covers EUR, USD, GBP). While most schemes cover the local currency, there are some exceptions, such as Korea which covers foreign currency bonds only.

²⁹ During the global financial crisis, many central banks have widened the range of collateral that is repo-eligible. Arguably this reduction in distortions across issuers is of greater significance than the introduction of onshore/offshore distortions for individual issuers that are now repo-eligible.

imagined illiquidity in the US market. Going forward, funding diversification may be a particularly compelling motivation.

3. Data and methodology

Our empirical analysis links the choice to issue bonds offshore to potential benefits from doing so. Using a discrete choice (probit) model and unit record data for all bonds issued by non-government residents (including public banks and public non-financial corporations) of Australia, Hong Kong, Korea, Japan and Singapore, we find that the propensity to issue a bond offshore is related to price incentives, bond characteristics, bond market characteristics and macroeconomic variables.

The data for Australia are sourced from the Reserve Bank of Australia which draws on several commercial data providers, namely Bloomberg, Insto and Thomson Reuters, as well as market liaison. The data for Hong Kong, Korea and Singapore are sourced from Thomson Reuters. For Japan, the onshore bond data are sourced from Thomson Reuters, and the offshore data are obtained from the international securities database compiled by the BIS (which combines information from a number of commercial data providers, including Dealogic, Euroclear and Thomson Reuters).³⁰

Characteristics recorded for each bond include: market of issue (onshore or offshore), date of issue, original term to maturity, deal size, currency, residency/nationality of issuer, industry sector, interest rate structure (fixed or floating), credit rating at issuance (not available for all bonds), sub-investment grade/investment grade. In addition, the data set for Australia also covers whether the bond is: credit-wrapped, structured, government guaranteed, repo eligible, whether non-resident withholding tax was applicable; and the bond spread at issuance.

Data are from 1992 to early 2009 for all countries. The sample sizes are large, though the number of observations varies substantially across countries from about 20,000 bonds issued by residents of Japan and Korea to about 7,000 for Australian residents, about 4,000 for Singapore and about 1,200 for Hong Kong. Not all bond characteristics and other variables are available for all bonds.

The empirical model is a probit model given by equations (1) and (2) which we apply to the unit record bond data:

$$y_{j,t} = \begin{cases} 1, & \text{if } y_{j,t}^* > 0 \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

$$y_{j,t}^* = \alpha \omega_{j,t} + \varepsilon_{j,t} \quad (2)$$

The variable $y_{j,t}$ is a dummy variable that takes the value of one if the bond was issued offshore, and zero if the bond was issued onshore. According to equation (1), whether the bond is issued offshore is assumed to be the result of an unobserved latent variable $y_{j,t}^*$, which depends linearly on a vector $\omega_{j,t}$, that includes bond or market characteristics, pricing information, the current account and a time trend.

The specification for the probit model includes the following variables:

³⁰ The offshore data for Hong Kong, Korea and Singapore are similar in aggregate to BIS data. The offshore data for Japan are BIS data which appear to be more complete than Thomson Reuters data in recent years.

- Size (log dollar value of the bond). We expect that larger bonds will be issued in larger /more liquid offshore markets.
- Tenor (log value). A potential motivation for issuing bonds offshore is to access longer term markets. We expect the coefficient to be positive for issuers tapping larger overseas markets. This is likely to be particularly true for lower-grade borrowers.
- Bond rating at issuance: Liquid low-grade markets are rare, so lower-rated borrowers may issue offshore to tap these markets. We use two measures for credit quality: (i) granular credit ratings (AAA=1, AA+=2, AA=3 etc), although availability of these data is patchy at best except for Australia where it is relatively complete (ii) sub-investment grade dummy, for which the coverage is good for all countries.
- Fixed interest rate structure. We do not have strong priors on the sign of this variable. The fixed-floating preferences of domestic investors and borrowers may vary across countries depending on the respective liability/asset structure. Higher-grade issuers are expected to have a comparative advantage in issuing fixed rate bonds. Also, this may not reflect the bond issuers' ultimate interest rate structure, as they may swap from floating to fixed and vice versa.
- Market size. The various aspects of market incompleteness discussed above are likely summarised by this variable. We expect the coefficient to be positive for the countries examined: a variety of characteristics of the US dollar and Euro markets provide incentives for offshore issuance. An important factor may be the networking externalities of larger markets. Market size is constructed as log of the size of the market in the currency of issuance normalised on the size of the US dollar market. So a US dollar bond has a value of $\log(100)$, a euro bond would have a value of about $\log(60)$, a yen bond about $\log(30)$, Australian dollar and Korean won bonds about $\log(2.5)$, Hong Kong and Singapore dollar bonds less than $\log(1)$ and New Zealand dollar bonds less than $\log(0.1)$. The values vary with relative market size over time. Source: BIS domestic debt data.
- Covered "bargain".³¹ Conceptually, the offshore bargain is the difference between what it would have cost to raise local currency funds onshore and the cost of raising local currency funding synthetically or directly offshore.³² We expect offshore issuance to be positively related to the covered bargain. We calculate the price incentive in two ways. Firstly, we use secondary market five-year bond yield indices for an AA-rated borrower, interest rate swap data and basis swap data (all from Bloomberg). For example the covered bargain on a US dollar bond issued by a Korean bank would be the spread of the five-year KRW yield over the domestic interest rate swap minus the spread of the five-year AA US dollar index over the US dollar interest rate swap adjusted for the won cross-currency basis swap. By construction, the incentive is zero for local currency issuance regardless of whether it is onshore or offshore (so we are not able to test the price incentive for local currency funding onshore versus offshore).
- Secondly, we use a more accurate transaction-based measure for a sub-sample of all senior one to five-year bonds issued by the major Australian banks since 2000. This measure is constructed from primary market spreads onshore and offshore

³¹ We borrow this terminology from McBrady and Schill (2007).

³² What it would have cost to issue onshore instead of offshore is not directly observable unless a borrower issued bonds with equivalent characteristics in both markets at the same time. Nonetheless, if the domestic secondary market is sufficiently liquid it should provide a good proxy for the opportunity cost.

(adjusted by the relevant swaps) for the bonds at issuance and secondary market onshore spreads for the same sample of banks (historically, the secondary market has provided a very good indication of the banks' issuance spread in the primary market in Australia). This methodology is not only more accurate, but allows us to compare the cost of raising (i) A\$ directly onshore (ii) A\$ synthetically offshore and (iii) A\$ directly offshore. Restricting the sample to the Australian banks also has the benefit of removing bond issues that may not be hedged through derivatives; the Australian banks swap back their foreign currency raisings to A\$ at the time of issuance. This measure of the price incentive lines up relatively well with our alternative proxy discussed above.

- One-year interest rate differential (issuing currency minus home currency) at the time of bond issuance. We include this as a proxy for uncovered interest parity (with a random walk exchange rate expectation, the interest differential is the expected uncovered interest return). While the covered bargain may be more relevant for borrowers, the expected uncovered return may be relatively more important for investors, as we have seen with the carry trade in recent years. The interest differential also has a wider economic interpretation as the return to capital. We expect residents of borrowing countries issuing foreign currency bonds (almost always offshore) to issue bonds in lower yielding currencies of net savings countries as a means of accessing investors in countries where the return to capital is relatively low. Source: Bloomberg.
- Current account balance as a per cent of GDP at the time of bond issuance. We introduced this variable as a proxy for domestic funding pressures. If there are barriers to foreign investment in the domestic market (e.g. information asymmetries, market risk, withholding tax) or investors have a preference for currency and credit risk to be unbundled, then borrowers may be more likely to issue offshore to access non-resident investors when the economy as a whole is borrowing from non-residents. We expect offshore issuance to increase when domestic savings cannot cover investment. For residents of external surplus countries (Hong Kong, Japan, Singapore), offshore issuance by domestic intermediaries may increase as a means of matching domestic investors' preferences with foreign assets, for example to provide foreign currency assets in a known name, while providing counterparty funding for non-resident borrowers who issue in the local currency. Source: Australian Bureau of Statistics and BIS data.
- Time trend. We include a time trend to account for the internationalisation of bond markets generally. This is perhaps particularly relevant for Singapore, where exchange controls were eliminated in 1999 and all onshore and offshore segments of the Singapore dollar bond market have grown rapidly since. In general, we expect offshore issuance to increase over time.
- Global financial crisis dummy. This is set equal to one from July 2007. It is intended to capture any effect the crisis may have had on the propensity to issue bonds offshore.

For Australia we also looked at:

- Australia managed funds/GDP as a measure of domestic savings which we expect would draw issuance onshore. The time series variable is matched to the issuance date of the bond. Source: Australia Bureau of Statistics.

An important characteristic of probit models is that they are highly non-linear; the estimated probabilities and marginal effects of any independent variable are conditional on the values of all covariates. This means that if the value of one of the independent variables changes, the marginal effect of all of them will also change. Accordingly, our discussion focuses on the

sign of the coefficient; a positive (negative) sign indicates that as the variable increases (decreases) so does the probability of offshore issuance.

4. Empirical results: factors motivating offshore issuance

In this section we begin by examining the role of individual factors on the onshore-offshore issuance decision, and then estimate multivariate probit models to allow for interaction among these factors. Finally, we examine subsamples of the bond data to inform on different motivations among sectors. Where relevant, we comment on the impact of the global financial crisis.

The distributions of the bond characteristics listed in the previous section for onshore and offshore bonds are shown graphically in Figure 4.³³ Univariate probit estimates are presented in Table 3 to illustrate the potential explanatory power of each of these factors on its own on the onshore-offshore decision. Overall, these bond characteristics have modest explanatory power. Characteristics with relatively stronger explanatory power are issuance of larger bonds offshore by Hong Kong, Korean and Singapore residents, issuance of smaller bonds offshore by residents of Japan, and issuance of lower-rated bonds offshore by residents of Singapore. Notably, residents of Australia, Korea and Singapore have only issued sub-investment grade bonds offshore. Offshore issuance by Korean residents is more likely to have a floating rate coupon than onshore issuance.

Multivariate estimates presented in Tables 4 and 5 give an idea of the relevance of the factors conditioned on other bond market characteristics, price incentives and macroeconomic conditions.

Table 4 includes individual bond characteristics as well as price incentives and macroeconomic conditions. The coefficients on bond size and tenor are positive, indicating that offshore bonds tend to be larger in size and longer in maturity. This is consistent with the notion that Asia-Pacific residents borrow offshore to access more complete, liquid markets. The exception is Japanese residents who issue smaller bonds offshore (consistent with Japan being a relatively large market), though the onshore/offshore distributions are very similar with most bonds being less than US\$0.5 billion (Figure 4). For other countries, the issuance of jumbo bonds (greater than US\$1 billion) is relatively common; these tend to be issued offshore.

The results for credit quality are a bit more nuanced. The only countries for which we have a substantial sample of bonds with granular ratings are Australia, Hong Kong and Japan. For those countries, credit quality, as measured by the credit rating, suggests that higher-rated residents are more likely to issue bonds offshore. However, the results for the sub-investment grade dummy suggest that residents are more likely to issue lower-rated bonds offshore. As seen in Figure 4, sub-investment grade bonds are almost exclusively issued offshore.

These seemingly conflicting results are consistent with the story Hale and Santos (2007) tell about the relationship between bond markets and bank borrowing, which would imply a nonlinear pattern. The lowest-rated entities don't borrow at all. As potential borrowers progress to a somewhat higher credit quality, they issue bonds in the sub-investment grade

³³ The graphs show the distribution of bonds by value rather than by number, which, arguably, investors care more about. The probit model tests the distributions by number. However, the distributions by value and number are very similar for all characteristics with the exception of the tenor of bonds issued by Japanese residents; by number, issuers go offshore for longer tenors, but by value the result is the opposite (consistent with Japan being a relatively large market).

market. At a higher credit quality the intermediation cost of bank borrowing becomes worthwhile due the lower borrowing cost from a higher revealed credit quality. Finally, as a potential borrower can signal high credit quality without bank intermediation, but helped by its track record with the bank, the intermediation cost of a bank is no longer offset by a lower borrowing cost. Setting the Hale and Santos model in an international context it would be expected that lower-grade borrowers would borrow offshore in the absence of a domestic low-grade market and higher-grade borrowers might take advantage of relatively liquid and diverse offshore markets.

These results support the idea that residents issue offshore to tap more liquid low-grade markets and more liquid or diverse high-grade markets. They may also reflect the potential benefits from unbundling of risk implicit in swap-covered borrowing. Lower-rated bonds issued offshore (in foreign currency) and swapped for higher-rated bonds issued in local currency by non-residents (see Munro and Wooldridge 2009) provide potential investors with bonds with different risk characteristics compared to each party borrowing in the desired currency. In particular, foreign investors are able to purchase minor currency risk separated to a large degree from credit risk.

The effect of coupon structure on the propensity to issue offshore is mixed. Residents of Japan, Korea and Singapore are more likely to issue floating rate bonds offshore while Australian and Hong Kong residents are more likely to issue fixed interest rate bonds offshore. The coupon structure may not reflect the ultimate interest rate exposure of resident borrowers for two reasons. First, borrowers may subsequently swap the funds for their desired coupon structure but borrow fixed or floating rate debt in response to cost structures determined by their own characteristics (eg credit quality) and investors' preferences. For example, higher-rated institutions (such as the Australian banks, who are the main offshore borrowers from Australia) may have a comparative advantage in issuing fixed rate bonds. Australian banks have floating rate mortgage assets, so tend to swap their fixed rate borrowing to floating. Second, the coupon structure may reflect the desired interest rate exposure of swap counterparties rather than the bond issuer if the (foreign currency) proceeds are swapped for local currency funding. Of note, Figure 4 shows that while Australian residents are more likely to issue fixed rate bonds offshore than onshore, overall they have a greater tendency to issue floating rate bonds (63% of offshore bonds and 75% of onshore bonds are floating). Bonds issued by residents of Korea and Japan show the opposite tendency, with around 65% of offshore bonds and over 90% of onshore bonds being fixed (where data are available). Borrowers may also issue fixed or floating rate debt in an attempt to lower their funding costs, depending on their expectations of future economic conditions, rather than hedging their asset exposure (Faulkender, 2005).

Table 5 includes market size in place of bond characteristics as a proxy for characteristics of the issuing market and other factors not captured such as liquidity and infrastructure. The notion that issuers tap offshore markets to take advantage of larger, more liquid and more diverse markets, is reinforced by the positive coefficient on market size. Offshore bonds tend to be in the currencies of a larger market. Market size serves as a proxy for a range of bond market characteristics including liquidity, diversification of products and investors and is typically correlated with the bond characteristics listed above. As can be seen in Table 3, market size has a larger explanatory power than the individual bond characteristics in the univariate probits. This result holds up in the multivariate estimates for some countries where it is included as an alternative to the individual characteristics (Table 5).

Because not all data are available for all bonds, the multivariate results are typically based on smaller samples. In the multivariate probit regressions (Table 4) the relationship between offshore issuance and size and tenor is not as strong. Accounting for other factors, Australian issuers are estimated to issue onshore for longer tenors and larger bonds (not a highly significant result) while Hong Kong and Japanese investors are estimated to issue offshore for longer tenors. These results are discussed in more sectoral detail later.

The pricing incentive to issue offshore is measured as the covered interest “bargain” (the deviation from covered interest parity) and the interest rate differential which we use as a proxy for the expected uncovered interest return. While we assume borrowers hedge their foreign currency borrowing, investors may be more likely to take uncovered positions (eg the carry trade).

The literature on covered interest parity shows that, for shorter maturities, deviations from parity tend to be small and short-lived (the 2008–09 experience notwithstanding). In longer-term markets, deviations tend to be larger and more persistent, and so may provide an important incentive in terms of currency of issuance. A bargain in a particular currency may lead residents to issue in that currency and swap the proceeds back into the desired currency. As shown in the univariate results in Table 3, the coefficient on the covered interest bargain (denoted CIP) has a positive sign except in the case of Japan, where the explanatory power (pseudo R²) is very small. In contrast, for Australian and Korean borrowers, the bargain has strong explanatory power. In the multivariate probit estimates (Table 5), the covered bargain is estimated to be positive as expected (significant for Australia and Hong Kong, near-significant for Korea and not significant for Japan) except in the case of Singapore, where it is not significant.

Measurement error is a concern with the CIP variable for a number of reasons. First, we are using yield indices rather than transaction costs and those indices may be subject to interpolation where there are relatively few securities for pricing.³⁴ Second, we assume our representative borrower to be an AA-rated bank. While this is a reasonable proxy for the major banks in the countries examined, the measure may be inappropriate for the lower-grade borrowers in our sample and for countries subject to changing ratings through the period. Nevertheless, we think that a deviation from covered interest parity at one horizon and credit quality is likely to be correlated with other horizons and credit ratings for the same currency. We expect that our covered cost estimates are least accurate for Hong Kong, as they are based on a sovereign index, and for Japan in view of the changes in ratings of Japanese borrowers over the period, which we do not account for. Third, not all foreign currency borrowings are swapped back to local currency, some of it is naturally hedged or it may be not hedged at all. However, this should bias our sample against finding issuance behaviour consistent with swap covered arbitrage.

As a cross-check on our pricing results we use more accurate issuance spreads available for a sub-sample of Australian major banks. Here the pricing data is based on actual issuance costs relative to the domestic secondary market. These results, shown in Table 6, are consistent with the broader Australian results, indicating that the banks borrow offshore when it is cheaper to do so. Using actual issuance costs, we are also able to test whether the banks issue Australian dollar offshore versus onshore for cost reasons. While the estimated coefficient is the expected positive sign, it is not highly significant for this small sample (Figure 5). Studies by the Reserve Bank of Australia (2006) have found that, on average, costs (after hedging) have been equivalent onshore and offshore over time for the major Australian banks. Short-term cost differentials arise at times, which leads to issuance in a particular market, though the banks’ issuance itself then contributes to driving costs back towards parity (Figure 6).

The significance of the covered bargain is important relative to the outstanding literature that examines bond issuance in response to deviations from parity. The only paper we know of that does this is McBrady and Schill (2007) which looks at internationally active opportunistic

³⁴ Moreover, although we have matched the rating of our onshore and offshore indices, there are different banks in the various countries’ indices so the margin could reflect factors other than price arbitrage such as credit risk or liquidity premia. We are also unable to distinguish between costs of local currency borrowing onshore and offshore.

borrowers' currency choice among major currencies using sovereign yields which may include a substantial measurement error. Based on that evidence, they conclude that those international borrowers are active arbitrageurs among major currencies. Here, with the exception of Japan, we examine borrowers from smaller currency areas, and the results suggest that they are also active arbitrageurs in the market. In fact, the benefits for issuers from minor currency areas of accessing larger markets may be an important driving force in price incentives for non-resident investors to issue in the minor currency, and potentially more so if local bond markets are relatively small or less diverse than those in major currency areas.

The interest differential serves as both a proxy for expected uncovered interest returns and the return on capital in different countries. In practice, the higher returns on capital in one currency provide a rationale for the carry trade whereby capital flows from low return on capital areas to higher return on capital areas (higher yield currencies).

The estimated coefficients for the interest differential in Table 3 are positive for Hong Kong, Japan and Singapore and negative for Australia and Korea. These results hold for the multivariate estimates where significant. As we expect capital to flow from countries with a low return on capital to those with a high return on capital we might expect this variable to be negative for high yield countries which tend to have external liabilities, and positive for lower interest rate countries that tend to have external asset positions. By issuing in lower yield currencies, borrowing countries may gain better access to savers in high-saving countries. Conversely, banks in high savings countries may issue bonds in high yield currencies as a means of providing a more diversified class of assets for domestic savers (such as high yield foreign currency bonds issued by a known name) while lending the proceeds to borrowers in a high yield country. While the returns to capital should, in theory, be arbitrated away as capital flows to areas with a higher return on capital, in practice the process may take decades. For example, a low-capital economy that wishes to double its capital stock could, in theory, borrow 100% of GDP in year one (run a current account deficit of 100% of GDP) and repay the funds over time. In practice, current account deficits of more than 10% of GDP are rare. Instead, a low-capital economy may run a persistent current account deficit over decades to achieve the same outcome and convergence on capital returns. In that context, the result that net borrowing countries issue bonds in currencies with a low return on capital and vice versa appears to make sense.

The results for the current account balance tell a similar story. As shown in Table 3, the coefficient on the current account balance is negative for Australia (suggesting that a larger current account deficit increases the probability of issuing offshore), not significant for Korea and positive for Hong Kong, Japan and Singapore. For Australia, a net borrowing country, a current account deficit implies that the country as a whole is borrowing from non-residents. This could be achieved by selling domestic bonds to non-resident investors. If, however, there are barriers to non-resident investment onshore (eg information asymmetries, home bias in investor preferences, correlated risks), then residents may issue bonds offshore as a means of accessing foreign investors. In that case we would expect to see a negative coefficient: a current account deficit increases the probability that the bond is issued offshore. For a country with an external surplus, a resident bank may be flush with domestic savings, but needs to find profitable investment opportunities. Banks from surplus countries may overcome aspects of market incompleteness or repackage risks for domestic savers by issuing bonds in borrowers' currencies and swapping the proceeds, or lending the foreign currency proceeds to foreign residents. In that case a larger current account surplus might be expected to be associated with a higher probability that bonds are issued offshore. We could have used the absolute value of the current account balance as a measure of borrowing and lending with non-residents but, as the countries in our sample have tended to run persistent deficits (Australia and Korea) or surpluses (Japan, Singapore and Hong Kong), the results would be qualitatively the same. In the multivariate regressions (Table 5), the same results

hold qualitatively, but are less significant once other factors (such as the interest differential) are taken into account.

The time trend serves as a proxy for factors not captured in our analysis that trend over time, particularly those that contribute to the increasing internationalisation of debt markets. The estimated univariate coefficients are positive for all countries except Singapore where the trend is not significant. The removal of capital controls and other barriers to internationalisation of debt markets and the development of derivatives markets that enable residents to take advantage of larger markets may be captured here. In the multivariate equations, the results are very mixed. Evidence of a trend toward greater offshore issuance over time, is not robust once other variables expected to affect the issuance decision are accounted for. While, offshore (and non-resident) issuance in Asia-Pacific currencies grew rapidly in the years leading up to the international financial crisis, domestic debt markets are also growing rapidly (Figures 2-3). We discuss the potential shift offshore in more detail in the policy section discussion later in the paper.

For Australia, we also included variables for repo eligibility, availability of a government guarantee, presence of non-resident withholding tax and the size of managed funds/GDP as a proxy for domestic savings. Repo eligibility was expected to draw banks' bond issuance onshore, whereas the government guarantee could work either way as it was available for both onshore and offshore issuance. Non-resident withholding tax, which was applicable for onshore bonds sold to non-residents for part of the sample was expected to drive bond issuance offshore while a larger pool of domestic savings was expected to draw bond issuance onshore. Although the dummy variable for repo eligibility was estimated to have had a significant effect in drawing bank issuance onshore (Table 7), acceptable collateral was widened during the global financial crisis, and so may equally reflect the crisis, ie difficulty in raising funding offshore during that period. When we include both repo eligibility and the crisis dummy, only the crisis dummy is found to be significant. The availability of a government guarantee also coincided with a mild shift toward onshore issuance, but like repo eligibility, was not estimated to be significant in the presence of a crisis dummy. Anecdotally, these factors can have a strong influence on the offshore/onshore issuance decision. For example, Australian banks were the first to issue government-guaranteed bonds in Japan during the global financial crisis, as they were one of the few countries whose guarantee extended to Japanese yen bonds. Overall, the onshore shift during the crisis was modest with banks expanding issuance both on- and offshore.

The effect of the non-resident withholding tax and supply of domestic savings should apply more broadly than banks. The non-resident withholding tax is estimated to not be significant. Anecdotally, the removal has a significant effect on non-resident issuance (growth of the Kangaroo bond market) which is outside our sample of issuance by residents. The ratio of managed funds/GDP as a proxy for domestic savings is estimated to be negative and significant, suggesting that as the supply of domestic savings increases, bond issuance is drawn onshore.

The global financial crisis dummy was included to pick up factors that may have affected the onshore/offshore motivations and the fact that markets were not functioning normally during this time. As shown in Table 8, it is significant and negative only for Hong Kong. For Australia and Singapore it is negative and significant for the financial subsample suggesting some tendency to issue onshore during the crisis, possibly reflecting stress in offshore USD markets in particular and home bias among investors amid uncertainty. Overall, the crisis period is marked more by a general fall in issuance rather than a major shift in its location. For example, during the credit crisis Australian securitised bonds have only been issued onshore. While this partly reflects government purchases of residential mortgage-backed securities (RMBS) onshore from late 2008, it is mostly due to the disruptions in the US securitisation market, which was at the centre of the crisis; structured investment vehicles (SIVs) were used to purchase around a third of Australian RMBS before the crisis. Nonetheless, offshore issuance by the major Australian banks' offshore issuance has been

stronger during the crisis than beforehand, supported by government guarantees that apply to offshore as well as onshore bonds.

Sectoral results

Tables 9 and 10 present results for financial and non-financial issuers and Table 11 presents more detailed sectoral results for Australia. Both financial and nonfinancial issuers are more likely to issue larger, lower-rated bonds offshore, with the exception of Australian financial institutions which issue both smaller and shorter tenors offshore and Japanese financial institutions which issue smaller bonds offshore. Looking at sectoral estimates for Australia (Table 11), the smaller offshore issuance size and shorter tenor appears to be related to bank issuance, particularly minor banks. The smaller banks' offshore issuance is skewed toward shorter maturities than their onshore issuance. One factor that might explain this is particular bond structures whereby many small tranches are issued under one set of documentation such as medium-term note programmes. In the unit record data these show up as several smaller bonds. Also, in recent years, some of the major Australian banks have also been issuing more exotic bonds offshore (such as step-up coupon bonds). These types of bonds tend to be relatively small and have only been issued offshore.

As shown in Figure 4, sub-investment grade bonds are almost exclusively issued offshore. The relationship between offshore issuance and credit quality may also involve other factors and vary by sector. For Australia, financial institutions are more likely to issue higher-rated bonds offshore while non-financial corporates, which issue most of the lower rated Australian bonds, are more likely to borrow offshore. Moreover, Australian corporates rated about BBB have tended to issue "credit-wrapped" bonds onshore – bonds that are guaranteed by monoline insurers to achieve an AAA rating (though many of these have been downgraded during the global financial crisis). This reflects strong demand by domestic investors for highly rated bonds due to investment mandates of managed funds. Lower-rated Australian corporates have not used credit enhancement when issuing offshore (so we are not able to control for credit-wrapping in the probit regression). At the other end of the credit quality scale, the larger and higher-rated (typically AA) Australian banks, who are better known overseas, have tended to be more prolific users of offshore funding than the smaller, lower-rated Australian banks which rely more on domestic funding (where they are better known).

Financial issuers are estimated to be more likely to issue offshore in search of price arbitrage, which is consistent with their more sophisticated financial skills. Non-financial issuers are estimated to be less motivated by price, perhaps consistent with a risk management motivation: the currency rather than the domestic currency with higher implied cost is what matters. Non-financial corporate offshore borrowing is almost exclusively in foreign currency.

In summary, our results suggest that, unsurprisingly, price arbitrage is an important motivator, possibly the most important, for issuing offshore. This is particularly the case for financial issuers whose issuance, in turn, contributes towards funding costs being equalised onshore and offshore. Market completeness and liquidity are also estimated to drive issuance decisions. This may be underestimated here to the degree that benefits from completing markets are reflected in price incentives. The results are also consistent with the notion that borrowers from net deficit currencies issue offshore to access foreign investors in net surplus currency areas, possibly by unbundling credit and currency risk and seeking to overcome barriers such as withholding taxes. It is difficult to test how important funding diversification is. Liaison with the Australian and New Zealand banks indicates that it is a factor they take into account in their funding decision. Consistent with this, they issue in a relatively wide range of currencies (Figure 2). It appears to be less of a consideration for offshore issuers from some other countries who predominantly tap the US market when they issue offshore, though this may reflect the expectation prior to the global financial crisis that the US dollar markets were unlikely to suffer a significant disruption.

5. Policy lessons and risks

The preceding discussion focuses on the potential benefits for domestic issuers from tapping offshore markets; but the use of offshore bond markets can pose risks to the borrower, the liquidity of the domestic bond market, and the financial stability of the borrowing economy.

The risks of unhedged foreign currency borrowing are well known. While currency mismatch may be a problem for some issuers, the experience of 2007–08 suggests that uncovered foreign currency borrowing is no longer a major issue in the Asia-Pacific region. Hedging surveys for Australia and New Zealand show that the vast bulk of offshore foreign currency borrowing is swapped into local currency financing. Of the remainder, most is naturally hedged against foreign currency income. As experienced during the Asian crisis and the 2007–08 period, foreign currency funding can be subject to foreign liquidity pressures and disruptions for short term foreign currency funding (eg trade credit) and rollover of longer-term foreign currency funding. It can be equally disruptive to local currency markets when borrowers who are unable to roll over funding in international markets turn to local markets with the intention of borrowing in local currency and converting the loan proceeds into foreign currency. As recent events have illustrated, mechanisms for using reserves to provide foreign currency liquidity can be an important part of risk mitigation.

Swap-covered foreign currency borrowing carries little currency risk, but is a more complex form of borrowing which involves other risks.³⁵ The greater complexity of swap-covered borrowing requires more sophisticated risk management capabilities on the part of both borrowers and supervisors. Moreover, refinancing risk involves not one bond market, but liquidity in both the foreign exchange swap market and the underlying funding markets on both sides of the swap. Disruptions in either of the funding or hedging markets can lead to problems in refinancing.³⁶ Rollover concerns are greater still if non-residents, who tend to make up the bulk of investors in offshore markets, are a less stable funding source during a crisis than domestic investors.

The experience of countries in the Asia-Pacific region that rely heavily on offshore funding, such as Australia and New Zealand, during the global financial crisis suggests that the risks can be managed effectively, especially for highly rated borrowers. Their resilience highlights the importance of a variety of factors, including: well capitalised banks with good risk management, widespread hedging of foreign currency borrowing, scalable domestic currency liquidity provision, strong fiscal positions and high sovereign ratings, and flexible exchange rates (see Munro and Wooldridge, 2009 for a more detailed discussion of risks). Where foreign currency borrowing was hedged (effectively domestic currency denominated borrowing), local currency liquidity provided a substitute for external funding and rollover requirements declined in foreign currency terms as local currencies depreciated. For Australian banks, as with other banks internationally, AAA government guarantees helped to maintain offshore market access.

Diversification of funding sources across markets may mitigate refinancing risk, though less so if liquidity pressures are correlated across markets. During the 2007–08 financial crisis, although funding pressures in the US market spread to other integrated markets, diversification appears to have provided some benefits, with borrowers continuing to tap less disrupted markets and entering new ones such as the Japanese Samurai market (Japanese yen bonds issued in Japan by non-residents).

³⁵ A well functioning domestic bond market with an established yield curve from which derivatives can be priced, helps to develop a derivatives market (Burger and Warnock, 2003).

³⁶ Refer to Munro and Wooldridge (2009) for further discussion of the risks of swap-covered borrowing.

Turning to macro financial stability, some countries may be concerned that offshore issuance may result in an increase in foreign indebtedness. Those borrowers previously restricted to borrowing onshore or not at all, might be able to access cheaper funding or a wider pool of funding. Greater access to external funding might in turn lead borrowers to increase financial leverage, financial risk (particularly if the debt is denominated in foreign currency or short term) and external indebtedness. These risks of offshore borrowing will of course depend on the risk management capacity of both borrowers and regulator and need to be weighed against the costs of financial autarky and the potential benefits of financial integration such as scope for consumption smoothing in response to shocks and pressures to allocate capital more efficiently (see Henry 2006 for a review), and other more nuanced and catalytic institutional benefits (Kose et al 2006).

A common concern is that offshore borrowing, which is mostly swap-covered foreign currency debt, may draw liquidity away from the domestic market. Swap-covered borrowing itself does not necessarily reduce the size of the local currency market. Rather, it changes the composition of issuers in the local currency market from domestic borrowers to non-resident borrowers (who issue local currency debt and swap it to their preferred currency).³⁷ However, non-resident issuance is highly skewed toward offshore markets, consistent with a loss of liquidity in the domestic market.

Because of network externalities and economies of scale in financial markets, liquidity tends to concentrate (Committee on the Global Financial System 1999), and there is a risk that it may tend to concentrate offshore. Indeed, the value of outstanding bonds issued offshore in Hong Kong dollars and New Zealand dollars is greater than onshore issuance (Table 2). Factors that would favour concentration of liquidity in the domestic market are a steady volume of government issuance, stable demand from domestic investors who want domestic currency assets (foreign investors' demand for local currency assets is likely to vary in response to exchange rate expectations), better assessment of domestic credit risk, especially in the case of lower-grade borrowers. The offshore market, however, offers lower costs, including a lack of withholding taxes and lower issuance costs. Peristiani and Santos (2003) report that underwriting costs in the eurobond market are now lower than in the US market, suggesting an absolute advantage, even in US dollar debt. Consistent with this, US dollar international debt markets (issuance by non-residents and by residents offshore) increased from about one tenth the size of the domestic debt market in the mid-1990s to about one third in 2007. There are advantages to a deep onshore market including availability of collateral for other domestic financial markets; access to a liquid market for domestic borrowers; better access for resident investors; the tendency for transparency to be greater onshore; and the contribution of a developed bond market to a more efficient banking system.³⁸

Rather than a concentration of liquidity in the domestic or offshore market, the two may provide potentially complementary segments. For example, onshore markets tend to serve domestic borrowers and investors, while offshore markets tend to serve non-resident borrower and investors. While competition from an offshore market is likely to expose weaknesses in the onshore market, a dose of competition may provide the incentive to improve domestic infrastructure and the regulatory, legal or information environment, leading

³⁷ The experience for Australia and New Zealand is that non-resident issuance in the domestic market does not crowd out local issuers (Battellino and Chambers, 2005 and Tyler, 2005). Non-resident issuance pushes down the cross-currency basis swap, making it cheaper to issue offshore and swap back the proceeds into local currency.

³⁸ Borensztein and Panizza (2006) find that banks and bond markets are complements, with bond market development contributing to the development of an efficient banking system. Banks provide bond underwriting services, bridging finance prior to issuance, bond distribution channels and are major issuers of bonds.

to a more efficient onshore market. In that case, offshore issuance may accelerate the development of the overall local currency bond market to the benefit of all borrowers. Battellino and Chambers (2005) argue that domestic financial institutions' first-hand experience in the offshore bond market helped to develop a financially sophisticated workforce which contributed to the development of a deep domestic bond market in Australia. If the onshore market infrastructure is weak, offshore issuance may usefully help to establish a minor currency as an asset class. Offshore markets, however, may concentrate a large segment of higher credit quality liquidity (Eurobonds are usually rated A or above) away from the domestic market and high-grade liquidity can be important for the development of lower-grade segments.

The balance between on- and offshore issuance is subject to policy influence, including simplicity of registration requirements, market infrastructure, transactions costs, withholding taxes, greater legal certainty and more efficient payment and settlement systems. Some onshore markets have competed more successfully than others. Issuance in the Kangaroo bond market (Australian dollar bonds issued onshore by non-residents) soared over the 2002–06 period due to a combination of factors. While a minimum volume of government issuance may be important to establish benchmarks, a fall in the supply of government debt securities left unfilled demand for high-grade local currency assets, a gap that was filled by high-grade non-residents. Second, growth in domestic demand for high-grade domestic currency securities was provided by pension funds and broadening of assets accepted by the central bank as collateral, Removal of non-resident interest withholding tax lowered costs.³⁹ It is worth noting that these policy changes were not intended to promote the domestic market, but reflected fiscal prudence, growing domestic pension savings, removal of preferential restrictions on collateral, and the principle of taxation in the place of residence. The policy shift was more a case of removing barriers to onshore market development than promoting it.

Rather than domination or segmentation, the advent of global bonds (issued in more than one market), suggests development toward an integrated global bond market (Miller and Puthenpurackal, 2005). Such a path may require a degree of convergence in both issuance requirements among markets and settlement platforms. To date global bonds account for a very small share of overall issuance. Another path to a global market might be integration of market access standards. Mutual fund recognition via acceptance of each others' registrations between Hong Kong and Australia provides a recent example of such integration (ASIC 2008). If liquidity concentrates in bond markets because of network externalities, then integration of networks may make location of issuance less important for local currency bond market liquidity.

While the offshore market may offer a substitute for a weak domestic market, development of the domestic debt and streamlining of domestic market infrastructure are likely to complement overall market development. Much has been done in recent years, particularly in Asia, to develop domestic local currency bond markets infrastructure and environment including developing local rating agencies, streamlining documentation requirements, developing settlement systems, and improving the legal and information environment (many of which are documented in Bank for International Settlements, 2006). Domestic market quality has moved toward best practice, markets have become more liquid, sovereign umbrella ratings have risen and an increasing number of regional currencies have become more established asset classes. Complementary to the development of domestic markets, foreign exchange controls on non-resident buying of assets in domestic debt markets have increasingly been eased.

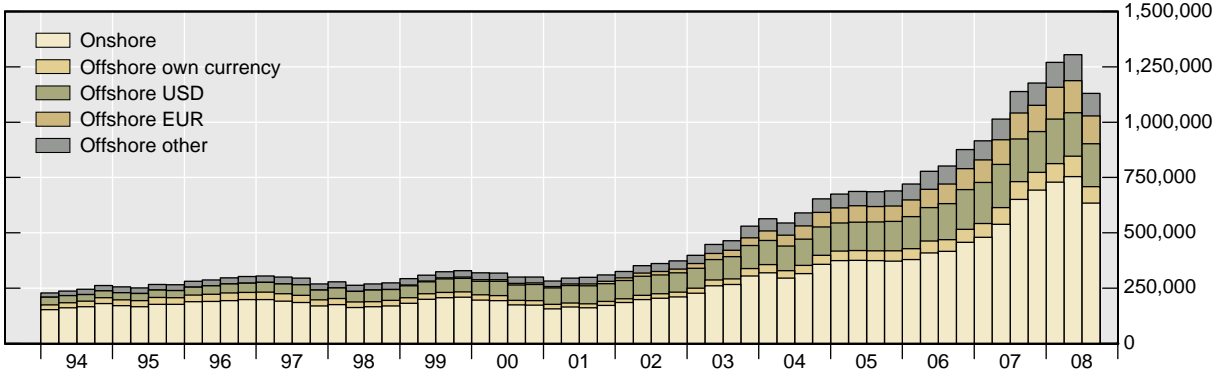
³⁹ In 2007–08, non-resident issues of New Zealand dollar bonds shifted toward onshore issuance after they became repo eligible.

6. Summary

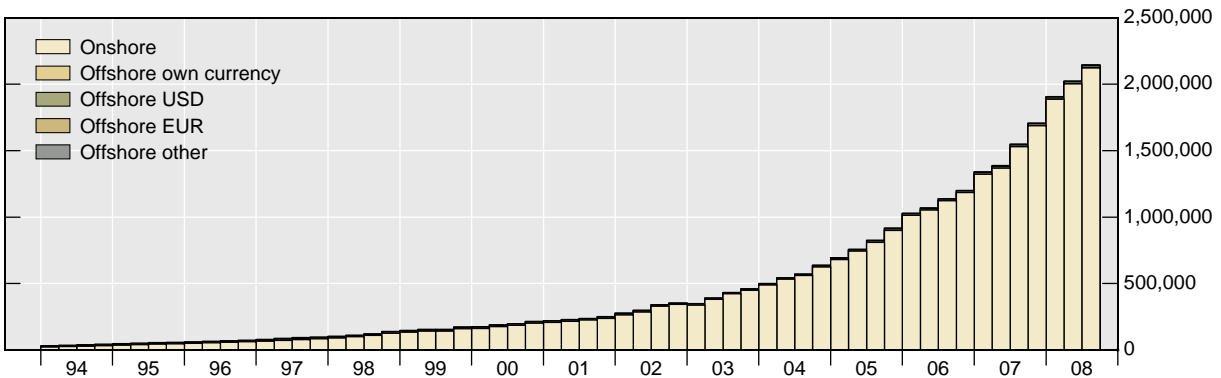
Asian bond markets, like bond markets globally, are becoming increasingly international in terms of offshore and non-resident issuance in the local currency. This paper set out a variety of motivations for offshore bond issuance by residents, and used a discrete choice (probit) model and unit record bond data for five Asia-Pacific countries (Australia, Hong Kong, Japan, Korea and Singapore) to link the issuance decision to potential benefits. Our results support the idea that (i) deviations from covered interest parity are actively arbitrated by residents of minor currency areas, as well as by internationally active borrowers among major currencies as established in the literature; and (ii) issuers benefit from the liquidity and diversification of larger “complete” offshore markets. The latter conclusion appears to be particularly true for lower-rated borrowers. Sub-investment grade bonds are almost exclusively issued offshore, reflecting the rarity of sub-investment grade markets outside the United States. Against the potential benefits to borrowers, we consider the risks, for both borrowers and the domestic market, and lessons from the financial crisis such as funding diversification. The many initiatives undertaken in Asia-Pacific countries in the past decade and those underway such as the ASEAN+3 Credit Guarantee and Investment Mechanism, remain highly relevant for both domestic markets development and for taking advantage of the potential benefits offered by international bond markets.

Figure 1
Bonds issued by Asia-Pacific residents
 US\$ million outstanding

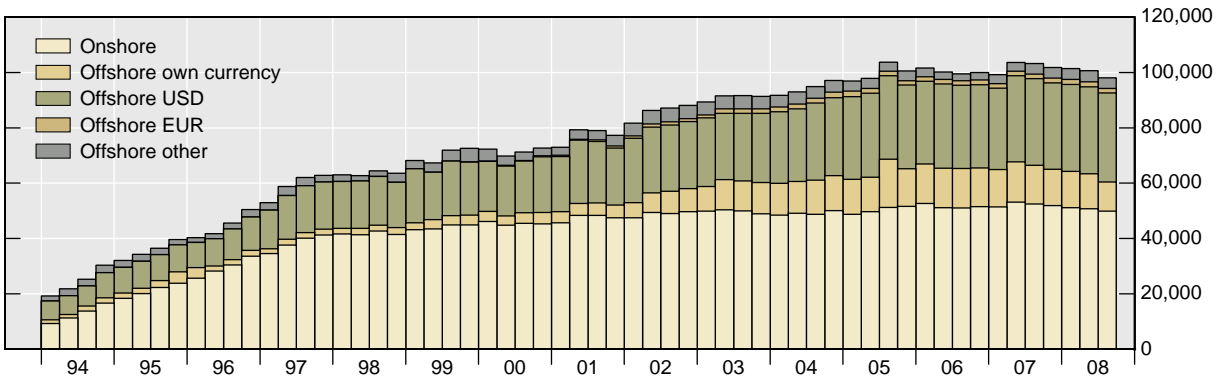
Australia



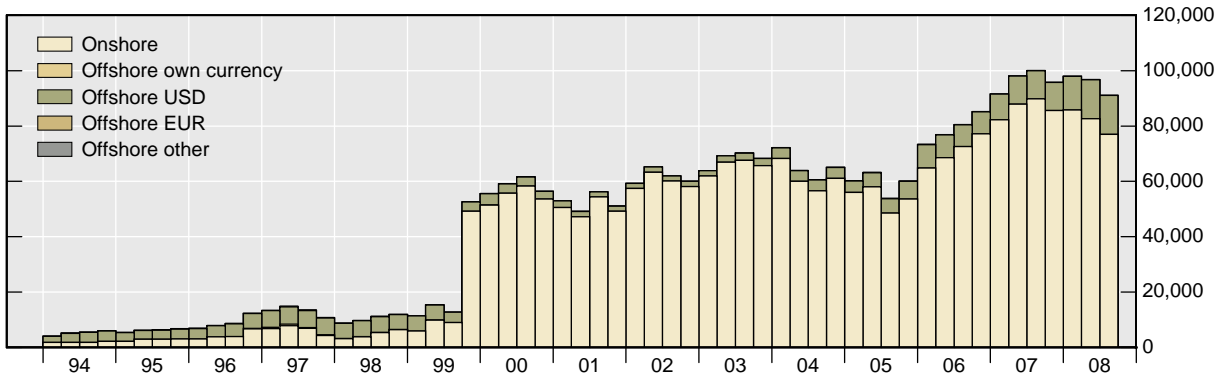
China



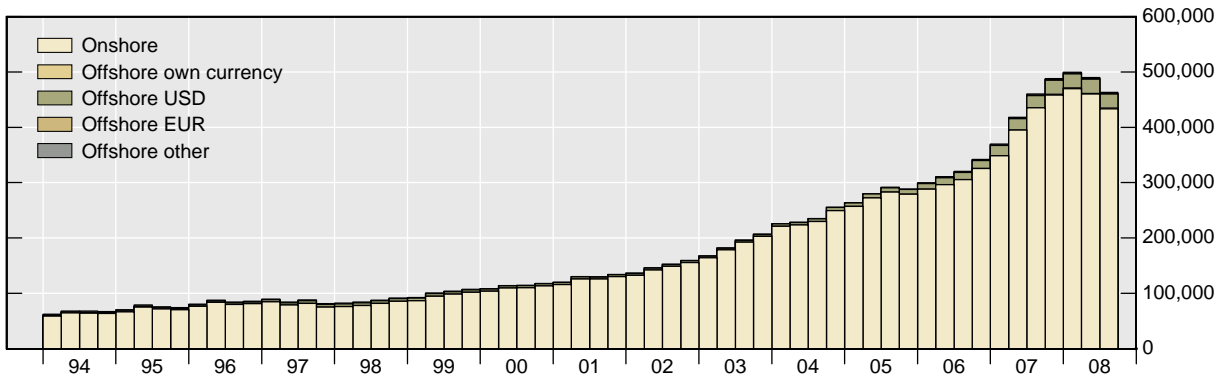
Hong Kong



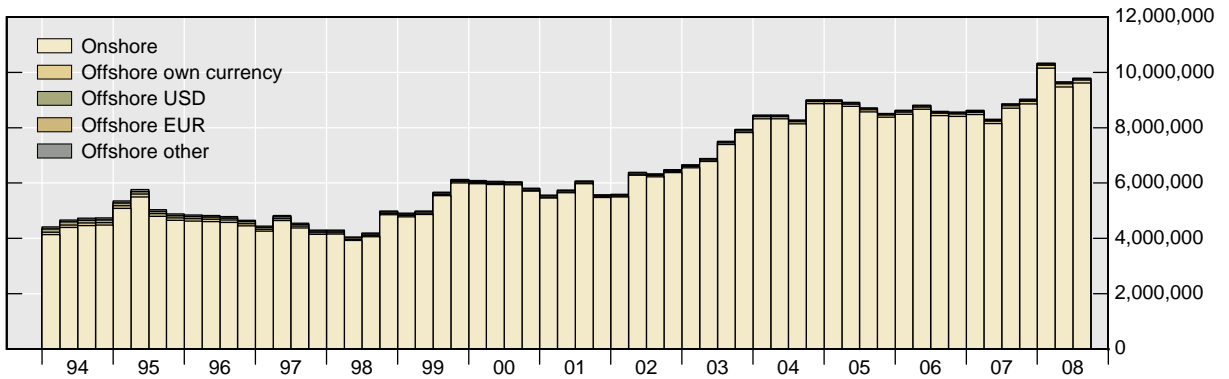
Indonesia



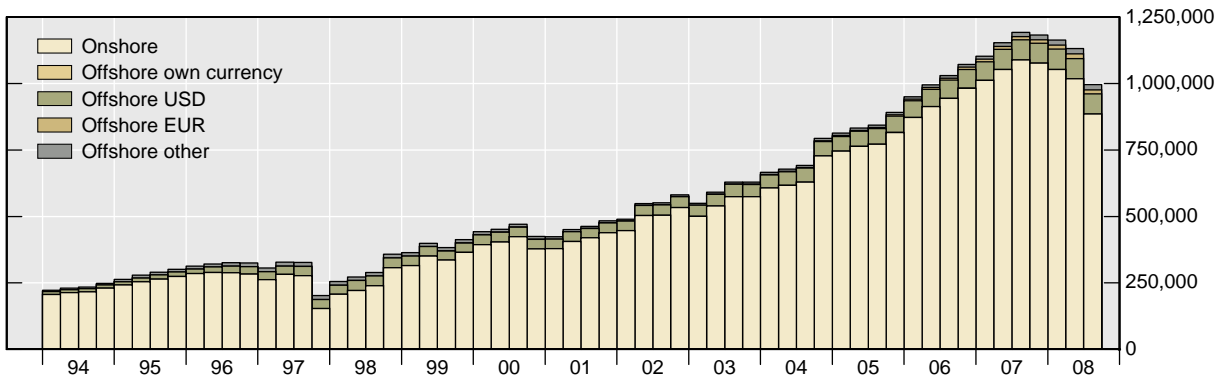
India



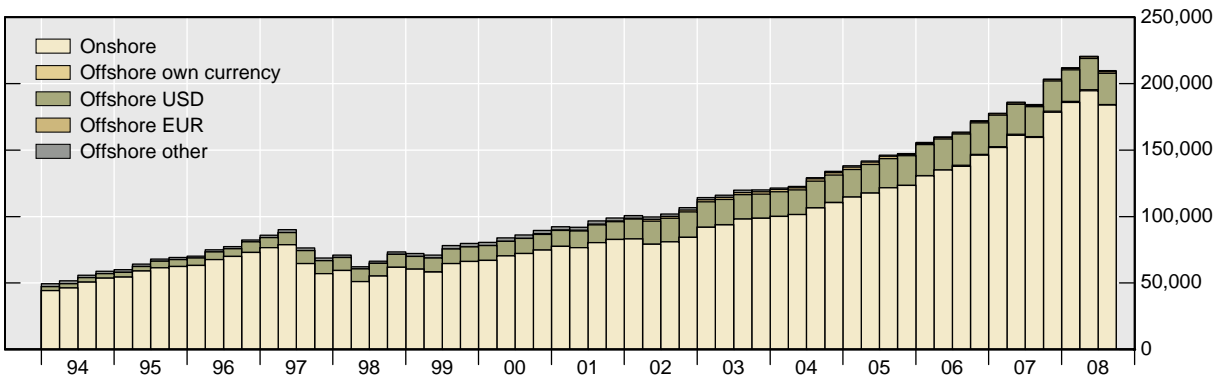
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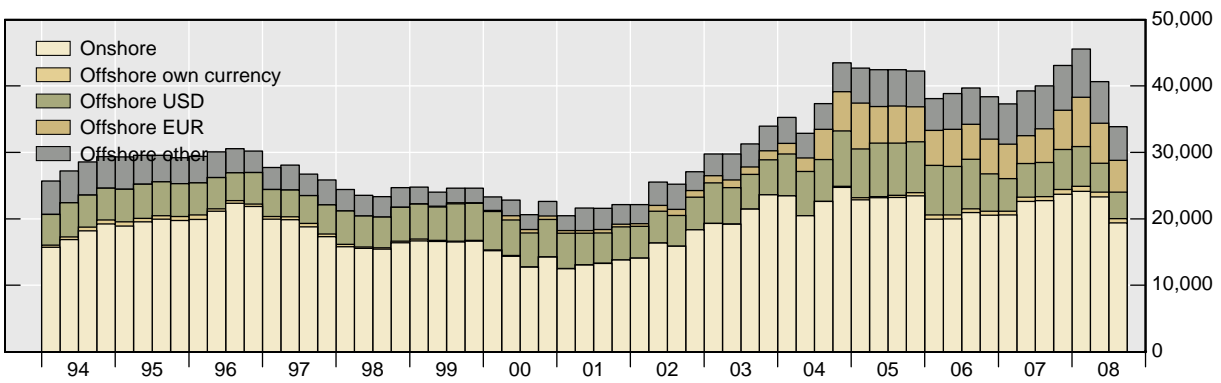
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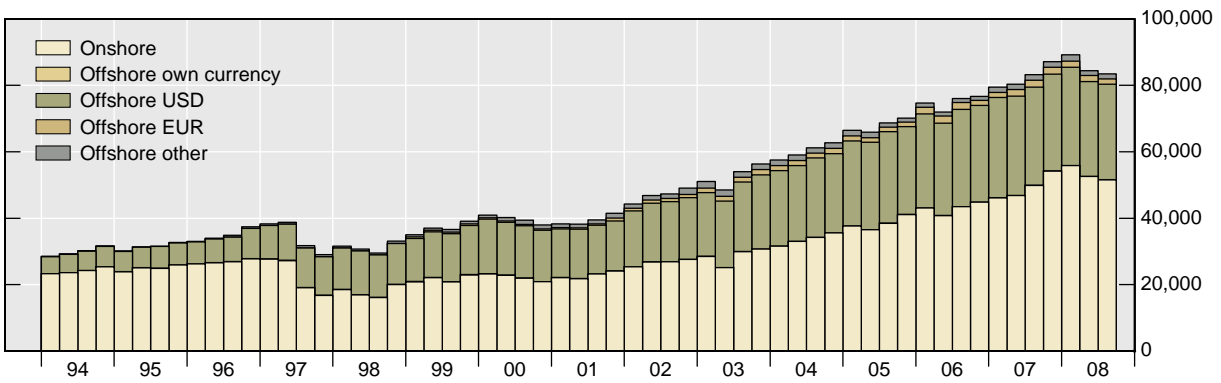
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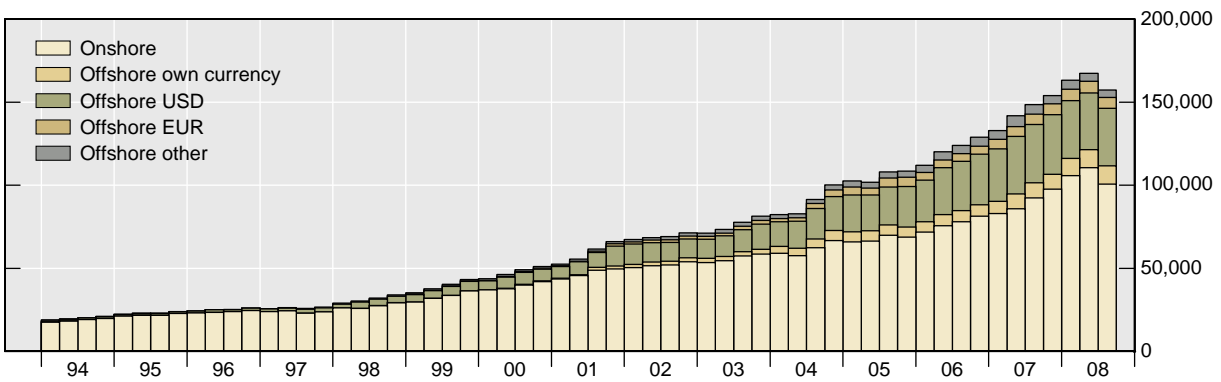
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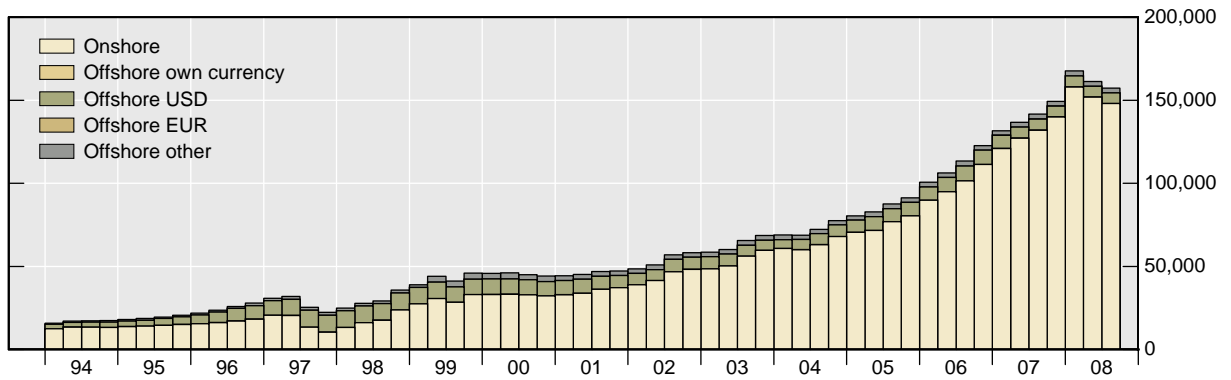
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Singapore



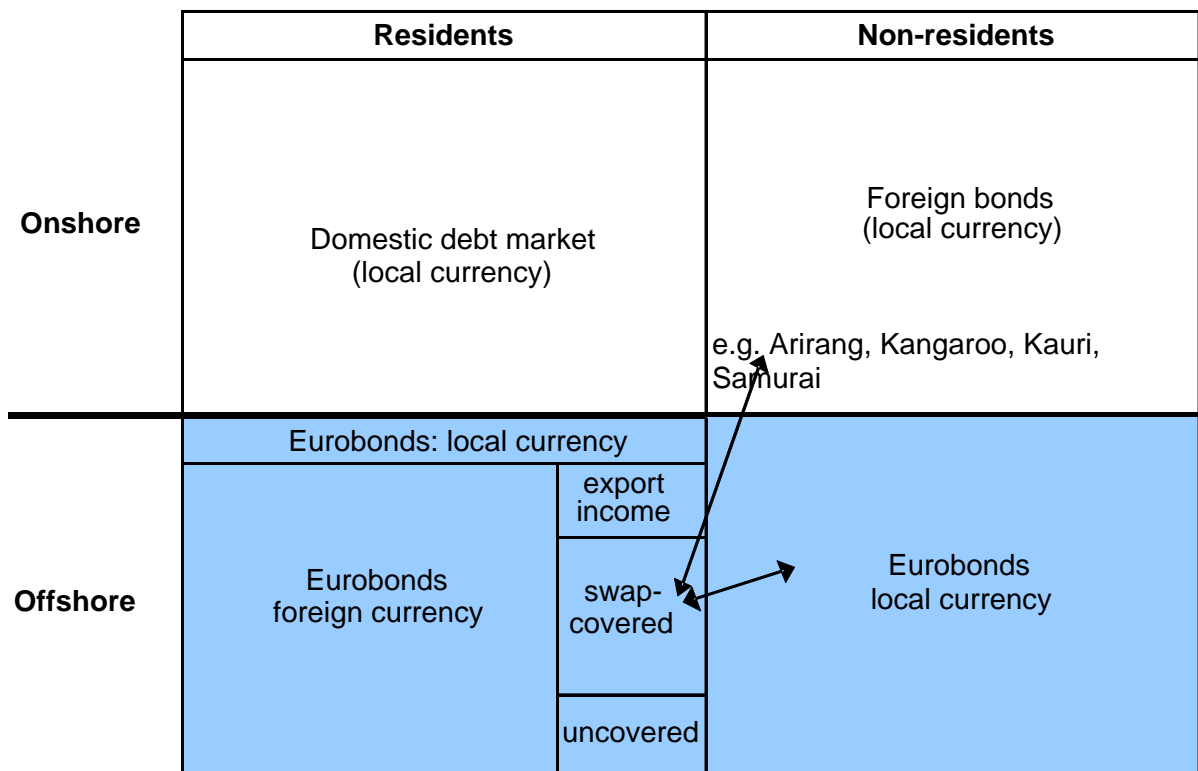
Thailand



Source: BIS.

Figure 2

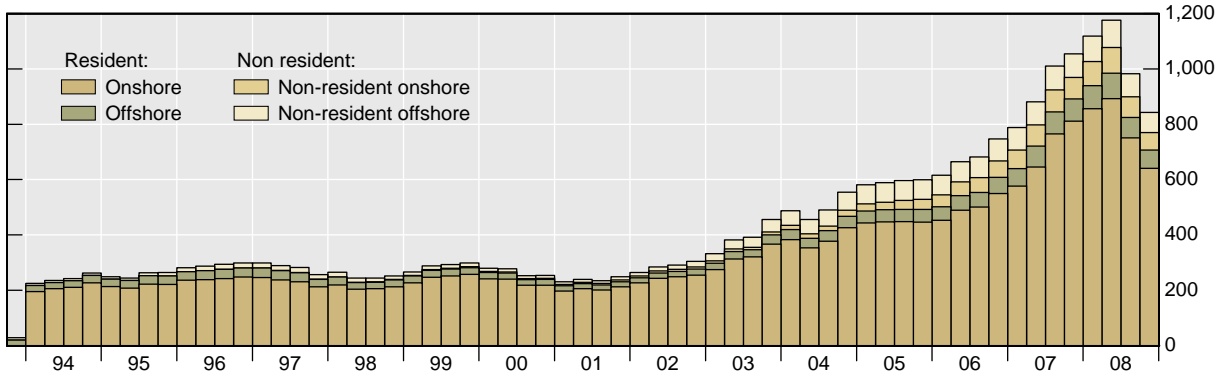
Stylised view of bond market: domestic issuer's perspective



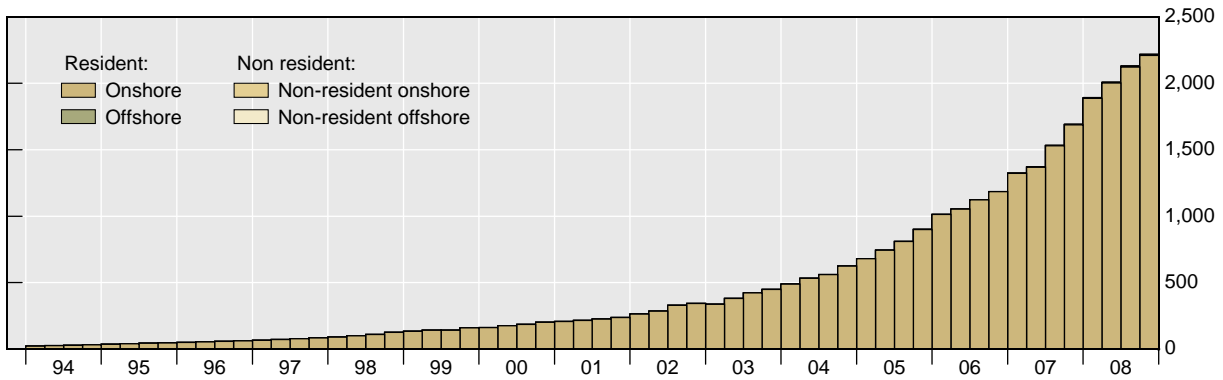
Note: Arrows indicate likely cross-currency swap counterparties.

Figure 3
Onshore and offshore issuance in Asia-Pacific currencies¹
 Amounts outstanding

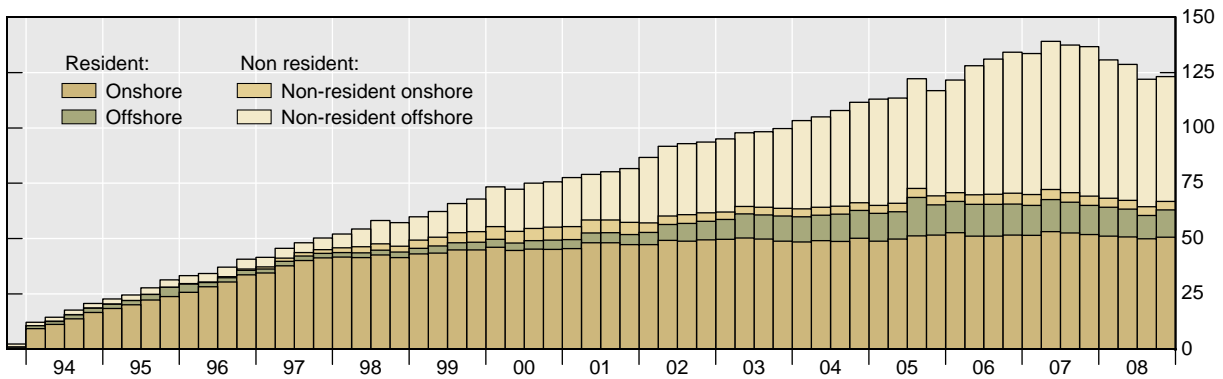
Australian dollar



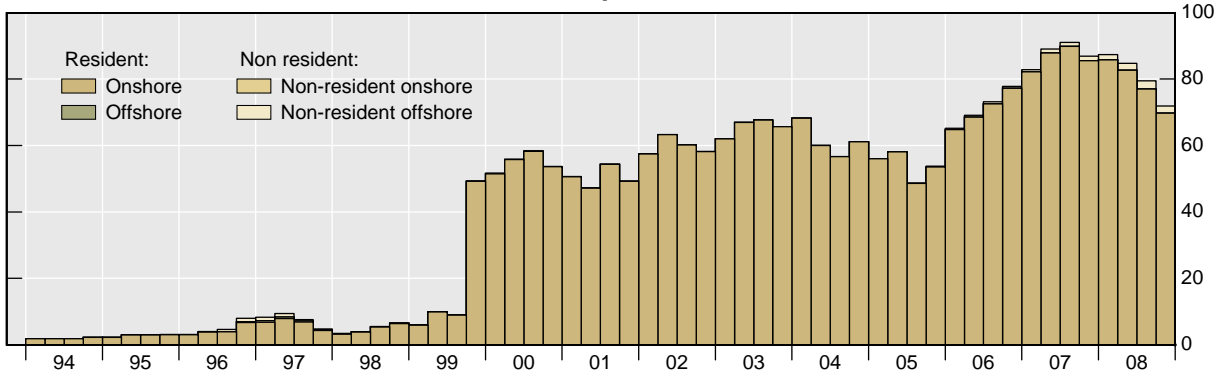
Renminbi



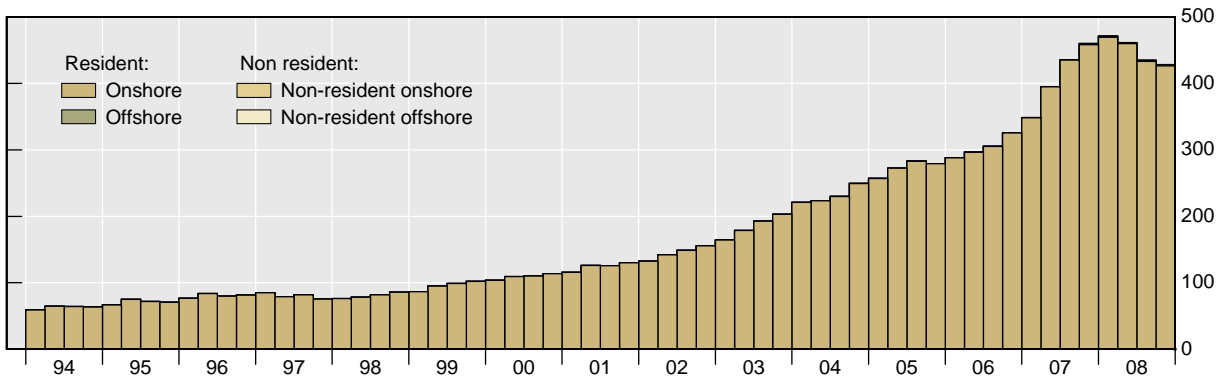
Hong Kong dollar



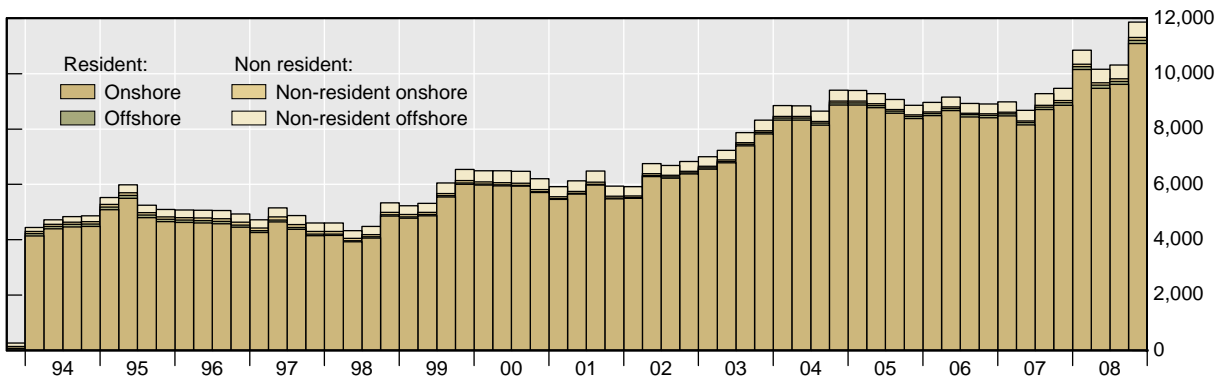
Rupiah



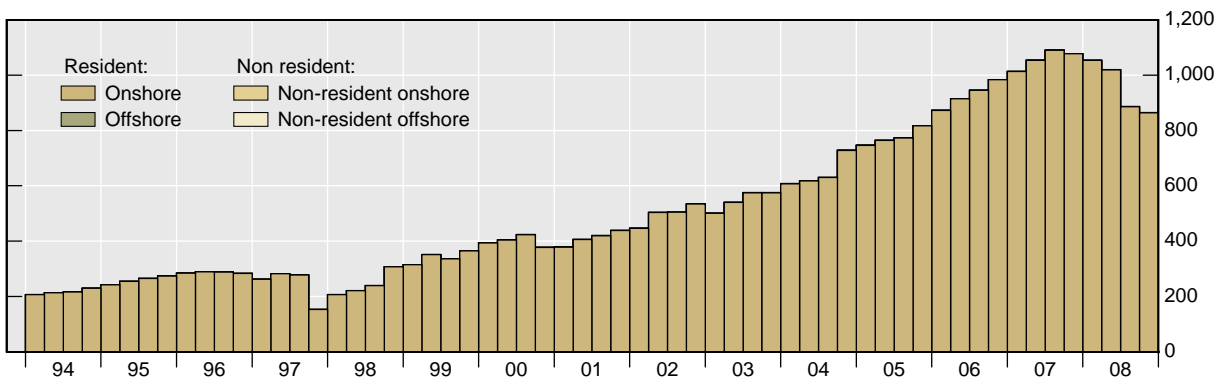
Indian rupee



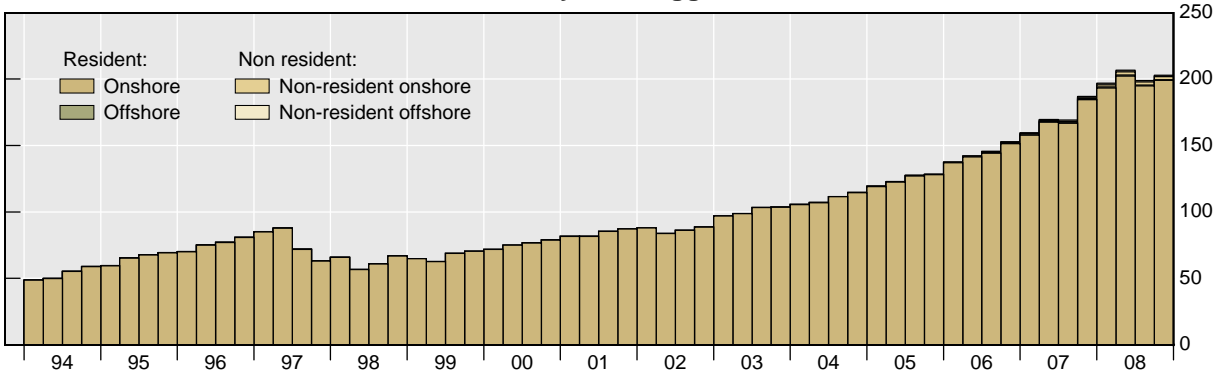
Yen



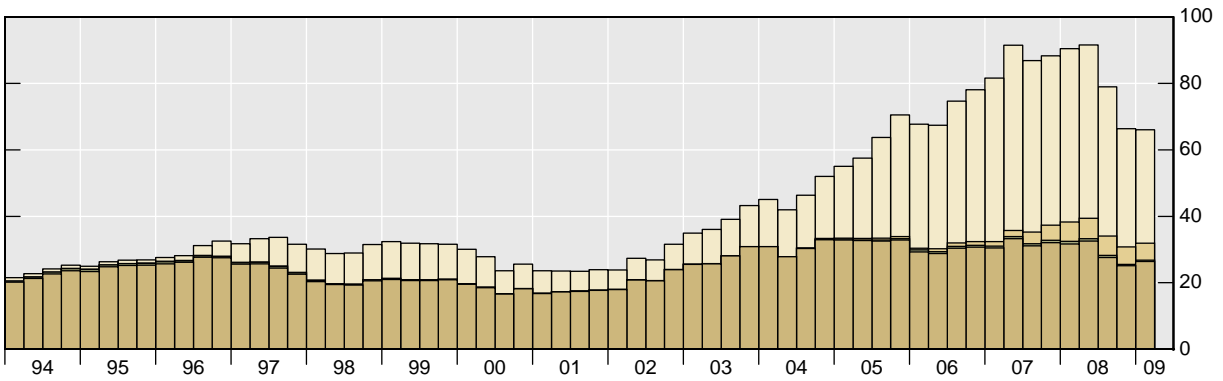
Won



Malaysian ringgit



New Zealand dollar



Singapore dollar

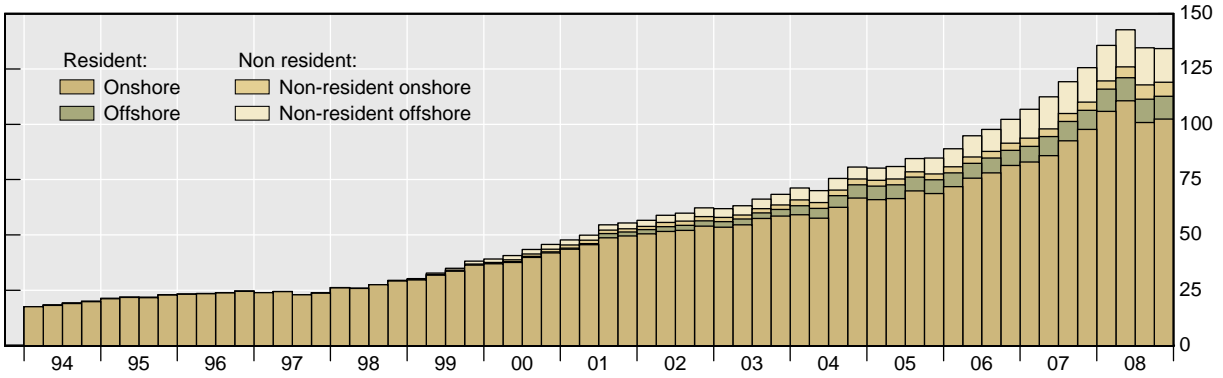
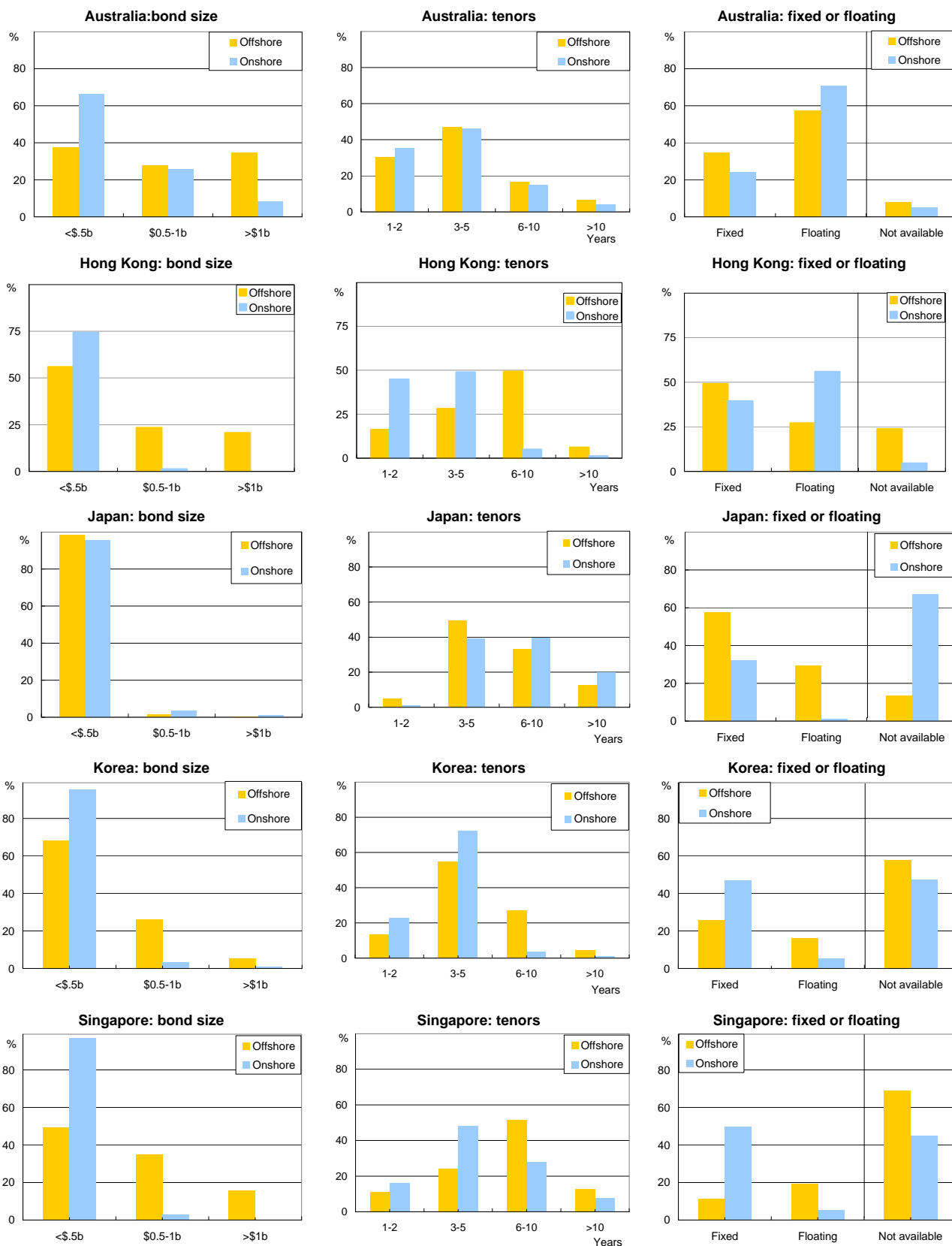
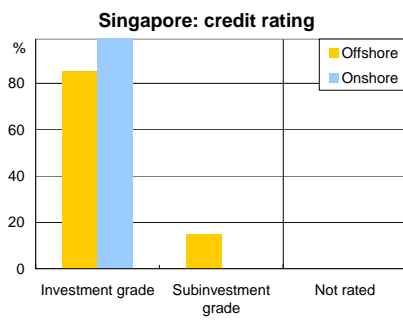
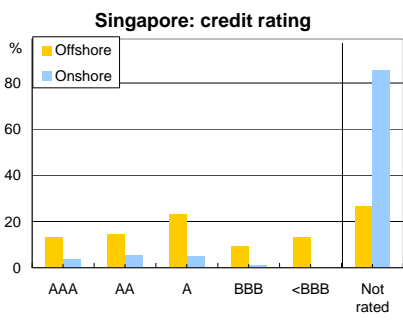
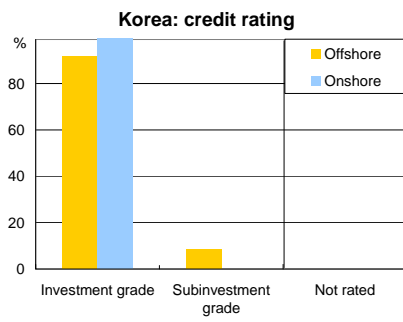
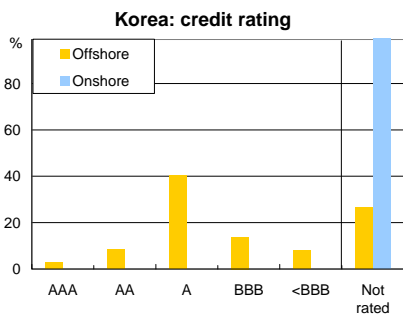
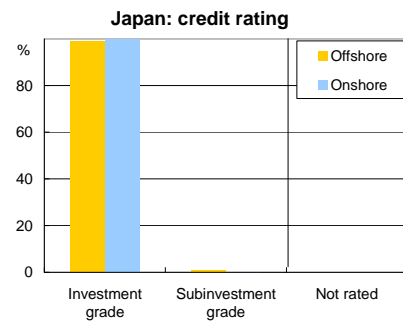
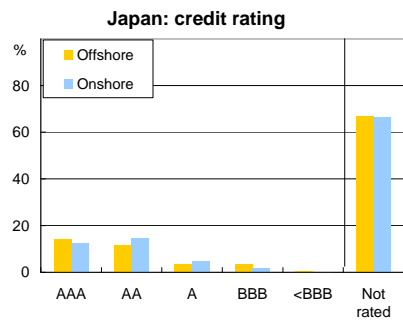
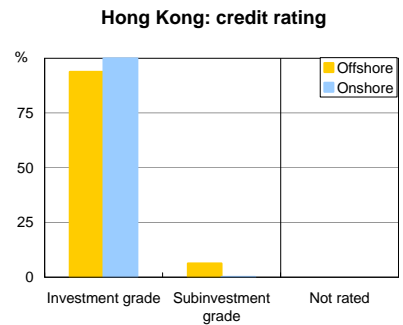
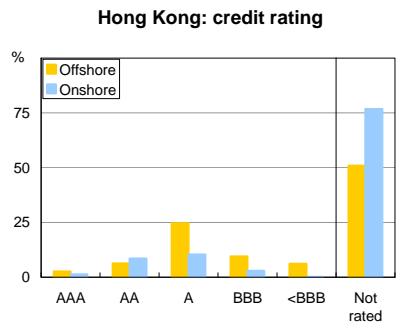
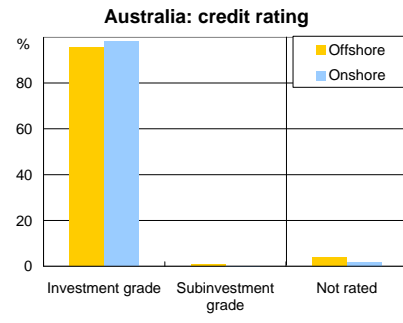
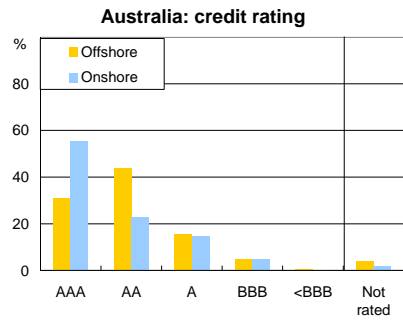


Figure 4
Bond characteristics





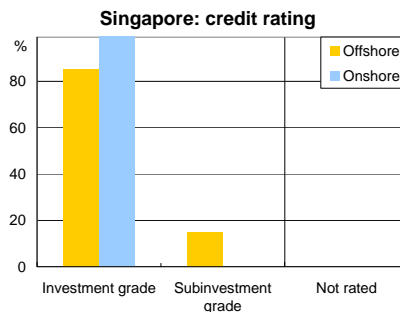
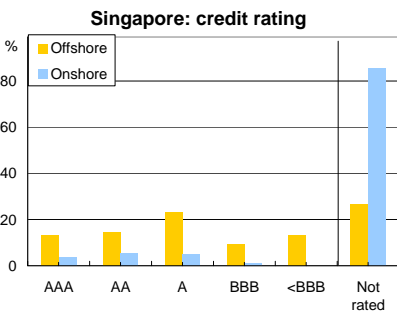
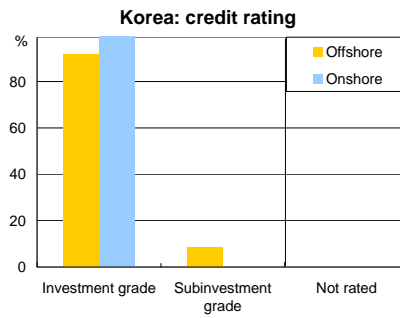
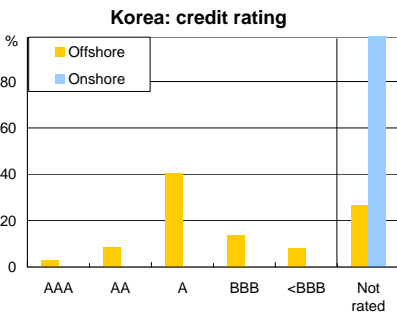
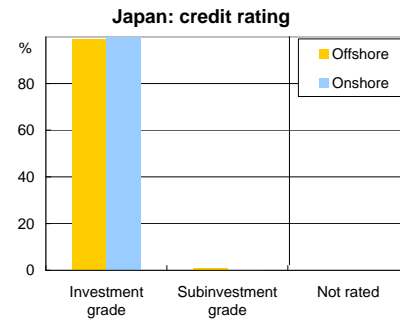
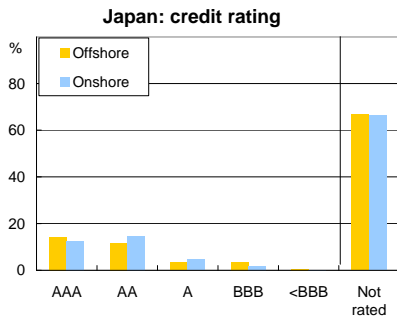
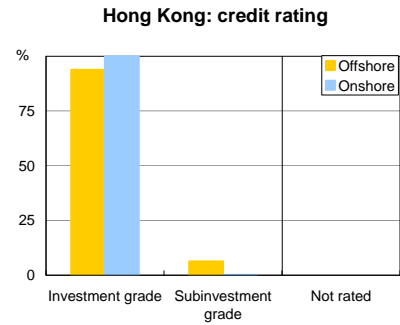
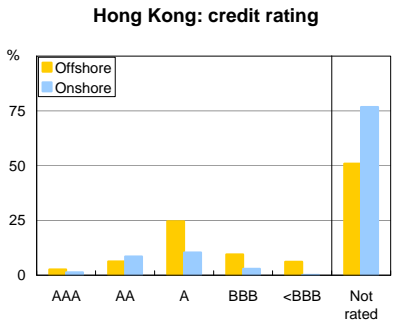
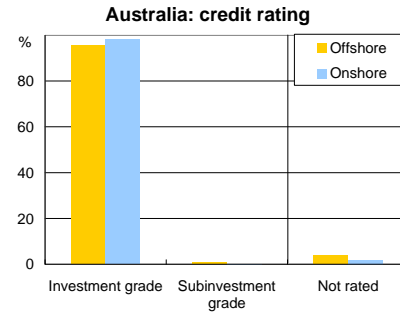
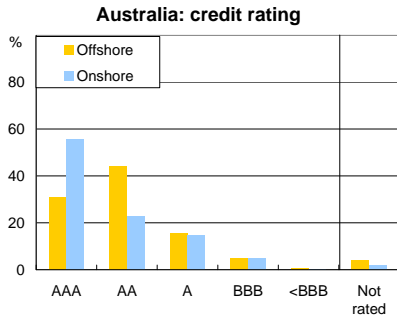


Figure 5

Australia major banks: covered bargain

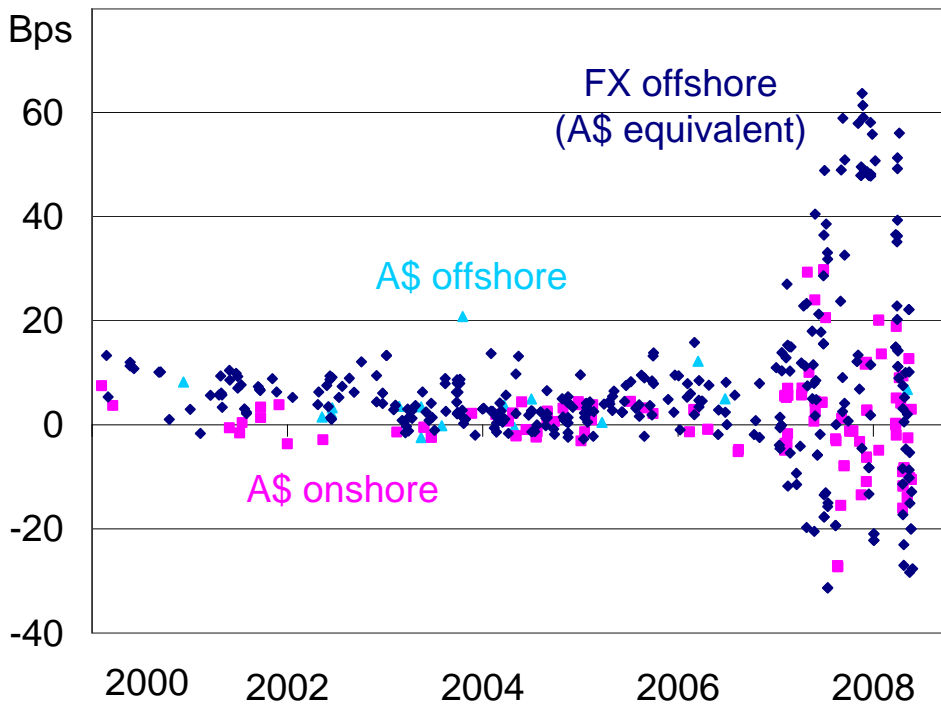
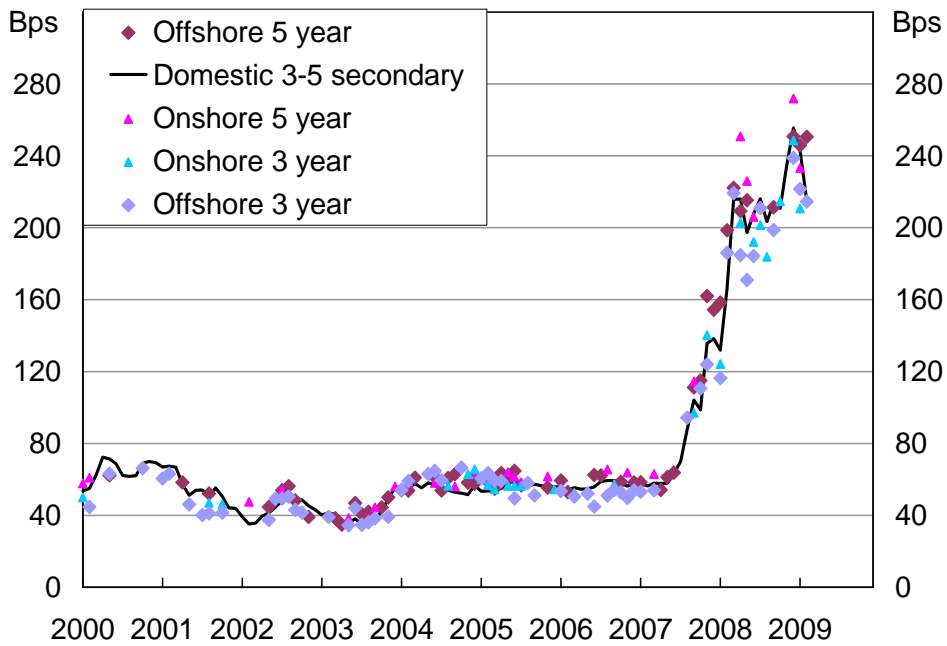


Figure 6

Major banks' bond pricing at issuance

\$A equivalent spread to CGS*



* Includes fee for guaranteed bonds.
Includes AUD, USD, Euro, GBP, CHF and JPY
Source: RBA

Table 1
Outstanding bonds issued by Asia-Pacific residents
 End-2007, per cent of GDP

	Onshore		Offshore		Offshore share
	Government (a)	Corporate (b)	Local currency (c)	Foreign currency (d)	(Per cent) =(c+d)/(a+b)
Australia	13	63	9	44	41
China	35	17	0	1	1
Hong Kong	9	16	6	18	49
Indonesia	18	2	0	2	11
India	38	4	0	3	6
Japan	163	39	2	1	2
Korea	49	64	0	11	9
Malaysia	38	58	0	13	12
New Zealand	18	N/A	1	14	45
Philippines	35	2	0	23	38
Singapore	42	18	6	29	36
Thailand	39	18	0	3	5

Source: BIS.

Table 2

Global market for bonds denominated in Asia-Pacific currencies

Outstanding, end-2007, per cent of GDP

	Onshore		Offshore		Non-resident offshore share
	Resident	Non-resident (a)	Resident	Non-resident (b)	(b)/(a)
Australian dollar	76	8.5	9	9.4	53
Chinese renminbi	52	0.0	0	0.1	100
Hong Kong dollar	25	2.1	6	32.6	94
Indonesian rupiah	20	0.0	0	0.3	100
Indian rupee	42	0.0	0	0.0	n/a
Japanese yen	202	1.6	2	10.1	86
Korean won	113	0.0	0	0.1	100
Malaysian ringgit	96	0.3	0	0.5	63
New Zealand dollar	18	3.5	1	39.8	92
Philippine peso	38	0.1	0	0.1	50
Singapore dollar	61	2.3	6	9.5	81
Thai baht	57	0.3	0	0.1	25

Source: BIS.

Table 3
Univariate probit estimates

		Australia	Hong Kong	Japan	Korea	Singapore
log(Size)	Coefficient	0.0685	0.3410	-0.4786	0.6130	0.3338
	z	7.45 **	17.77 **	-74.82 **	40.64 **	10.42 **
	Pseudo Rsq	0.01	0.07	0.10	0.28	0.08
	No obs	6,795	3,757	17,706	19,946	1,191
log(Tenor)	Coefficient	0.069	0.362	0.416	0.195	0.235
	z	8.11 **	12.33 **	35.03 **	6.94 **	4.68 **
	Pseudo Rsq	0.01	0.03	0.05	0.01	0.02
	No obs	6,786	3,572	17,702	20,114	1,192
Rating Index	Coefficient	0.063	0.053	0.017	3/	0.133
	z	9.07 **	3.59 **	1.61		3.75 **
	Pseudo Rsq	0.01	0.01	0.00		0.07
	No obs	5,939	1,160	2,142		187
Sub-inv Grade	Coefficient	1/	1.82	0.63	1/	1/
	z		7.87 **	3.46 **		
	Pseudo Rsq		0.02	0.00		
	No obs		3,846	9,983		
Fixed	Coefficient	0.76	0.03	-1.04	-1.43	-0.62
	z	20.37 **	0.67	-20.85 **	-25.45 **	-5.04 **
	Pseudo Rsq	0.06	0.00	0.05	0.17	0.04
	No obs	5,286	3,452	11,519	5,935	583
CA/GDP	Coefficient	-0.110	0.044	0.223	0.007	0.028
	z	-9.8 **	8.7 **	23.43 **	1.65	4.21 **
	Pseudo Rsq	0.01	0.02	0.02	0.00	0.01
	No obs	6,799	2,768	17,706	20,114	1,192
CIP	Coefficient	27.590	0.0496 2/	-1.700	1.371	1.100
	z	20.85 **	0.8	-6.23 **	14.78 **	4.11 **
	Pseudo Rsq	0.60	0.00	0.00	0.20	0.02
	No obs	6,563	2,607	14,581	1,220	937
$i - i^H$	Coefficient	-2.005	-0.0482	0.2903	-0.9977	0.2373
	z	-30.34	-1.81	16.4 **	-35.9 **	6.94 **
	Pseudo Rsq	0.50	0.00	0.02	0.51	0.04
	No obs	6,799	3,746	17,349	19,998	1,168
year	Coefficient	0.039	0.014	0.020	0.084	-0.006
	z	11.22 **	3.04 **	9.93 **	26.08 **	-0.58
	Pseudo Rsq	0.01	0.00	0.00	0.08	0.00
	No obs	6,799	3,846	17,706	20,114	1,192
Market Size	Coefficient	0.436	0.041	0.010	0.055	0.053
	z	16.91 **	15.11 **	14.44	30.79 **	9.05 **
	Pseudo Rsq	0.66	0.36	0.01	0.63	0.45
	No obs	6,798	3,801	17,396	20,040	1,185

Note: ** indicates significance to the 1% level; * indicates significance to the 5% level.

Dependent variable is 1 if the bond is issued offshore and 0 is issued onshore.

z:

The pseudo R^2 measures the improvement of the regression fit against a regression on a constant only.

1/ Sub-investment grade bonds only issued offshore.

2/ HK pricing constructed from sovereign index (no corporate index), so potentially large measurement error.

3/ Ratings only available for offshore bonds.

Table 4
Multivariate probit estimates with bond characteristics

	Australia		Hong Kong		Japan		Korea	Singapore
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(Size)	-0.074 -2.67 *	-0.055 -1.87	0.261 5.91 **	0.299 9.88 **	-0.293 -5.14 **	-0.095 -2.21 *	0.467 3.77 **	0.342 3.89 **
log(Tenor)	-0.13 -2.38 *	-0.14 -2.55 *	0.36 6.05 **	0.32 8.08 **	0.487 3.73 **	0.71 7.32 **	0.50 1.87	-0.02 -0.1
Rating Index	-0.041 -2.82 **	--	-0.022 -1.13	--	-0.148 -5.65	--	3/	2/
Sub-investment grade	--	1/	--	1.32 3.50 **	--	1.54 3.44 **	3/	1/
Fixed	1.02 14.23 **	1.01 14.15 **	0.28 2.61 *	0.29 4.56 **	-1.029 -5.52 **	-1.38 -10.27 **	-0.11 -0.50	-1.15 -4.93 **
CA/GDP	-0.064 -2.25 *	-0.054 -1.94	0.023 2.13 *	0.032 4.11 **	0.148 1.49 *	-0.039 -0.57	-0.060 -1.19	-0.017 -0.62
CIP	58.7 8.14 **	56.7 7.95 **	0.49 2.52 *	0.13 1.37	4/	4/	0.501 1.87	-0.70 -0.92
$i^L - i^H$	-1.31 -6.42 **	-1.27 -6.31 **	0.57 4.9 **	0.64 8.68 **	5/	5/	-0.56 -5.22 **	1.14 3.78 **
year	0.051 4.67 **	0.052 4.74 **	-0.0286 -1.28	-0.012 -0.66	-0.186 -4.15 **	-0.062 -2.18 **	-0.272 -1.33	0.140 1.69
No obs.	4,498	4,487	953	2,603	646	2,594	807	426
Pseudo Rsq	0.74	0.74	0.11	0.27	0.33	0.28	0.55	0.43

Notes: Dependent variable is 1 if the bond is issued offshore and 0 is issued onshore.

** indicates significance to the 1% level; * indicates significance to the 5% level

The pseudo R^2 measures the improvement of the regression fit against a regression on a constant only.

1/ Sub-investment grade bonds only issued offshore.

2/ Small sample.

3/ Ratings only for offshore bonds.

4/ Dropped because of collinearity

5/ $i_{diff} > 0$ predicts offshore perfectly for the available sample

Table 5
Multivariate probit estimates with market size

	Australia	Hong Kong	Japan	Korea	Singapore
Market size	0.343 6.05 **	2/	0.0727 19.26 **	0.043 14.81 **	0.1237 0.44
CA/GDP	-0.0077 -0.37	-0.000341 -0.06	0.153 10.53	-0.126 -2.2 *	0.025 1.24
CIP	21.92 1.11	0.816008 11.59 **	/4	-2.35 -6.66 **	1.025 0.02
i_diff	0.4049 0.66	0.151004 6.67 **	/5	-1.43 -10.76 **	-1.38 -0.09
year	-0.050 -8.42 **	0.124485 11.42 **	0.1294 26.87	-0.68 -3.59 **	-0.002 -0.05
No obs.	0.6563	3870	14336	1199	935
pseudo Rsq	0.66	0.17	0.09	0.79	0.74

Notes: Dependent variable is 1 if the bond is issued offshore and 0 is issued onshore.

** indicates significance to the 1% level; * indicates significance to the 5% level

The pseudo R² measures the improvement of the regression fit against a regression on a constant only.

2/ Market size >0.48 predicts offshore perfectly

4/ Dropped because of collinearity

5/ i_diff>0 predicts offshore perfectly for the available sample

Table 6

More accurate pricing data (Australian major banks)

	Index Pricing	Actual pricing		Index Pricing	Actual pricing	
		all issues	AUD issues		all issues	AUD issues
Market size				0.49 1.76	0.42 2.37 *	-7.44 -2.85 **
log(Size)	-0.54 -3.29 **	-0.44 -3.11 **	-1.55 -3.83 **			
log(Tenor)	-0.86 -2.15 *	-0.67 -1.64	0.87 1.08			
Rating Index	-0.43 -1.61	-0.19 -0.85	-0.90 -2.1 *			
Fixed	-1.20 -1.95	-1.46 -2.45 *	2/			
CA/GDP	-0.25 -2.3 *	-0.19 -2.12 *	-0.57 -2.69 **	-0.19 -2.31 *	-0.18 -2.52 *	-0.44 -2.77 **
CIP 1/	0.251 4.46 **	0.044 2.33 *	0.059 1.24	0.221 4.71 **	0.061 4.4 **	0.065 2.42 *
$i^L - i^H$	-4.68 -5.92 **	-3.50 -5.88 **	--	-2.89358 -3.05	-2.4119 -3.4 **	-2.08 -2.32 *
year	-0.37 -4.19 **	-0.33 -4.7 **	-0.59 -3.6 **	-0.29 -4.81 **	-0.27 -5.12 **	0.53 1.78
	481 0.79	481 0.72	108 0.39	481 0.74	481 0.69	151 0.30

1/ Index pricing based on AA indices. Actual pricing based on actual bond price relative to AUD secondary market price.

2/ AUD floating rate bonds issued only onshore.

Note: 2000–2009 period.

Table 7

Crisis dummy and other factors

	Repo eligibility	Govt' guarantee available	Non-resident withholding tax	Managed funds
log(Size)	-0.52 -9.74 **	-0.53 -9.8 **	-0.07 -2.66 **	-0.07 -2.53 **
log(Tenor)	-0.37 -3.5 **	-0.36 -3.41 *	-0.13 -2.4 *	-0.12 -2.26 *
Rating Index 3/	-0.30 -8.05 **	-0.30 -7.97 **	-0.04 -2.79 **	-0.04 -2.81 **
Fixed	0.45 3.72 **	0.42 3.45 **	1.01 14.21 **	1.02 14.2 **
CA/GDP	-0.15 -3.58 **	-0.10 -1.98 *	-0.063 -2.24 *	-0.077 -2.67 **
CIP 1/	41.0 6.88 **	37.5 6.42 **	58.4 7.99 **	59.3 8.22 **
$i^L - i^H$	-0.85 -5.6 **	-0.80 -5.44 **	-1.30 -6.36 **	-1.32 -6.49 **
year	-0.11 -4.42 **	-0.03 -1.53 **	0.05 3.48 **	0.09 4.51 **
Repo eligibility	-1.04 -3.66 **			
Govt' guarantee available		-0.63 -2.03 *		
Non-resident withholding tax			0.047 0.29	
managed funds				-0.011 -2.43 *
	1,817 0.73	1,817 0.72	4,498 0.74 (1)	4,498 0.74 (1)

Table 4 ref. eqn.

Dependent variable is 1 if the bond is issued offshore and 0 is issued onshore.

Note: ** indicates significance to the 1% level; * indicates significance to the 5% level

Note: Columns 1-2 are estimated for Australian banks; columns 3-4 is for bonds issued by Australian residents.

1/ Index based cost.

Table 8
Effect of the international financial crisis

	Crisis dummy				
	Australia	Hong Kong	Japan	Singapore	Korea
log(Size)	-0.07 -2.67**	0.30 9.97**	-0.10 -2.26*	0.34 3.89**	0.47 3.78**
log(Tenor)	-0.13 -2.38*	0.32 8.04**	0.71 7.28**	-0.02 -0.1	0.50 1.86
Rating Index 3/	-0.04 -2.8**	1.26 3.36**	1.48 3.3**	4/	
Fixed	1.02 14.12**	0.27 4.17**	-1.41 -10.37**	-1.15 -4.9**	-0.12 -0.55
CA/GDP	-0.063 -2.13*	0.017 2.07*	-0.023 -0.34	-0.018 -0.62	-0.062 -1.21
CIP 1/	58.7 8.12**	0.0 -0.25	6/	-0.7 -0.92	0.5 1.77
$i^L - i^H$	-1.31 -6.4**	0.67 9.07**	5/	1.14 3.78**	-0.56 -5.22**
year	0.05 3.83**	0.07 3.51**	-0.12 -3.31**	0.14 1.6	-0.34 -1.21
crisis dummy	-0.01 -0.09	-0.80 -6.76**	0.46 2.45	-0.09 -0.1	0.14 0.38
	4,498	2,317	2,594	446	807
	0.74	0.16	0.29	0.46	0.56
Table 4 ref. eqn.	(1)	(4)	(6)	(7)	(8)

Dependent variable is 1 if the bond is issued offshore and 0 is issued onshore.

Note: ** indicates significance to the 1% level; * indicates significance to the 5% level

1/ Actual cost relative to AUD secondary market.

2/ This result (onshore but insignificant shift from govt guarantee) holds if estimated for major bank subsample.

3/ Rating index for Australia, sub-investment grade dummy for other countries.

4/ Sub-investment grade issuance only offshore.

5/ Foreign currency interest rates all higher than domestic interest rates.

6/ Dropped because of collinearity

Table 9
Sectoral estimates: financial institutions

	Australia	Hong Kong	Japan	Korea	Singapore
log(Size)	-0.08 -2.66 **	0.28 8.65 **	-0.15 -2.88	0.92 3.02 **	0.38 3.28 **
log(Tenor)	-0.15 -2.47 *	0.277 6.64 **	0.9278 7.79 **	0.408 0.71	0.0145 0.06
Rating Index	-0.057 -3.44 **	--	--	--	--
Sub-investment grade	--	1.13 2.59 *	1.016 2.16 **	2/	1/
Fixed	1.22 15.79 **	0.28 4.25 **	-0.66 -4.18 **	-0.87 -1.55	-0.764 -2.12 *
CA/GDP	-0.07 -2.32 *	0.03 3.93 **	-0.0049 -0.05	-0.015 -0.13	-0.03 -0.87
CIP	50.7 7.74 **	0.1 1.27	4/	2.03 2.8 **	-3.07 -2.12 *
$i^L - i^H$	-1.137 -6.18 **	0.664 8.43 **	5/	-0.436 -2.26 *	1.999 2.4 *
year	0.047 4.14 **	0.002 0.11	-0.081 -2.16 *	-0.32 -0.75	0.176 1.47
No obs.	3923	2167	725	313	156
Pseudo Rsq	0.74	0.11	0.26	0.76	0.46

Notes: Dependent variable is 1 if the bond is issued offshore and 0 is issued onshore.

** indicates significance to the 1% level; * indicates significance to the 5% level

The pseudo R^2 measures the improvement of the regression fit against a regression on a constant only.

/1 Sub-investment grade bonds only issued offshore.

2/ Small sample.

3/ Ratings only for offshore bonds.

4/ Dropped because of collinearity

5/ $i_{diff} > 0$ predicts offshore perfectly in the sample

Table 10
Sectoral estimates: nonfinancial corporates

	Australia	Hong Kong	Japan	Korea	Singapore
log(Size)	0.28 1.55	0.09 0.66**	1.46 1.56	0.30 1.98*	0.37 1.05
log(Tenor)	0.71 2.57*	0.55 2.23*	-0.038 -0.04	0.719 2.12*	-0.2477 -0.44
Rating Index	0.197 3.55**	--	--	--	--
Sub-investment grade	--	1/	4/	2/	1/
Fixed	-0.57 -1.84	0.04 0.1	3/	0.05 0.18	-1.299 -1.76*
CA/GDP	-0.095 -0.70	0.047 1.24	-1.277 -1.00	-0.113 -1.90	0.113 1.00
CIP	1/	0.047 1.24	4/	0.257 0.75	4/
$i^L - i^H$	2/	0.386 1.54	/5	-0.5766 -3.7**	4/
year	-0.006 -0.1	-0.138 -2.32	-0.081 -2.16*	-0.13 -0.51	0.031 0.12
No obs.	432	123	21	495	290
Pseudo Rsq	0.21	0.14	0.37	0.45	0.78

Notes: Dependent variable is 1 if the bond is issued offshore and 0 is issued onshore.

** indicates significance to the 1% level; * indicates significance to the 5% level

The pseudo R² measures the improvement of the regression fit against a regression on a constant only.

/1 Sub-investment grade bonds only issued offshore.

2/ Only offshore rating in dataset.

3/ Only fixed rate bonds issued onshore in the sample.

4/ Dropped because of collinearity.

5/ i_diff predicts success perfectly for the available sample.

Table 11

Detailed sectoral estimates: Australian data

	All	Corporate	Non-bank financials	Bank	Major Banks	ABS 3/
log(Size)	-0.074 -2.67*	0.280 1.5500	-0.062 -0.45	-0.534 -9.94**	-0.462 -6.56**	0.054 0.59
log(Tenor)	-0.13 -2.38*	0.71 2.57*	-0.23 -1.05	-0.36 -3.47**	-0.52 -3.45	0.27 1.44
Rating Index	-0.04 -2.82**	0.20 3.55**	-0.18 -3.38**	-0.28 -7.77**	0.05 0.48	-0.05 -0.81
Fixed	1.02 14.23**	-0.57 -1.84	1.04 3.59**	0.46 3.77**	0.46 2.87**	all fixed
CA/GDP	-0.064 -2.25*	-0.095 -0.70	-0.260 -2.46*	-0.161 -3.80**	-0.089 -1.43	-0.027 -0.31
CIP	58.7 8.14**	1/	186.0 0.00	37.4 6.37**	29.2 5.16**	1/
$i^I - i^H$	-1.31 -6.42**	2/	-5.09 0.00**	-0.80 -5.42**	-0.74 -4.94**	2/
year	0.05 4.67**	-0.01 -0.1	0.03 0.73**	-0.05 -2.6**	0.00 -0.07	0.09 2.25*
No obs.	4,498	432	242	1,817	1,214	1,474
Pseudo Rsq	0.74	0.21	0.54	0.72	0.73	0.04

Dependent variable is 1 if the bond is issued offshore and 0 is issued onshore.

Note: ** indicates significance to the 1% level; * indicates significance to the 5% level

1/ CIP not equal to zero predicts offshore issuance perfectly. Corporates typically lower rated than AA banks, so FC issuance looks like a bargain.

2/ Dropped because of collinearity

3/ Excludes sub-investment grade ABS issuance which is not issued publicly, but retained on bank balance sheets ("skin in the game").

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Motivations for swap-covered foreign currency borrowing

Anella Munro and Philip Wooldridge¹

1. Introduction

Borrowing denominated in foreign currencies soared during the 2000s.² Gross issuance of foreign currency bonds tripled between 2002 and 2007 to \$2.4 trillion, and even in 2008, during the international financial crisis, foreign currency borrowing remained relatively high (Figure 1). Issuance in some previously non-internationalised currencies, including a number of Asia-Pacific currencies, increased particularly fast (Figure 2). Indeed, for many currencies, issuance by non-residents outstripped the growth in issuance by residents, thereby expanding the presence of foreign issuers in the market (Figure 3).

A puzzling aspect of this large volume of foreign currency bonds is that many issuers immediately swap the funds raised into another currency, typically their own local currency. In other words, issuers raise foreign currency funding and simultaneously enter a currency swap to pay interest in local currency and receive interest in foreign currency, thereby replicating the cash flows associated with a local currency bond. What motivates borrowers seeking local currency financing to issue swap-covered foreign currency bonds rather than tap the local currency market directly?

The finance literature focuses on operational incentives as the main explanation for why borrowers tap foreign currency markets. Allayannis and Ofek (2001) examine a sample of S&P500 non-financial firms and find evidence that firms issue foreign currency-denominated debt to hedge currency exposures arising from foreign operations or foreign currency income. Kedia and Mozumdar (2003) obtain similar results for foreign currency debt issued in 10 major currencies by large US firms. Geczy, Minton and Strand (1997) and Graham and Harvey (2001) find that firms with greater growth opportunities and tighter financing constraints are more likely to use currency derivatives, as well as those with foreign exchange exposure and economies of scale in hedging.

Rising trade and investment flows undoubtedly contributed to the increase in foreign currency bond issuance during the 2000s. However, issuance rose faster than can be explained by such flows alone. For example, foreign currency issuance rose from about 10% of world exports in the late 1990s to more than 14% in 2006–07 (Figure 1). Moreover, non-financial corporations, which are the focus of most of the abovementioned empirical studies, are minor participants in foreign currency bond markets. Non-financial corporations accounted for less than 10% of foreign currency bond issuance during the 2000s. Financial institutions are the largest borrowers in foreign currency bond markets, followed by governments, and both are less likely than non-financial corporations to have an operational

¹ Senior Economists, Bank for International Settlements. We are grateful for comments from participants in seminars at the Bank for International Settlements, the Reserve Bank of Australia, and the Reserve Bank of New Zealand; for discussions with Fergus Edwards and Paul Daley; and for research assistance from Clara Garcia. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank for International Settlements.

² Bonds are categorised as “foreign currency bonds” when denominated in a currency different from that of the territory where the issuer principally resides and as “local currency bonds” when denominated in the same currency as that of the territory where the issuer principally resides. In this paper, no distinction is made between onshore and offshore issuance.

reason to borrow in foreign currency. Financial institutions and governments with no foreign operations or sales regularly seek to lower their financing costs by engaging in “opportunistic” swap-covered borrowing (McBrady and Schill, 2007).

Furthermore, in the few countries with comprehensive national data on derivatives positions, a substantial proportion of foreign currency borrowing is evidently swapped into local currency. In Australia, close to 85% of external debt liabilities denominated in foreign currencies are hedged with financial derivatives into Australian dollars (Becker et al, 2005). In New Zealand, about 81% of foreign currency liabilities are hedged into New Zealand dollars (Statistics New Zealand, 2008).

The literature on swap-covered interest parity indicates that price differences across markets are actively arbitrated. In the most liquid markets, prices can adjust to new information without any trading taking place and so are unlikely to deviate significantly from their no-arbitrage levels. In less liquid markets, prices are slower to adjust and, therefore, temporary arbitrage opportunities may explain some swap-covered borrowing. However, if temporary, then opportunities for arbitrage should decline over time. The growing participation of non-residents in local currency markets, shown in Figure 3, and the large volume of swap-covered borrowing in some well developed markets indicates that the factors that give rise to swap-covered borrowing may be persistent.

Drawing on the literature on debt issuance, we consider a range of market imperfections and frictions that may result in persistent gains from raising local currency financing indirectly, on a swap-covered basis, rather than directly. Transactions costs, market size, market incompleteness, information asymmetries and regulatory frictions all potentially contribute to the attractiveness of swap-covered borrowing. We take these propositions to a large database on debt issuance, examining the characteristics of bonds issued by residents in foreign currency and by non-residents in local currency, natural swap counterparties with potentially comparative cost advantages. We find that the relative characteristics of resident and non-resident counterparties’ issuance are consistent, in terms of credit quality, maturity, coupon structure, with the implications of many of the motivations considered. The counterparties’ characteristics are significantly different in several respects, consistent with some of the hypotheses put forward.

While this paper has a finance focus, it is also relevant to the macroeconomic literature on financial crises. Many past crises were exacerbated by currency and maturity mismatches on firms’ or banks’ balance sheets. Countries’ vulnerability to such mismatches is sometimes attributed to residents’ inability to borrow abroad in their own currency (“international original sin”, which leads to currency mismatch) or to borrow long term in the domestic market (“domestic original sin”, which leads to maturity mismatch).³ Credible macroeconomic policies that protect the value of debts denominated in local currency, such as a commitment to low inflation, fiscal prudence and a transparent exchange rate policy, are necessary if non-residents are to buy local currency debt. But sound macroeconomic policy does not appear to be sufficient in some emerging markets. This paper looks in more detail at the microeconomic level. Swap-covered borrowing may offer a way to overcome currency or maturity mismatches, through the use of foreign debt markets. However, it is not a panacea. Against any benefits must be weighed the risks and regulatory demands associated with a more complex form of financing, as well as the consequences for the development of local capital markets. Moreover, if there are benefits to be exploited from swap-covered borrowing, they can only be realised if regulations, particularly exchange controls, allow. Residents must be able to borrow in foreign currency, non-residents in local currency, and both must be permitted to engage in currency swaps.

³ The term “original sin” was first used by Eichengreen and Hausmann (1999).

The rest of the paper proceeds as follows. Section 2 provides an overview of the size and structure of cross-currency swap markets. Section 3 explores potential motivations for swap-covered foreign currency borrowing, and Section 4 takes the implications of these motivations to the data on foreign currency bond issuance. Section 5 discusses the risks of swap-covered borrowing. The final section concludes with policy lessons and areas for future research.

2. Currency swap markets and international bond markets

Swap-covered foreign currency borrowing presumes the existence of a currency swap market. Currency swaps are over-the-counter derivatives. They can be characterised as an exchange of a loan in one currency for a loan in another currency. The principal amount is usually exchanged at both the initiation and termination of the swap, and interest payments are exchanged during its life. Interest can be paid at either a fixed or a floating rate. While plain vanilla currency swaps take the form of fixed-for-floating rates, there are a bewildering variety of ways in which currency swaps can be structured. Currency swaps can be negotiated for any maturity, but they are typically used for medium- and long-term transactions, out to several decades for some currencies.⁴

Currency swaps were introduced in the 1970s and their use has expanded enormously since then. According to the BIS Triennial Central Bank Survey, the average daily turnover of currency swaps rose from \$3.8 billion in April 1995 to \$31.5 billion in April 2007 (Table 1). The nominal value of outstanding swaps rose from \$2.0 trillion to \$14.1 trillion over the same period.

An important innovation in currency swap markets was the shift in the 1990s towards trading currency basis swaps, in which floating rate payments in one currency are exchanged for floating rate payments in a different currency. A currency swap can thus be decomposed into a combination of a cross-currency basis swap and single-currency interest rate swaps. Currency basis swaps are typically quoted against US dollar Libor. A basis swap spread of x basis points indicates that a counterparty wanting to swap US dollars for a foreign currency loan must pay x basis points above the benchmark floating rate on foreign currency funds in return for US dollar Libor. As shown in Figure 4, currency basis swap spreads for many currencies were positive over the 2005–07 period and then turned negative in 2008.⁵

In the 2000s, the trading of currency swaps increased noticeably for many currencies. Whereas in April 2004 there were only seven currencies in which turnover exceeded \$400 million a day, in April 2007 there were 15 currencies with turnover above \$400 million, including the South Korean won, the South African rand and the Hong Kong dollar.

The development of currency swap markets is closely related to the participation of non-residents in local currency markets and, no less important, the participation of residents in foreign currency markets. By definition, the currency exposures and preferences of non-residents differ from those of residents. Residents of one territory do not generally have a need for funding in the currency of another territory. Therefore, there is a natural symbiosis between resident and non-resident market participants. In currency swap markets, as in

⁴ For short-term transactions, up to one year, foreign exchange (FX) swaps are more widely used. Unlike currency swaps, FX swaps do not involve an exchange of payment streams; only the principal amount is exchanged.

⁵ The downward move in spreads in 2008 likely reflected a combination of supply pressures and changes in the risk characteristics of the underlying money market instruments. See Baba and Packer (2008) for a discussion.

other segments of foreign exchange markets, controls that restrict transactions between residents and non-residents tend to depress trading activity (Tsuyuguchi and Wooldridge, 2008).

While investors can participate in currency swap markets, the participation of issuers appears to be especially important for the development of these markets. Issuance by non-residents of bonds denominated in a given currency has significant explanatory power for the turnover of currency swaps in that currency (Figure 5a). In other words, countries with large non-resident participation in their bond markets relative to GDP tend to have large currency swap markets. New Zealand and Switzerland are at one extreme and many emerging market currencies are at the other. The relationship between issuance by residents of bonds in foreign currencies and local currency swap activity is weaker but still positive (Figure 5b).

It is unclear whether foreign currency issuance is a precondition for the development of a currency swap market. For example, Korea has a large currency swap market even though few non-residents borrow in Korean won. What is clear is that activity in one market supports activity in the other. This self-reinforcing relationship is consistent with the contention, put forth by McBrady and Schill (2007) among others, that internationally active bond issuers are the arbitrageurs who effectively link global bond markets.

3. Motivations for swap-covered foreign currency borrowing

There are two commonly cited explanations for the use of swaps: risk management and comparative advantage (Kolb, 2000). Risk management is undeniably an important motivation for the general use of currency swaps. When either the operations or the desired financial structure of a firm changes, currency swaps are a cost-effective way to transform risk exposures and alter future cash flows. However, changes in operations and financial structures cannot explain swap-covered borrowing; by definition, such borrowing is intended to replicate risks, not to transform them. Bond issuers raising funds in one currency with the express intention of swapping the funds for another currency are choosing to replicate cash flows that could be also be achieved by borrowing directly in the desired currency.

Comparative advantage is a more convincing motivation for swap-covered foreign currency borrowing. Indeed, central banks in countries with large volumes of swap-covered borrowing frequently cite comparative advantage as the key motivation for such borrowing (eg see Eckhold, 1998; Drage et al, 2005; Olafsson, 2005; Ryan, 2007). In financial markets, comparative advantage exists when the same risk is priced differently in different markets. If borrowing costs differ across markets, then issuers can reduce their overall financing costs by raising funds in the market in which each has a comparative cost advantage and swapping the proceeds.

Covered interest parity

The existence of comparative advantage creates opportunities for arbitrage. As arbitrage takes place, costs should converge consistent with covered interest rate parity. Empirical support for long-term swap-covered interest parity is weak relative to short-term covered interest parity using forward contracts.⁶ Most studies find that deviations from long-term interest parity are small on average but can be large and persistent. Popper (1993) estimates

⁶ On short-term interest parity, see Taylor (1987) and Peel and Taylor (2002).

mean absolute deviations of 15 to 50 basis points among major currencies for the period 1985–88. Fletcher and Taylor (1996) adjust for transactions costs and estimate deviations of 12 to 33 basis points for the period 1985–89.

The persistence of deviations from covered interest parity does not necessarily prove the availability of arbitrage opportunities. Measured deviations may reflect underlying risks. In other words, estimated differences in borrowing costs across markets may compensate for risks and so, on a risk-adjusted basis, may not indicate a comparative cost advantage. Turnbull (1987) suggests that spread differences for seemingly identical risks reflect compensation for credit risk taken on by the higher quality counterparty in a swap agreement. Counterparty credit risk can be important for currency swaps because they involve an exchange of both principal and interest payments, in contrast to interest rate swaps where only interest payments are exchanged (Duffie and Huang, 1996). Similarly, currency basis swap spreads incorporate differences between the credit risk embedded in the money market rates of one currency and that in the other currency (Tuckman and Porfirio, 2003). For example, if the non-dollar leg of a currency basis swap is based on a collateralised rate, such as a rate for bankers' acceptances, and the US dollar leg is based on Libor, an unsecured bank lending rate, then the swap spread is fairly priced only when positive.

Nevertheless, several studies find that issuers systematically respond to estimated deviations from interest parity. Cohen (2005) finds that the choice of currency in international bond issuance is influenced by currency strength and interest rate differentials, suggesting a role for expected, uncovered interest returns. McBrady and Schill (2007) examine "opportunistic" foreign currency issuance by firms with no foreign currency revenues over the period 1993–97. They find that uncovered interest "bargains" of 10 to 20 basis points are common and persistent and that the choice of issuing currency is influenced by differences between local and foreign funding costs.

Even if there is no observed deviation from covered interest parity, if market imperfections and frictions give rise to asymmetries between markets that can be arbitrated through swap-covered borrowing, large volumes of swap-covered foreign currency borrowing may persist in order to maintain swap-covered interest parity. Imperfections vary significantly among markets. In general, large financial markets, particularly US dollar and euro markets, more closely meet the ideal of a complete market than small markets, such as Philippine peso or Indian rupee markets.⁷ Differences among markets potentially give issuers more favourable access to one market than to another, thereby raising the possibility that issuers can gain by exploiting their comparative advantage and engaging in swap-covered borrowing.

The remainder of this section focuses on four types of market imperfections that potentially give rise to cross-border arbitrage opportunities: transactions costs, non-traded assets, agency and information problems, and regulations. The importance of each of these as a motivation for swap-covered foreign currency borrowing is likely to differ across markets and change over time. In liquid, complete markets, prices can adjust to new information without any trading taking place and so arbitrage is unlikely to explain why issuers engage in swap-covered borrowing. In less liquid markets, prices are slower to adjust and thus arbitrage opportunities may exist, but probably only temporarily. In illiquid, incomplete markets, arbitrage opportunities may be substantial and persistent.

⁷ There are exceptions. For example, yen financial markets are the third largest in the world but sterling markets are widely perceived to be more developed. For a ranking of financial sector development, eg see World Economic Forum, 2008.

Transactions costs

At the simplest level, the existence of transactions costs would tend to favour borrowing directly rather than through a more complex route involving multiple transactions. Transactions costs, however, differ substantially among markets. In financial markets, some types of transactions costs are a decreasing, non-linear function of volumes. For example, the maintenance of trading systems involves fixed costs and, therefore, total trading costs decline as volumes increase. In addition, the heterogeneity of market participants is often greater in large markets, thereby reducing search costs. The self-reinforcing nature of market liquidity strengthens the link between transactions costs and volumes: the willingness of a market participant to transact in a given market depends on the willingness of other participants to do likewise (CGFS, 2000). As a result, transactions costs can differ significantly for nearly identical instruments.⁸

In a small market, the volume of transactions in any given instrument will naturally be smaller than in a large market, and transactions costs will be correspondingly higher. If the relationship between volumes and transactions costs is convex, then the cost difference of issuing a large bond in a small market compared to a large market may be less than the difference to issuing a small bond. Owing to differences in *relative* transactions costs, issuers from small markets, especially issuers of small bonds, may be able to lower their borrowing costs by tapping more liquid markets.

In addition to varying with volumes, transactions costs often vary with the riskiness of the traded instrument. Chakravarty and Sarkar (1999) find that both trading volumes and risk are equally important determinants of bid ask spreads in US fixed income markets: spreads decline with trading volume and increase with the bond yield and residual maturity. Consequently, relative transactions costs for risky bonds, including low-grade bonds and long-duration bonds, may be lower in large markets.

Transactions costs can be broadly defined to include enforcement and bankruptcy costs. Enforcement procedures are simpler in certain jurisdictions. In the international bond market, contracts are predominantly governed by English law, regardless of the residency of the issuer or the currency in which the bond is denominated. The probability of a creditor needing to take enforcement action varies according to the credit quality of the borrower and, therefore, low-grade borrowers from markets where enforcement costs are high may be able to lower their financing costs by committing to contracts settled in more creditor-friendly jurisdictions, and swapping the proceeds with a non-resident borrower that can signal high credit quality and issues debt in the market with weak enforcement. While this is primarily a motivation for offshore borrowing (the borrower from the weak-enforcement market could issue in the desired currency in the euromarket), if offshore use of a currency is restricted then differences in the legal and information environments can also motivate an exchange of borrowings between low-grade and high-grade borrowers.

Transactions costs may also help to explain why issuers, rather than investors, appear to be the main arbitrageurs in international bond markets. Investors typically trade in smaller volumes than issuers; one bond issue is typically bought by many investors. If investors are willing to assume credit risk but not currency risk, then it is likely to be cheaper for the issuer to bundle a currency swap together with a foreign currency bond than for multiple investors to buy a foreign currency bond and swap out the currency risk.

⁸ For example, in government securities markets, bid-ask spreads are usually much narrower for recently issued ("on-the-run") bonds than for off-the-run issues (see eg CGFS, 2000; Fleming, 2002).

Non-traded assets

The literature on non-traded assets⁹ identified a variety of reasons why markets may be segmented and incomplete and, in turn, diversification in international financial markets may be difficult.¹⁰ The range of assets traded differs substantially among markets. The absence of a particular type of asset may arise from either a lack of supply or a lack of demand. The structure of an investor's liabilities may create demand for particular types of assets; conversely the structure of a borrower's assets may create demand for a particular form of funding. This can make it difficult for investors to optimise their portfolios to meet their investment objectives, and make it difficult for borrowers to raise funding without one or the other taking on additional risk. Consequently, investors may end up shunning certain risks altogether. Generally, smaller markets tend to have more non-traded assets than larger markets. The juxtaposition of assets that are traded in one market but not in another can create opportunities for arbitrage.

An important asset missing in some markets is bonds with minimal default risk, ie bonds with the highest, AAA credit ratings. National governments are typically the most creditworthy borrowers in their own currency. In countries where the government is not very creditworthy (for example because it has a history of poor macroeconomic management), there are unlikely to be other resident issuers with (international) AAA credit ratings. There is usually a "sovereign ceiling", which caps the perceived creditworthiness of borrowers in a country. Even in countries where the government is very creditworthy, there may be a scarcity of highly rated debt because fiscal prudence restricts the supply of government debt. Swap-covered borrowing involving a highly rated non-resident issuer allows issuers to fill the void, benefiting from the tighter credit spread on top-rated bonds relative to lower-rated bonds.

Another important asset missing in some markets is long-term, fixed-rate bonds, ie bonds with maturities beyond five years paying a fixed (as opposed to a floating) coupon. In countries with a history of poor macroeconomic management, a high degree of economic uncertainty can cause investors to avoid such investments. Even in countries with a stable policy environment, investors may be constrained (by regulation or by liability structure) from buying long-term, fixed rate bonds, or may prefer not to because of risk preferences. As a result, the cost of issuing a long-term, fixed rate bond can vary significantly among markets.

Other important assets missing in some markets are foreign exchange, interest rate and credit derivatives. Derivatives facilitate the unbundling of risks.¹¹ Local currency bonds are typically exposed to exchange rate, interest rate and credit risks, which investors may be willing to bear individually but not in combination, particularly if these risks are correlated (for example, domestic credit risk may be correlated with currency risk).¹² If instruments are

⁹ See Cuthbertson (1957) for a discussion of heterogeneous clienteles as an explanation for the term structure of interest rates; Modigliani and Sutch (1966) on preferred habitat (bond investors prefer one maturity over another, for example to match their liabilities, and are only willing to buy bonds outside of their maturity preference if a risk premium is paid). Svensson and Werner (1993) examine portfolio choice and asset pricing when some assets are non-traded, for example, when a country cannot trade claims to its output on world capital markets. Vayanos and Vila (2007) present a model in which arbitrageurs integrate markets.

¹⁰ See French and Poterba (1991), Baxter and Jermann (1997) on the extent of the lack of diversification and Obstfeld and Rogoff (2000) in the context of a broader discussion.

¹¹ Burger and Warnock (2007) find that high variance and negative skewness deter US investors from investing in foreign bonds markets. To the extent that these risks can be hedged or unbundled (eg they are credit or market risk), there may be gains to swap-covered borrowing; to the extent that they are the result of poor macroeconomic management, swap-covered borrowing may not overcome them.

¹² For example, if, in times of stress, the credit quality spread rises (the price of the bond falls) at the same time as the minor currency depreciates (flight to quality to the US dollar), then a highly rated non-resident will be in a position to unbundle those risks relative to a lower-rated domestic bond.

available in one market to unbundle risks but not in another, then this can create opportunities for arbitrage. Investors seeking exposure to credit risk may be willing to buy bonds issued by low-grade foreign borrowers, which potentially reduce the idiosyncratic risk in their portfolios but, in the absence of a liquid currency swap market, do so only in a given currency. For investors seeking exposure to exchange rate or interest rate risk, local currency bonds issued by high-grade non-residents may be in greater demand than bonds issued by lower-grade residents in the absence of a liquid credit derivatives market. Herrera Pol (2004) suggests that strong demand for the World Bank's issues of international bonds in minor currencies is explained in part by investors' preference to take on minor currency risk separate from credit risk. If issuers can unbundle risks for investors, then they may achieve lower borrowing costs. Common themes in discussions with market participants are segmentation of markets for currency risk and credit risk, and difficulty among domestic issuers in placing domestic currency debt directly.

Agency and information problems

Agency and information problems are omnipresent in financial markets but are more acute in some markets than others. In particular, the effectiveness of mechanisms to mitigate agency and information problems varies considerably. Some countries have weak disclosure requirements, poor accounting practices, opaque corporate governance rules, and concentrated ownership structures. Such information asymmetries contribute to home bias, whereby investors hold a larger share of local assets in their portfolios than would be optimal in a well diversified portfolio. Stulz (1981) constructs a simple model of international asset pricing in which there is a cost associated with holding risky foreign assets and shows that they will not hold some foreign assets, even if the return is increased slightly.¹³ Furthermore, local investors tend to be better informed than foreign (distant) investors. For example, for a sample of 32 countries, Bae, Stulz and Tan (2008) find that local analysts' earnings forecasts are more precise than those of analysts based in countries far from the company being analysed.

Moreover, borrowers from countries where mechanisms to mitigate agency and information problems are weak may be able to expand their investor base, thereby lowering their financing costs, by committing to contracts that require them to adhere to higher standards. Foreign bond markets potentially serve this purpose.^{14, 15} This is primarily a motivation for offshore borrowing, but if offshore use of a currency is restricted then it may be mutually advantageous for borrowers from markets with weak standards to issue abroad in foreign currency and swap with borrowers that are able to signal higher standards.

¹³ See also Stulz (2005) which discusses agency problems in the context of foreign investment and Alfaro et al (2008) which examines explanations for the Lucas paradox (the lack of capital flows from rich to poor countries). and finds institutional quality to be the most important.

¹⁴ Banks play an important role in overcoming agency and information problems. For example, Hale and Santos (2008) find that firms with a record of high creditworthiness and low creditworthiness enter the public bond market (investment grade market and high-yield markets respectively) before firms with an intermediate reputation. Moreover, a firm's relationships with investment banks in connection with private bond issues and syndicated loans may speed entry into the public bond market by allowing the firm to signal higher credit quality.

¹⁵ The literature on equity cross-listings finds some evidence of higher valuations for firms listed in the US due to greater disclosure (Doige, Karolyi and Stulz (2004)). This argument is weaker for bonds however as disclosure requirements tend to be weaker.

Regulations

Regulatory barriers, such as taxes, reporting requirements and exchange controls, can create significant differences in financing costs between markets. Moreover, these differences can persist until there are changes to the regulatory wedge (Smith et al, 1986). Regulatory barriers are commonly imposed by governments or government agencies. Market participants themselves may also create regulatory barriers, for example through investment mandates that restrict the range of investible assets.

The list of potential regulatory barriers is long and many create cost differences between onshore and offshore borrowing. Regulatory barriers were pivotal factors in the growth of offshore markets for US dollars. To the extent that regulatory barriers restrict the offshore use of a currency, they may also motivate swap-covered borrowing. Indeed, currency swaps evolved out of instruments structured to circumvent exchange controls. In the 1970s, the United Kingdom restricted capital outflows. Firms planning foreign investments circumvented the restrictions through a parallel loan, in which a UK company made a sterling loan to the UK subsidiary of a foreign company and the foreign company lent the equivalent amount in foreign currency to the foreign subsidiary of the UK firm (Clark, 2004).

Even in the absence of exchange controls, there are other regulatory barriers that can give different advantages to resident and non-resident borrowers. Restrictions that effectively segment low-grade and high-grade markets are one potentially important source of comparative advantage. For example, assets eligible for use as collateral in central banks' lending operations often trade at a premium because the available supply is limited. High-grade bonds issued by non-residents are sometimes eligible, potentially creating an opportunity for such borrowers to lower their financing costs by engaging in swap-covered borrowing. Furthermore, many institutional investors are restricted by mandate from investing in low-grade bonds. These restrictions are less distortionary in markets with heterogeneous investor bases, such as large markets, and so low-grade borrowers may gain from issuing in larger markets and swapping the proceeds. Mandates that restrict the range of investible assets or the use of derivatives may also be a factor in explaining why arbitrage opportunities in international bond markets are exploited more actively by issuers rather than investors.

The market imperfections and frictions discussed above have a number of implications for the characteristics of swap-covered foreign currency bond issuance if such issuance is used to overcome those market rigidities. In the next section, we draw out those implications and compare them to the characteristics of bonds and issuers.

4. Data and empirical results

From the discussion in Section 3, it follows that if market imperfections and frictions are key motivations for swap-covered borrowing, then there should be clear differences in the characteristics of foreign currency bonds issued by those engaged in such borrowing and on opposite sides of the currency swap. In particular, for any country or currency bloc, there should be clear differences between foreign currency bonds issued by residents and local currency bonds issued by non-residents. We examine these differences for 13 Asia-Pacific countries and find that bond characteristics are generally consistent with issuers seeking to arbitrage cost differentials.

Data sources

Data on individual bond issues are obtained from the international debt securities database compiled by the BIS. This database combines information from several commercial data providers, namely Dealogic, Euroclear and Thomson Financial. The BIS seeks to capture all foreign currency bonds (foreign bonds and eurobonds) as well as local currency bonds

marketed to foreign investors, such as the international tranches of global bonds. The coverage of foreign currency bonds is close to complete.

Characteristics recorded for every bond in the database include: date of issue, original term to maturity, issue size, coupon structure (fixed or floating), currency and market of issue, type of issue (bond or medium-term note), and residency and industry sector of the issuer. The credit rating of the bond at the time of issue is also captured, but not for all bonds. Our sample covers the 1990–2008 period. We exclude bonds with an original maturity of less than one year because coverage is incomplete for short-term funding instruments. The BIS database includes neither US commercial paper nor interbank placements, which are close substitutes for money market instruments. We also exclude convertible (equity-linked) bonds because the funds raised are typically not swapped by the issuer.

From the BIS database, we extract all foreign currency bonds issued by residents of 13 Asia-Pacific economies: Australia, China, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand and Chinese Taipei. We also extract all bonds denominated in the currencies of these same 13 economies and issued by non-residents. This results in 26 sub-samples. Bonds issued by residents of offshore financial centres and not denominated in the local currency of the centre are classified as foreign currency bonds regardless of the nationality of the issuer. For example, a Hong Kong dollar bond issued by the Cayman Islands-based subsidiary of a Hong Kong firm is classified as a Hong Kong dollar issue by a non-resident.

The number of observations in the 26 sub-samples varies enormously. The number of foreign currency bonds issued by Asia-Pacific residents ranges from 10,016 by Australian residents to 22 by Taiwanese residents. The number of bonds denominated in Asia-Pacific currencies issued by non-residents ranges from 79,220 in Japanese yen to four in Chinese renminbi.

For each of the 13 countries and every bond characteristic of interest, we test for differences between the distribution of foreign currency bonds issued by residents and the distribution of local currency bonds issued by non-residents. The distributions are typically severely skewed, and so we use a non-parametric test: the Wilcoxon-Mann-Whitney test, corrected for tied ranks (eg see Siegel and Castellan, 1988). The null hypothesis tests whether the two sets of observations do not differ systematically from each other. The alternative states that they do differ systematically, implying that they are not samples from the same population. We calculate size-weighted means, to account for skewness in issue sizes, as well as equally weighted means.

One important piece of information missing in our sample is whether the issuer swapped the funds raised into another currency. As a result, our sample is biased against finding patterns consistent with arbitrage by issuers. Swap-covered borrowing is surely not the sole motivation behind all foreign currency bonds in our sample, and so using the sample to test whether market imperfections can explain issuer behaviour reduces the probability of a type II error but heightens the probability of a type I error.

Results

There are several potential ways to compare the characteristics of the bond data with the implications from the previous section. Here we present a univariate analysis contrasting characteristics of bond issues in foreign currencies by residents of a given market with the characteristics of issues in the local currency of the same market by non-residents. Summary statistics are presented in Tables 2 to 9. Histograms are plotted in Figures 6 to 9.

Currency of issuance

Table 2 compares the currency composition of foreign currency bonds issued by Asia-Pacific residents with the residency composition of local currency bonds issued by non-residents. Foreign currency issuance is highly concentrated in the US dollar market. Concentration is lowest among Australian and New Zealand issuers, who borrow large amounts of euro and minor currencies in addition to US dollars, and highest among Indian issuers (a small sample). The US domestic market accounts for about 40% of global domestic debt markets, as reported in BIS statistics. In contrast, the share of US dollar issuance among residents of these Asia-Pacific countries is typically much higher.¹⁶ For local currency bonds issued by non-residents, the distribution of issuance across currencies is less concentrated, consistent with the notion that differences across markets create opportunities for gains from trade.

The concentration in US dollar borrowing could relate to a several characteristics of the US market, including a large low-grade market (lower costs or stronger risk assessment infrastructure), size of the term market (lower costs), flexibility from a (usually) liquid short-term commercial paper market. If transactions costs are a convex, decreasing function of volumes, and different market segments (in the domestic or foreign market) have different volumes there may be gains from swap-covered borrowing with a non-resident with different characteristics. Foreign currency bonds issued by residents of a smaller or more segmented markets will tend to be denominated in currencies of larger markets, where the difference in costs between market segments is smaller. Conversely, bonds issued by non-residents in the smaller or more segmented market will tend to be issued by residents of large markets (to provide a swap counterparty). Credit quality and maturity are discussed in more detail below.

Issue size

Table 3 and Figure 6 summarise distributions by issue size. For 10 of the 13 comparisons, the mean size of foreign currency bonds issued by residents is larger than that of local currency bonds issued by non-residents. This result does not support the hypothesis that convex and decreasing transactions costs play a role (which would suggest that foreign currency bonds issued by residents of small markets would tend to be smaller in size). Instead it supports the idea that residents issue in a foreign currency to access a larger or more liquid market, while non-residents issuing in local currency are limited by market size or market liquidity.

Credit quality

Table 4 summarises the distribution of credit ratings for foreign currency bonds issued by residents and local currency bonds issued by non-residents. Lower numbers correspond to higher credit ratings, eg 1 = AAA. For all cases except Japan, the credit ratings of bonds issued by non-residents are significantly higher than those of bonds issued by residents. Differences in the distribution of credit ratings are consistent with low-grade and high-grade borrowers exploiting a comparative advantage to lower their borrowing costs. Such an advantage could arise from differences in transactions costs, enforcement costs, non-traded assets, or regulations.

As shown in Figure 7, this result is mainly due to the fact that non-resident issuance is concentrated in the AAA segment of the market. If there are few domestic high grade issuers (eg because of a low sovereign ceiling, or because of fiscal prudence) leading to a scarce or

¹⁶ Only in New Zealand is it lower, but that may be because New Zealand banks borrow through their Australian parents.

non-traded high-grade asset in that currency, then non-residents issuing bonds in that currency will tend to be highly rated (eg greater than or equal to the sovereign ceiling). Regulations may reinforce this from the demand side, if certain classes of investors (eg pension funds or assets accepted as collateral) are restricted to high-grade debt.

Enforcement mechanisms may also play a role. If there are differences across markets in enforcement mechanisms to mitigate agency and information problems, then residents of weaker enforcement areas will tend to issue foreign currency bonds in markets that adhere to higher standards, and local currency bonds issued by non-residents will be issued by residents of areas that adhere to higher standards or by borrowers who can otherwise signal credit quality such as international organisations.

Industry sector

As a cross-check on the distribution of credit ratings, we also compare the distribution of issuers by industry sector. Whereas data on credit ratings are incomplete, data on industry sectors are available for the issuer of each bond. Credit ratings and industry sectors are loosely correlated. Supranational institutions and national governments from high-income countries tend to be the highest-rated issuers, with AAA or AA ratings. Financial institutions are typically rated AA or A, and non-financial corporations A or lower. However, bond issues may be rated either higher or lower than the issuer, depending on credit enhancements, subordination, and other contractual clauses.

In nine of the 13 comparisons, resident issuers of foreign currency bonds came from sectors that tended to be lower rated than the sectors from which non-resident issuers of local currency bonds came (Table 5). Among both resident and non-resident issuers, banks and non-bank financial institutions were the dominant issuers (Figure 8). However, there were important differences in the industry sector of the next largest group of issuers. Among non-resident issuers supranational institutions and governments were active, whereas among resident issuers non-financial corporations were more active.

Maturity

If differences across markets in the demand for and supply of funding lead to a relatively small or illiquid long-term bond markets, then foreign currency bonds issued by residents of the smaller market will tend to have a longer term to maturity relative to local currency bonds issued by non-residents. There is weak support for the notion that residents tap foreign currency markets for longer-term funding. The maturity of foreign currency bonds issued by residents is often, but not always, longer than that of local currency bonds issued by non-residents (Table 6 and Figure 9). In eight of the 13 comparisons, the maturity of foreign currency bonds is longer. In four comparisons, the maturity of local currency bonds is longer. In one case, the Philippines, there is no significant difference, although the issue weighted-mean maturity is longer for foreign currency bonds.

Coupon structure

If differences across markets in the demand for and supply of funding lead to a relatively small or illiquid fixed coupon bond markets, then foreign currency bonds issued by residents of the smaller market will tend to have a greater proportion of fixed rate structures relative to local currency bonds issued by non-residents. The data do not support that hypothesis. Fixed rate bond issues account for a smaller share of foreign currency bond issues by residents than they do for local currency bond issues by non-residents (Table 7). In eight of the 13 comparisons, this is the case. In four comparisons, there is no significant difference in interest rate structures. Only in one case, Indonesia, do residents appear to tap foreign currency markets for fixed rate funding.

Foreign bond or Eurobond

Foreign currency bonds can be issued as either “foreign” bonds or “Eurobonds”. Foreign bonds are issued onshore, in the currency of the market where the bond is registered, whereas Eurobonds are issued offshore, in a currency different from that of the market where the bond is arranged. Reporting requirements are typically more extensive for foreign bonds than Eurobonds. However, issuers do not appear to use foreign currency bonds as a device to commit to higher reporting standards. The Eurobond market is clearly the market of choice for foreign currency issues (Table 8). In only four cases – residents of China, Malaysia, Thailand and Chinese Taipei – are issuers more likely to issue foreign bonds than Eurobonds. All four countries have exchange controls that deter offshore use of the currency. Among the five substantial markets in terms of size (Australia, Hong Kong, Japan, New Zealand and Singapore) issuance is very skewed toward Eurobonds. Peristiani and Santos (2008) report that, 10 years ago, it was cheaper to issue a bond in the US market, and that underwriting costs have declined over the decade. Eurobond costs, however, have fallen faster, eliminating the cost differential.

Single or multiple issue

We also considered whether a bond was issued as a single issue or part of a medium-term note (MTN) programme. A single bond issue often requires extensive documentation, whereas under a MTN programme the same documentation can be used for multiple securities.¹⁷ Therefore, MTNs are less effective devices for committing to higher reporting standards. Local currency bonds issued by non-residents are overwhelmingly MTNs (Table 9). For residents of Australia, Hong Kong, New Zealand and Singapore (the more developed international bond markets and higher rated countries) foreign currency bonds issued by residents are also almost all MTNs. In most other Asia-Pacific economies, residents’ issues are usually single issues. These patterns provide some support for differences in reporting standards as a motivation for swap-covered borrowing. Alternatively, they may simply reflect the role of large, regular borrowers as the arbitrageurs in international bond markets.

5. The risks of swap-covered funding

The use of foreign currency bonds to raise local currency debt indirectly can pose risks to the financial stability of both the borrower and the borrowing economy. Swap-covered debt is a more complex product than direct borrowing, so puts greater demands on the risk management capacity of the borrower and the regulator in terms of currency risk, counterparty risk, rollover risk, and interest rate risk. Of these the most important is probably rollover risk, particularly where there are large net or gross external debt positions. In this section, these risks are discussed in turn, followed by a brief overview of how they played out in Australia and New Zealand in 2007-08, two countries with substantial net external debts funded in part through swap-covered borrowing. The discussion reinforces the importance of strong risk management, a sound banking system, the ability and willingness of governments to provide temporary support and the benefits of domestic savings and more stable forms of external funding such as foreign direct investment.

¹⁷ Each new MTN requires only a pricing supplement setting out the terms of the issue. MTNs are typically issued by large borrowers, who regularly disclose information, and they are frequently tailored to satisfy specific investor preferences.

External debt and rollover risk

An important concern associated with synthetic local currency borrowing is a rapid increase in external indebtedness. Where it has been widely used, there are typically large gross or net external debt positions. Many of the potential motivations discussed in Section 3 suggest that borrowers previously restricted to borrowing local currency directly may be able to access cheaper funding or a wider pool of funding by overcoming market rigidities. Greater access to external funding may in turn lead borrowers to increase financial leverage, while increasing exposure to external wholesale funding. The risks, of course, need to be weighed against the benefits of financial integration and the extent to which they can be mitigated through prudential supervision.

The bulk of swap-covered financing involves financial intermediaries, and so maturity mismatch is a potential concern. Maturity mismatch may lead to rollover risk on two levels: during the tenor of the swap and at maturity of the swap. If the swap does not match the foreign currency debt and local currency assets in terms of tenor and coupon structure, as well as currency, then the borrower may face currency risk, rollover risk and interest rate risk.

Even if the swap matches assets and liabilities, rollover risk will re-emerge at maturity of the swap if the debt needs to be rolled over (for example, if net external debt is large). The rollover risks may be large for swap-covered borrowing which relies on wholesale funding sources. The same is true for wholesale funding in local currency. Both tend to be less stable than the domestic deposit base which typically benefits from deposit insurance. Wholesale borrowing is normally not covered by government deposit insurance, and is likely to be less stable during a crisis.

Non-resident investors may be a particularly unstable funding source, providing funding during expansions when the local currency is expected to appreciate, and withdrawing funding during times of stress if the local currency is expected to depreciate. The ability to substitute domestic funding for large volumes of external funding (direct or swap-covered) may be very limited. Large net debt suggests weak domestic savings performance. The private savings rate may increase by a few percent relative to GDP, but the increase in savings may be small relative to gross external financing requirements in the event of severe external funding stress. Moreover, with integrated markets, external funding pressures are likely to spread quickly to domestic markets. In the event of severe stress public savings will almost certainly be called upon, where feasible, to fill the funding gap if the net debt is large.

Swap-covered borrowing requires rollover in both funding and hedging markets. This added complexity may increase risk relative to external local currency funding. Allayannis et al (2003) look at a sample of East Asian non-financial borrowers and find that, during the Asian crisis, the financial performance of firms that used synthetic local currency debt was worse than those that relied on direct local or foreign currency borrowing. They attribute this result to the illiquidity of swap markets, which made it expensive for firms to roll over short-term derivative positions used to hedge long-term debt.

Swap-covered borrowing may allow a borrower to diversify funding sources. Among integrated financial systems, however, market liquidity is likely to be highly correlated so that diversification of the funding base may offer little scope for reducing rollover risk. Diversifying the funding base from the domestic market (in the periphery) to the US markets (the centre) may normally be considered a good approach to reducing liquidity risk as US markets are normally very liquid and may be resilient to stress in the periphery. Stress in the centre, however, is likely to spread to smaller markets in the absence of exchange controls (see Baba and Packer (2008) for a discussion of foreign exchange forward and swap market dislocations in 2007–08). A sharp rise in the cost of foreign currency funding may translate rapidly to a rise in the cost of local currency funding. With some degree of segmentation among markets, however, there may be some scope to reduce market risk. This appears to have been the case to some degree in 2008 with a number of new issuers entering the Samurai market (Japanese yen bonds issued in Japan by non-residents).

Currency risk

The ability to hedge currency risk is a major potential benefit of swap-covered borrowing for an emerging economy that has difficulty borrowing in its own currency. It can potentially benefit from access to international financial markets without currency mismatch if a non-resident can successfully issue local currency debt to provide a swap counterparty (if exchange controls do not prohibit).

Interest rate risk

Even if borrowings are structured so that currency and tenor are hedged, interest rate risk could still be a problem if local currency income and local currency payments under the cross currency swap are not matched. For example, if a domestic bank swaps foreign currency payments for fixed term local currency payments, but has floating rate local currency income (or vice versa) it may face difficulty if monetary policy is adjusted rapidly. Liquid local currency interest rate swap markets help manage interest rate risk.

Replacement risk

Swaps are generally traded in over-the-counter markets. While this allows customisation of products, without central clearing the two borrowers assume each other's credit risk. Various hedged risks, including currency risk, can re-emerge if one counterparty to the swap defaults. As recent developments have shown, assessing counterparty risk is complicated by the opacity of firms' financial positions. When one counterparty fails, the other may be left with a mismatched position due to interest rate or currency fluctuations. For example, suppose the minor currency resident holds minor currency principal as collateral but has US dollar liabilities at maturity. If the minor currency depreciates sharply, losses could be substantial. Bilateral netting and collateral arrangements are widely used to reduce the risks associated with a counterparty default. Central clearing may reduce risks further by providing a highly rated central counterparty, requiring positions to be marked to market daily, and making use of multilateral netting through offsetting long and short positions. Potential barriers are low liquidity in minor currency markets, which may delay or prevent market making, and high margins for those providing swaps in a less transparent environment.

Domestic market liquidity

A potential concern regarding synthetic debt is that offshore issuance may take liquidity from the domestic market. Swap-covered borrowing itself does not necessarily reduce the size of the local currency market. Rather, it changes the composition of issuers in the market from domestic borrowers to non-resident borrowers. However, if non-resident borrowers prefer to issue on the offshore markets, there may be a loss of liquidity in the domestic market. This need not be the case, however. Offshore issuance may complement domestic market development through competition that motivates efficiency or by establishing a minor currency assets class (widening the pool of potential investors).

How have the risks played out in 2007–08?

In the Asia-Pacific region, Australia and New Zealand stand out as countries with large outstanding amounts of swap-covered borrowing and large net external debts. Non-resident local currency bond issuance at end-2007 was 44% of GDP in New Zealand and 27% of GDP in Australia. In this section we briefly discuss recent developments in those two markets.

Most previous crises had been concentrated in the periphery, and the US markets were thought to be deep and liquid so that additional funding could be found without large adverse price movements. This turned out to not be the case. Borrowing costs rose sharply with the

drying up of the US commercial paper market, an important source of temporary liquidity, and dislocation in currency swap markets associated with dollar funding pressure and counterparty concerns. The US dollar shortage spread quickly to domestic markets, where funding costs rose as borrowers turned to domestic markets for funding. The rise in US dollar costs was moderated a little as demand for dollars drove down the cost of swapping US dollar funding into other currencies where liquidity pressure was less severe. With increased risk aversion, placing minor currency debt directly became more difficult.

Australian banks and their New Zealand subsidiaries appear to be managing these risks successfully. The banks entered the crisis well capitalised and profitable. Hedging appears to have largely matched external borrowings and local currency assets. Asset quality has deteriorated somewhat, but not sharply and gross positions are modest.

Rollover risk, or the degree to which it translates into higher funding costs, has been very important because of the large net external debt. While private savings have risen and deposits increased, this has been far from the scale required to fund current the account deficits and roll over external debt. Several other factors have helped to fill the potential funding gap. First, liquidity provision by the two central banks was scaled up rapidly. The ability to rapidly scale up liquidity has, in turn, been facilitated by effective control of the overnight interest rate which has meant that an increase in liquidity need not undermine monetary policy; and strong fiscal positions (fiscal surpluses and near-zero public sector debt) that have allowed greater public borrowing without adverse effects on public sector credit quality.

Second, in early 2008, the banks prefunded a substantial amount of maturing debt (despite high perceived costs at the time) as a cushion against continued market dislocations, which left them in a stronger position when rollover costs increased later in the year.

Third, government guarantees have helped the banks increase both domestic and foreign currency funding by upgrading the credit quality of bank debt to AAA in the case of Australia and to AA+ in the case of New Zealand. In both cases, the guarantees are intended to be temporary.

Fourth, Federal Reserve initiatives to provide US dollar liquidity increased credibility. These initiatives included provision of US dollar swap lines to several countries, including Australia and New Zealand, and direct purchases of commercial paper (for which the AA banks were sufficiently rated to be eligible).

Fifth, flexible exchange rates have aided adjustment. Currency depreciation of about 40% relative to the US dollar has both increased competitiveness (and so helped to reduce funding requirements) and reduced the US dollar value of the funding required. The latter has been valuable in the face of US dollar market illiquidity as funding costs have tended to rise sharply with issuance volume. At the same time, currency depreciation has not had adverse valuation effects as debts are effectively denominated in local currency. Overall, valuation effects are positive as foreign currency assets have increased in local currency.

The resilience of Australia and New Zealand in the face of a US dollar crisis, despite large net external debts funded largely through US dollar markets, suggests that widespread use of swap-covered borrowing can be managed. That resilience has, however, been supported by a variety of mitigating factors including a well capitalised banking system with good risk management, a strong fiscal position, scalable domestic currency liquidity provision, government guarantees, investment grade sovereign ratings, and floating exchange rates. Whether a country with a sub-investment grade rating or weaker institutions would be able to weather the same storm with substantial net debt is open to debate.

7. Conclusions

As yet, few countries consistently access external financing in their own currencies. Sound macroeconomic policies are recognised as a necessary condition for countries to borrow in their own currency. But sound macroeconomic policy – price stability, fiscal prudence, and a transparent exchange rate regime – does not appear to be sufficient for some countries, suggesting that microeconomic constraints may also be important.

One suspect is domestic capital market development. The many initiatives to develop domestic bond markets in Asia in the past decade have facilitated local currency funding by extending domestic market liquidity and maturity, improving credit assessment, reducing market frictions and domestic market risk, and increasing non-resident access, especially for investors. Fiscal prudence and foreign reserve accumulation have contributed to rising sovereign rating ceilings, supporting extension of the domestic bond market to higher-grade debt. Some aspects of bond market development, such as the development of an internationally rated AAA market and liquid low-grade market, may take decades. Swap-covered foreign currency borrowing may help domestic borrowers to efficiently access local currency funding in the meantime.

This paper aims to fill a gap in the literature by outlining the motivations for swap-covered borrowing. In this paper we have considered aspects of bond market incompleteness, and market frictions that may be overcome to some extent by swap-covered foreign currency borrowing and therefore motivate that form of borrowing. Empirical assessment established several stylised facts. The characteristics of bond issuance by residents in foreign currency and by non-residents in local currency (swap counterparties) are significantly different in several respects. Foreign currency issuance by residents is, on average, significantly lower rated, longer term and larger in size than non-resident issuance in the domestic market, consistent with the notion that swap-covered borrowing may provide resident issuers with access to larger, more liquid low-grade and long-term markets. Non-resident issuance in Asia-Pacific currencies is highly skewed toward AAA issuers, suggesting that a credit quality gap is important. This is consistent with several motivations, including a scarcity of high-grade minor currency debt, for example due to a low sovereign ceiling or fiscal prudence, regulations that limit certain investor classes to high-grade debt, and risk unbundling.

In practice, many of the motivations for swap-covered foreign currency borrowing that we discussed may be valid in different countries at different times. In less complete and liquid markets, arbitrage of price gaps is likely to predominate. Most countries' low-grade debt markets are relatively undeveloped compared to the US market, and most countries' sovereign ratings are below AAA, so that swap-covered borrowing provides a potential means of arbitraging non-traded assets and unbundling risk. Even in countries rated AAA such as Australia and Singapore, non-resident issuance is a growing share of total issuance in domestic currency, suggesting more persistent motivations such as market completeness through diversification or risk unbundling. In recent years, bond markets in most currencies have become more international and cross-currency swap markets have grown rapidly where not restricted. The events of 2007–08 may reverse these trends in some markets for a while, and have helped in our understanding of the risks. Looking forward, more globally integrated markets, including significant volumes of this pattern of borrowing, look increasingly to be the norm.

The questions raised are important ones for policymakers in terms of understanding current market developments, promoting domestic bond market development, financial stability or understanding the potential effects of easing exchange controls. The continued development of domestic bond markets remains an important focus in reducing information asymmetries, developing more liquid low-grade and long-term markets, reducing market frictions and supporting other domestic financial markets. Swap-covered borrowing provides a potential means of overcoming market frictions, thus allowing domestic firms to raise financing more efficiently while diversifying and deepening domestic currency debt markets. Many unanswered questions provide fertile ground for further research.

Table 1
Average daily turnover of currency swaps^a

	April 1995	April 1998	April 2001	April 2004	April 2007
All currencies ^b	3,772	9,902	7,190	21,116	31,497
USD	3,126	8,628	5,944	17,605	27,333
EUR			2,190	9,732	11,240
GBP	165	937	1,207	4,835	5,052
JPY	1,147	2,865	1,969	3,354	3,495
CAD	64	308	361	521	2,388
CHF	125	352	152	1,118	1,924
AUD	150	381	510	1,573	1,824
KRW	n/a	7	46	342	1,303
SEK	7	26	145	119	1,070
ZAR	0	20	50	62	538
NZD	9	11	101	80	474
HKD	18	231	285	293	420
INR	n/a	0	1	97	411
TRL	n/a	n/a	1	1	336
BRL	n/a	n/a	403	381	307
NOK	6	5	42	98	207
PLN	n/a	n/a	4	6	185
DKK	150	41	103	87	182
MXN	n/a	0	34	384	161
SGD	2	73	18	54	154
IDR	n/a	30	13	24	148
CNY	n/a	n/a	n/a	4	133
TWD	n/a	6	22	102	99
THB	n/a	4	11	246	59

^a Turnover in over-the-counter markets of the specified currency against all other currencies, in millions of US dollars. Data are adjusted for local and cross-border interdealer double counting but are not adjusted for gaps in reporting.

^b The sum of transactions in individual currencies equals twice the total turnover because two currencies are involved in each transaction.

Sources: BIS Triennial Central Bank Surveys.

Table 2

Share of issuance by currency of issue and residency of issuer^a

	Foreign currency bonds issued by residents: currency of issue					Local currency bonds issued by non-residents: residency of issuer					
	USD	EUR	JPY	Other	HH ^b	US	EU ^c	Supra ^d	Other	Memo: Nation ^e	HH ^b
AU	48	28	6	19	0.34	18	32	27	23	<1	0.26
CN	75	22	2	...	0.62	...	...	61	39	39	0.52
HK	88	2	2	8	0.78	5	19	6	70	14	0.54
ID	83	1	12	3	0.71	22	2	45	30	...	0.35
IN	99	...	...	1	0.97	18	6	18	57	...	0.40
JP	56	34	...	11	0.44	20	25	5	50	52	0.36
KR	69	10	13	8	0.51	63	...	...	37	35	0.53
MY	91	7	...	1	0.84	10	8	20	61	...	0.43
NZ	28	31	9	31	0.28	11	28	33	28	...	0.28
PH	88	6	5	1	0.77	23	...	61	17	...	0.45
SG	73	13	5	8	0.57	25	22	2	51	...	0.37
TH	78	...	22	...	0.66	29	15	19	37	...	0.28
TW	67	...	...	33	0.56	...	6	92	2	...	0.85

AU = Australia; CN = China; HK = Hong Kong SAR; ID = Indonesia; IN = India; JP = Japan; KR = Korea; MY = Malaysia; NZ = New Zealand; PH = Philippines; SG = Singapore; TH = Thailand; TW = Chinese Taipei.

^a Percentage share of total issuance over the 2000–08 period, calculated in current USD.

^b Hirschman-Herfindahl index of concentration.

^c Euro area.

^d Supranational institutions.

^e Non-resident issuers who are nationals of the specified country. Some nationals are included in the shares of US and EU residents, but most reside in “Other” countries, mainly offshore financial centres.

Sources: BIS; authors' calculations.

Table 3
Distribution by size of issue^a

	Mean: size weighted		Mean: equal weighted		Standard deviation		Skewness		Number of observations		W test stat ^d
	FC by res ^b	LC by non- res ^c	FC by res ^b	LC by non- res ^c	FC by res ^b	LC by non- res ^c	FC by res ^b	LC by non- res ^c	FC by res ^b	LC by non- res ^c	
AU	620.4	251.0	64.3	25.7	189.1	76.1	7.0	5.9	10016	9976	51.17**
CN	490.0	169.8	200.0	153.1	245.6	58.3	2.2	1.8	128	4	0.15
HK	388.0	60.4	33.0	17.4	100.3	27.4	7.6	3.9	1732	8632	5.88**
ID	587.0	50.0	108.2	12.3	228.2	21.6	3.6	4.1	205	237	7.67**
IN	527.9	58.1	186.9	29.6	254.2	29.8	5.5	1.8	72	20	5.84**
JP	540.1	253.2	145.9	20.2	239.9	68.6	2.9	13.4	1120	79220	35.25**
KR	406.8	65.2	154.1	38.2	197.4	32.5	4.4	0.9	1151	41	7.67**
MY	545.8	144.0	285.3	73.1	274.0	72.7	1.2	1.0	99	55	5.46**
NZ	386.0	224.2	102.9	52.8	171.0	95.2	4.6	5.0	306	1829	9.83**
PH	573.2	93.5	280.2	45.1	287.4	48.8	2.4	1.1	175	12	4.57**
SG	460.2	90.0	28.5	17.5	110.9	35.7	8.2	4.6	1830	1498	0.96
TH	280.7	65.6	149.1	17.3	140.7	29.0	2.5	2.6	113	114	10.85**
TW	257.7	102.1	93.1	45.8	126.7	51.0	2.1	1.8	22	137	1.04

^a In years.

^b Foreign currency bonds issued by residents.

^c Local currency bonds issued by non-residents, ie bonds denominated in the specified currency and issued by non-residents.

^d Wilcoxon-Mann-Whitney test; ** and * indicate that the null hypothesis, that the two sets of observations do not differ systematically from each other, is rejected at the 99% and 95% confidence levels, respectively.

Table 4
Distribution by credit rating^a

	Mean: size weighted		Mean: equal weighted		Standard deviation		Skewness		Number of observations		W test stat ^d
	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	
AU	2.7	1.9	3.3	1.8	2.4	1.5	1.6	1.9	686	482	13.54**
CN	7.3	.	7.9	.	1.2	.	0.5	.	46	0	.
HK	7.7	2.8	6.5	3.1	3.4	1.8	0.7	0.6	52	284	7.36**
ID	13.6	2.1	13.4	3.2	0.7	2.9	-0.6	1.9	21	11	7.73**
IN	9.4	.	9.7	.	0.6	.	0.0	.	18	0	.
JP	2.3		2.4	3.7	2.3	2.9	1.9	1.1	268	1989	8.87**
KR	6.8	1.0	6.4	1.0	2.7	0	0.5	.	251	3	2.90**
MY	7.6	2.7	7.5	2.7	2.4	2.9	-0.1	2.1	41	7	3.18*
NZ	4.4	1.5	4.8	1.6	2.1	1.3	1.1	2.1	36	160	8.87**
PH	12.4	1.0	12.1	1.0	2.1	0.0	-3.8	.	40	2	2.38*
SG	5.2	2.7	6.1	3.3	4.6	1.8	0.5	0.0	55	41	2.58**
TH	8.2	3.2	8.5	3.9	3.0	2.4	0.5	-0.3	35	17	4.90**
TW	6.8	1.5	4.7	1.3	3.1	1.2	0.9	4.1	3	17	3.48**

^a 1 = AAA/Aaa; 2 = AA+/Aa1; 3 = AA/Aa2; 4 = AA-/Aa3; 5 = A+/A1; 6 = A/A2; 7 = A-/A3; 8 = BBB+/Baa1; 9 = BBB/Baa2; 10 = BBB-/Baa3; 11 = BB+/Ba1; 12 = BB/Ba2; 13 = BB-/Ba3; 14 = lower than BB-/Ba3.

^b Foreign currency bonds issued by residents.

^c Local currency bonds issued by non-residents, ie bonds denominated in the specified currency and issued by non-residents.

^d Wilcoxon-Mann-Whitney test; ** and * indicate that the null hypothesis, that the two sets of observations do not differ systematically from each other, is rejected at the 99% and 95% confidence levels, respectively.

Table 5
Distribution by industry sector of issuer^a

	Mean: size weighted		Mean: equal weighted		Standard deviation		Skewness		Number of observations		W test stat ^d
	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	
AU	2.4	2.0	2.1	2.3	0.5	0.7	1.5	0.9	10016	9976	16.9**
CN	2.0	1.8	2.4	1.5	0.9	1.0	-0.1	2.0	128	4	1.86*
HK	2.6	2.1	2.2	2.1	0.5	0.5	2.4	0.9	1732	8632	3.19**
ID	2.1	1.9	3.3	2.1	1.0	0.5	-1.0	2.3	205	237	12.6**
IN	2.7	1.6	3.0	1.7	0.9	0.6	0.0	0.0	72	20	5.24**
JP	3.2		3.4	2.3	0.9	0.6	-1.2	0.4	1120	79220	42.8**
KR	3.0	2.6	2.9	2.6	1.1	0.9	-0.1	0.6	41	1150	1.50
MY	3.0	2.1	3.1	2.1	0.8	0.6	-0.9	0.0	99	55	7.14**
NZ	2.1	1.9	2.1	2.1	1.1	0.7	0.6	0.3	306	1829	2.81**
PH	1.7	1.3	2.2	1.8	1.2	0.8	0.4	0.4	175	12	0.79
SG	2.7	2.4	2.3	2.2	0.6	0.5	1.6	1.6	1830	1498	5.50**
TH	2.5	2.2	2.5	2.1	1.2	0.5	-0.1	1.1	113	114	2.68**
TW	2.1	1.1	2.1	1.2	0.5	0.6	2.3	3.0	22	137	7.54**

^a 1 = supranational institution, national government or sub-national government; 2 = bank; 3 = non-bank financial institution; 4 = non-financial corporation.

^b Foreign currency bonds issued by residents.

^c Local currency bonds issued by non-residents, ie bonds denominated in the specified currency and issued by non-residents.

^d Wilcoxon-Mann-Whitney test; ** and * indicate that the null hypothesis, that the two sets of observations do not differ systematically from each other, is rejected at the 99% and 95% confidence levels, respectively.

Table 6
Distribution by maturity^a

	Mean: size weighted		Mean: equal weighted		Standard deviation		Skewness		Number of observations		W test stat ^d
	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	
AU	10.3	5.1	8.8	3.5	8.1	3.3	1.7	6.2	10016	9976	61.21**
CN	7.8	9.5	7.3	9.3	9.2	1.5	8.5	-2.0	128	4	2.42*
HK	7.1	4.4	5.5	4.2	4.2	3.5	3.3	3.6	1732	8632	17.61**
ID	12.5	6.7	4.6	7.6	9.9	5.2	3.6	0.9	205	237	7.21**
IN	8.9	5.0	9.9	4.3	12.9	3.1	5.4	1.2	72	20	4.14**
JP	8.1	8.6	6.8	8.7	5.0	11.0	3.8	0.8	1120	79220	12.56**
KR	6.8	3.5	5.2	3.5	5.4	3.0	7.0	4.1	1151	41	4.43**
MY	10.8	6.1	9.3	5.2	10.9	2.6	6.2	1.4	99	55	3.97**
NZ	5.3	3.9	5.1	4.0	3.8	2.5	2.3	1.8	306	1829	3.63**
PH	12.5	5.7	9.4	6.3	9.6	4.1	5.2	1.9	175	12	1.35
SG	7.4	5.4	5.3	4.3	3.4	3.5	2.4	3.6	1830	1498	12.59**
TH	8.0	4.4	7.0	3.0	4.4	2.4	3.1	2.2	113	114	9.96**
TW	7.0	4.8	4.0	4.6	3.1	1.8	2.5	0.5	22	137	2.65**

^a In years.

^b Foreign currency bonds issued by residents.

^c Local currency bonds issued by non-residents, ie bonds denominated in the specified currency and issued by non-residents.

^d Wilcoxon-Mann-Whitney test; ** and * indicate that the null hypothesis, that the two sets of observations do not differ systematically from each other, is rejected at the 99% and 95% confidence levels, respectively.

Table 7
Fixed versus floating rate structure^a

	Mean: size weighted		Mean: equal weighted		Standard deviation		Skewness		Number of observations		W test stat ^d
	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	
AU	1.6	1.2	1.4	1.1	0.5	0.3	0.5	3.4	10016	9976	51.38**
CN	1.3	1.0	1.4	1.0	0.5	0.0	0.3	.	128	4	1.70
HK	1.4	1.2	1.3	1.2	0.5	0.4	0.9	1.7	1732	8632	12.65**
ID	1.1	1.4	1.2	1.5	0.4	0.5	2.0	0.0	205	237	7.59**
IN	1.3	1.4	1.4	1.7	0.5	0.5	0.4	-0.7	72	20	1.94
JP	1.1	1.2	1.4	1.2	0.5	0.4	0.5	1.5	1120	79220	14.57**
KR	1.3	1.0	1.5	1.1	0.5	0.3	-0.1	2.8	1151	41	4.48**
MY	1.1	1.1	1.3	1.2	0.5	0.4	0.9	1.9	99	55	1.77*
NZ	1.5	1.1	1.5	1.1	0.5	0.3	-0.1	2.9	306	1829	19.40**
PH	1.1	1.1	1.2	1.2	0.4	0.4	1.7	2.1	175	12	0.08
SG	1.3	1.2	1.2	1.2	0.4	0.4	1.7	1.5	1830	1498	1.18
TH	1.3	1.1	1.4	1.0	0.5	0.2	0.5	5.1	113	114	6.41**
TW	1.7	1.1	1.8	1.2	0.4	0.4	-1.4	1.3	22	137	5.16**

^a 1 = fixed-rate bond; 2 = floating-rate bond.

^b Foreign currency bonds issued by residents.

^c Local currency bonds issued by non-residents, ie bonds denominated in the specified currency and issued by non-residents.

^d Wilcoxon-Mann-Whitney test; ** and * indicate that the null hypothesis, that the two sets of observations do not differ systematically from each other, is rejected at the 99% and 95% confidence levels, respectively.

Table 8

Eurobond versus foreign bond^a

	Mean: size weighted		Mean: equal weighted		Standard deviation		Skewness		Number of observations		W test stat ^d
	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	
AU	1.1	1.3	1.0	1.0	0.2	0.2	5.2	4.5	10016	9976	3.38**
CN	1.3	1.6	1.4	1.8	0.5	0.5	0.6	-2.0	128	4	1.54
HK	1.1	1.1	1.0	1.1	0.1	0.2	7.7	4.1	1732	8632	6.32**
ID	1.0	1.0	1.1	1.0	0.2	0.0	3.8	.	205	237	3.77**
IN	1.2	1.2	1.2	1.1	0.4	0.3	1.5	2.9	72	20	1.09
JP	1.1	1.2	1.3	1.0	0.5	0.1	1.0	8.6	1120	79220	70.27**
KR	1.2	1.5	1.2	1.5	0.4	0.5	1.7	0.2	1150	41	1.13
MY	1.2	1.7	1.2	1.4	0.4	0.5	1.4	0.3	99	55	2.55*
NZ	1.1	1.1	1.1	1.0	0.2	0.2	4.0	6.0	306	1829	2.54*
PH	1.1	1.3	1.1	1.2	0.3	0.4	2.9	2.1	175	12	0.84
SG	1.0	1.2	1.0	1.1	0.1	0.2	9.4	4.1	1830	1498	6.82**
TH	1.4	1.7	1.3	1.2	0.4	0.4	1.1	1.5	113	114	1.13
TW	1.3	1.7	1.2	1.7	0.4	0.4	1.8	-1.1	22	137	5.18**

^a 1 = Eurobond; 2 = foreign or global bond.

^b Foreign currency bonds issued by residents.

^c Local currency bonds issued by non-residents, ie bonds denominated in the specified currency and issued by non-residents.

^d Wilcoxon-Mann-Whitney test; ** and * indicate that the null hypothesis, that the two sets of observations do not differ systematically from each other, is rejected at the 99% and 95% confidence levels, respectively.

Table 9

Single bond versus medium-term note programme^a

	Mean: size weighted		Mean: equal weighted		Standard deviation		Skewness		Number of observations		W test stat ^d
	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	FC by res ^b	LC by non-res ^c	
AU	1.5	1.5	1.9	1.9	0.3	0.3	-2.6	-3.2	10016	9976	6.44**
CN	1.0	1.0	1.0	1.0	0.0	0.0	.	.	128	4	.
HK	1.5	1.8	1.9	1.9	0.3	0.3	-2.5	-3.4	1732	8632	5.43**
ID	1.2	1.9	1.6	1.9	0.4	0.2	-0.5	-3.9	205	237	8.43**
IN	1.1	1.8	1.2	1.9	0.4	0.3	1.4	-2.9	72	20	5.52**
JP	1.1	4.7	1.2	2.0	0.4	0.2	1.9	-4.4	1120	79920	115.02**
KR	1.3	1.4	1.5	1.5	0.5	0.5	0.2	0.2	1151	41	12.98**
MY	1.0	1.2	1.1	1.5	0.3	0.5	3.1	-0.1	99	55	6.19**
NZ	1.6	1.7	1.8	1.9	0.4	0.3	-1.9	-2.4	306	1829	2.00*
PH	1.1	1.7	1.2	1.8	0.4	0.5	1.5	-1.3	175	12	4.32**
SG	1.4	1.7	1.9	1.9	0.3	0.3	-3.3	-3.4	1830	1498	0.15
TH	1.1	1.3	1.3	1.8	0.5	0.4	0.7	-1.4	113	114	6.99**
TW	1.1	1.0	1.4	1.1	0.5	0.3	0.4	2.3	22	137	3.34**

^a Bond issued with its own documentation = 1; bond issued as part of an MTN programme = 2.

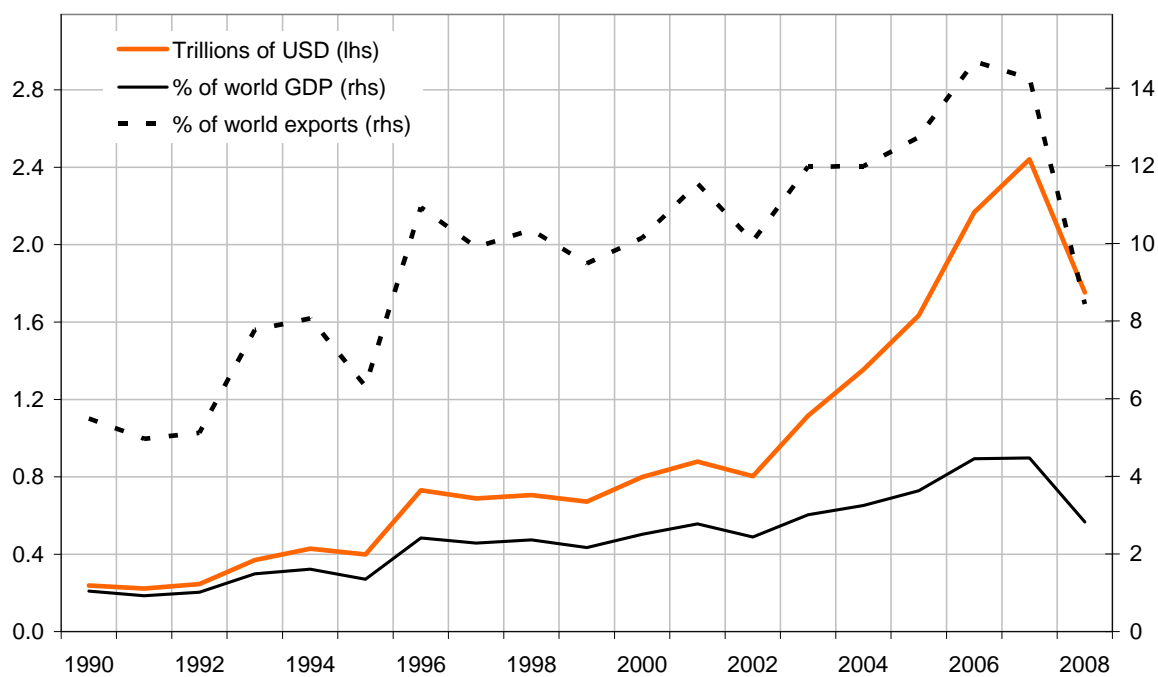
^b Foreign currency bonds issued by residents.

^c Local currency bonds issued by non-residents, ie bonds denominated in the specified currency and issued by non-residents.

^d Wilcoxon-Mann-Whitney test; ** and * indicate that the null hypothesis, that the two sets of observations do not differ systematically from each other, is rejected at the 99% and 95% confidence levels, respectively.

Figures

Figure 1
Gross issuance of foreign currency bonds^a

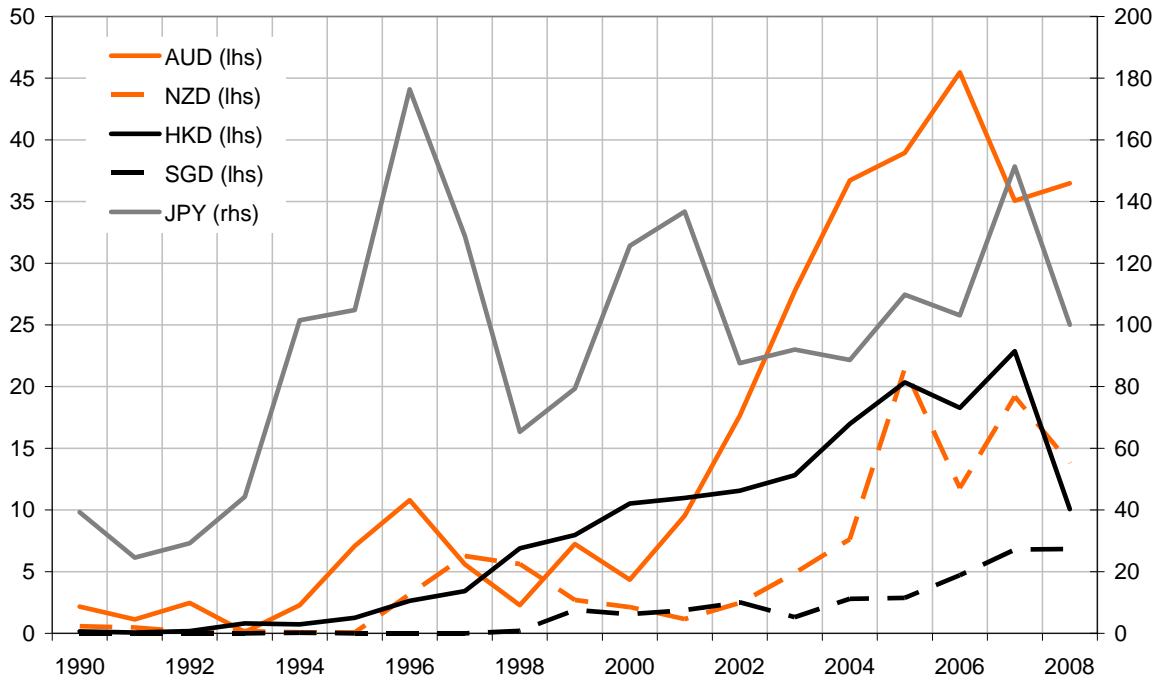


^a Bonds and medium-term notes denominated in a currency different from that of the territory where the issuer principally resides.

Sources: BIS; Dealogic; Euroclear; ICMA; IMF; Thomson Financial; authors' calculations.

Figure 2a

**Gross issuance of foreign currency bonds
denominated in Asia-Pacific currencies^a**

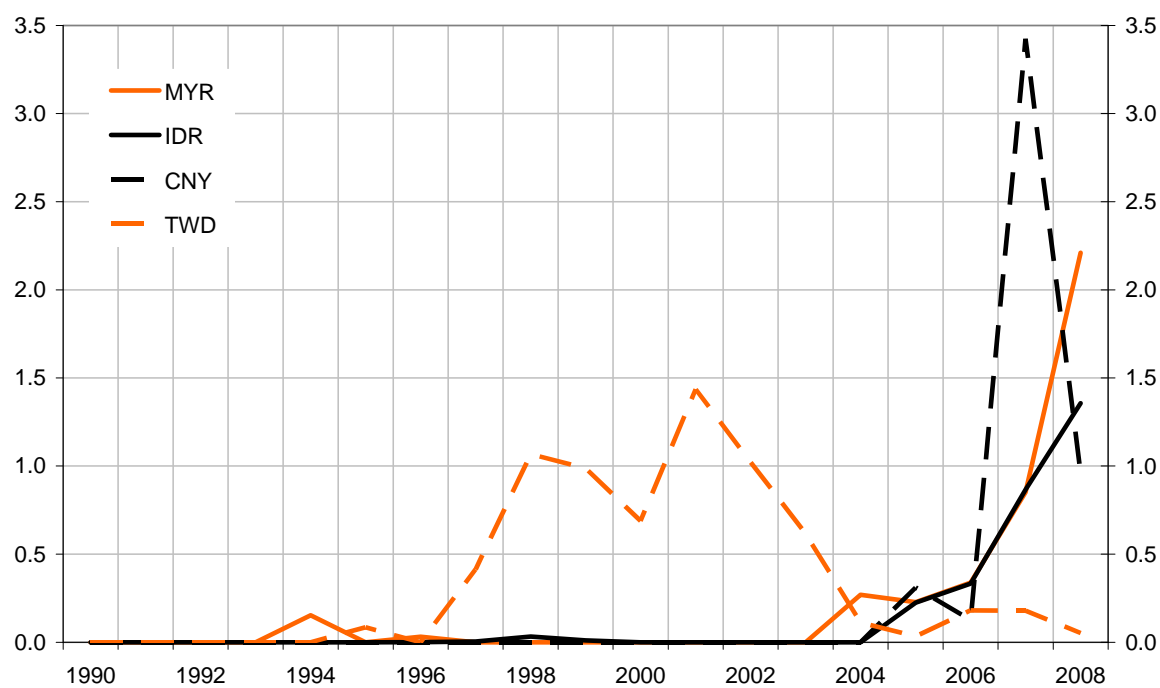


^a In billions of constant 2008 US dollars.

Sources: BIS; Dealogic; Euroclear; ICMA; IMF; Thomson Financial; authors' calculations.

Figure 2b

**Gross issuance of foreign currency bonds
denominated in Asia-Pacific currencies^a**

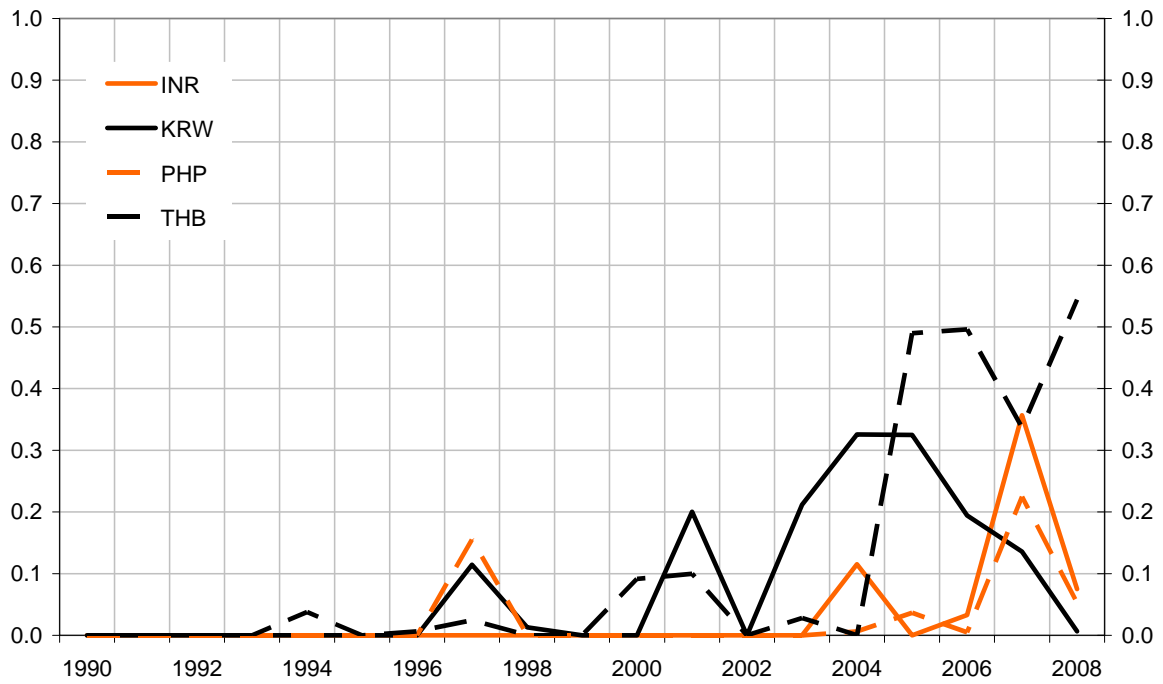


^a In billions of constant 2008 US dollars.

Sources: BIS; Dealogic; Euroclear; ICMA; IMF; Thomson Financial; authors' calculations.

Figure 2c

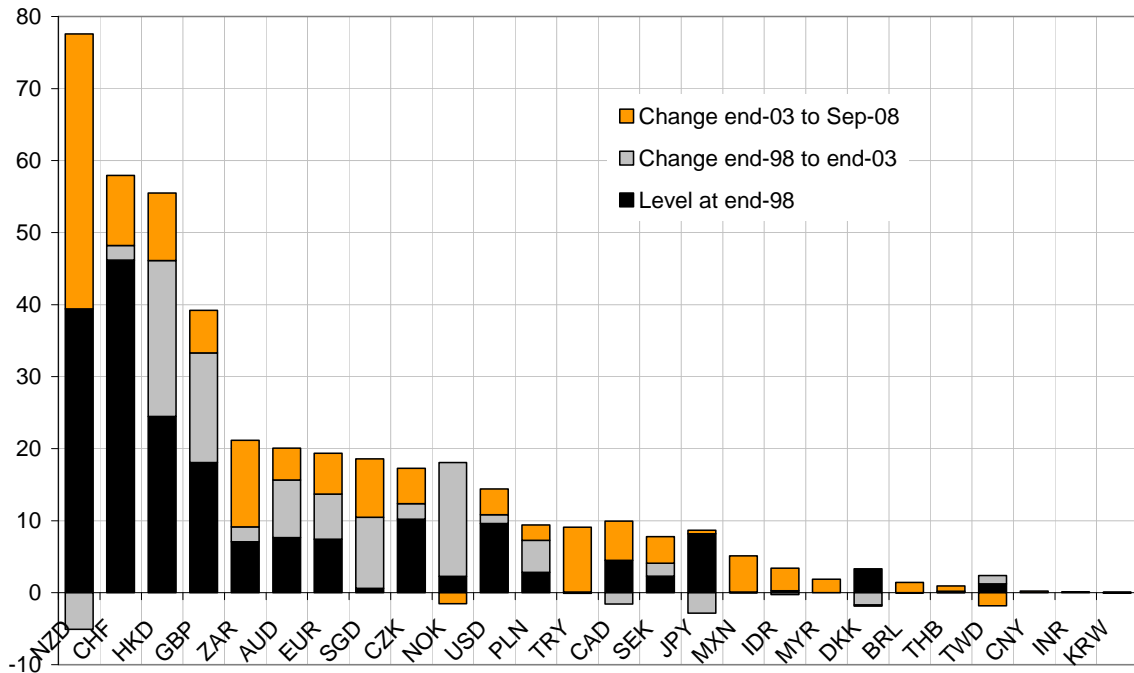
**Gross issuance of foreign currency bonds
denominated in Asia-Pacific currencies^a**



^a In billions of constant 2008 US dollars.

Sources: BIS; Dealogic; Euroclear; ICMA; IMF; Thomson Financial; authors' calculations.

Figure 3
Participation of non-resident issuers in local currency markets^a

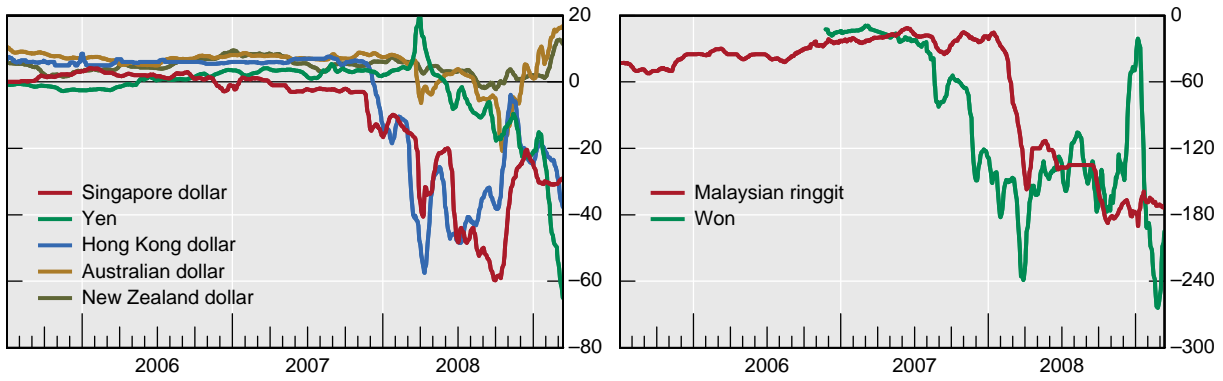


^a Outstanding stock of debt securities issued by non-residents in the specified currency as a percentage of all debt securities issued in the specified currency. Data on residents' and non-residents' issues are from different sources and may be incomplete.

Sources: BIS; Dealogic; Euroclear; ICMA; national data; authors' calculations.

Figure 4

Cross-currency basis swap spreads^a

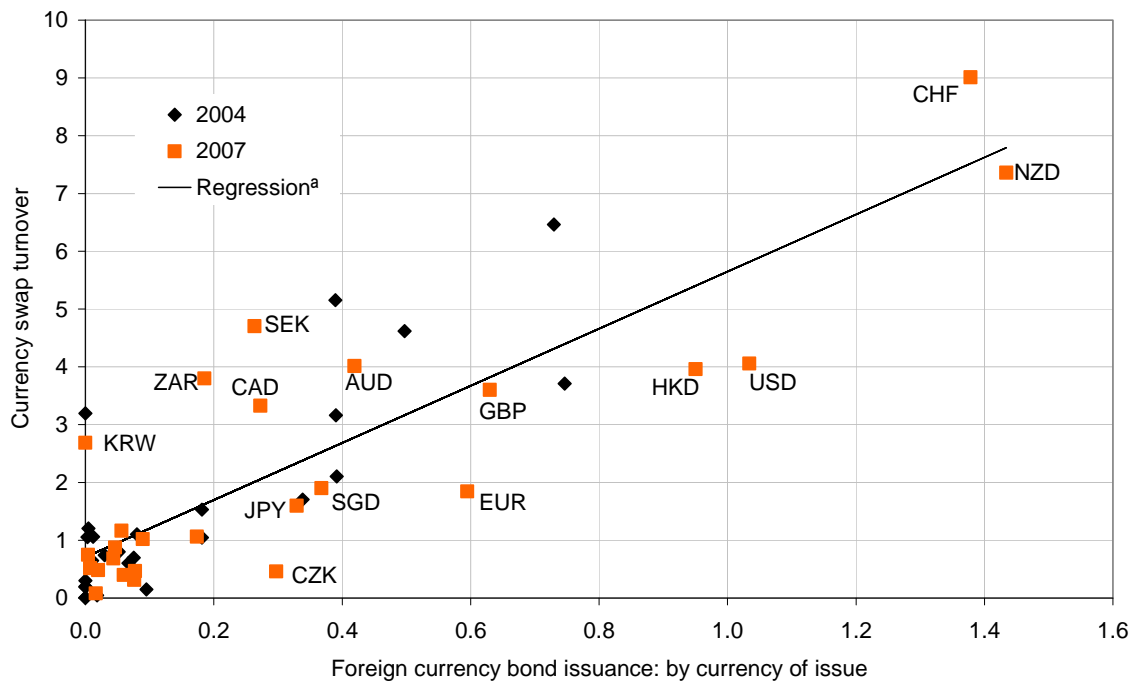


^a Spread to borrow the specified currency in exchange for lending USD at Libor. Five-year indicative spreads, in basis points; 10-day moving average.

Source: Bloomberg.

Figure 5a

**Correlation between currency swap turnover
and foreign currency bond issuance (by currency of issue)^b**



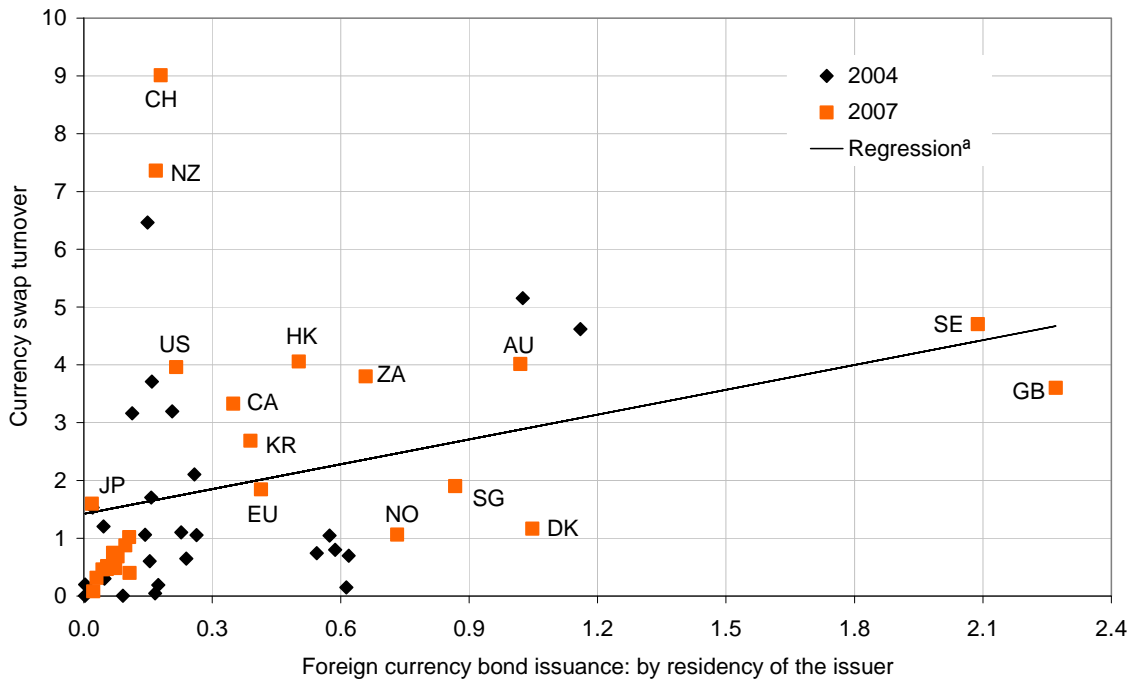
^a Intercept = 0.7076 (t -statistic = 3.7085); slope coefficient = 4.9415 (t -statistic = 11.0291); $n = 52$; $r^2 = 0.7087$.

^b Horizontal axis: monthly gross issuance (during the April–June period of the year specified) by non-residents of bonds and notes denominated in the specified currency, as a percentage of national annual GDP; vertical axis: monthly turnover (in April of the year specified) of currency swaps denominated in the specified currency, as a percentage of national annual GDP.

Sources: BIS Triennial Central Bank Survey; Dealogic; Euroclear; ICMA; IMF; authors' calculations.

Figure 5b

**Correlation between currency swap turnover
and foreign currency bond issuance (by residency of the issuer)^b**



^a Intercept = 1.4200 (t -statistic = 4.1549); slope coefficient = 1.4320 (t -statistic = 2.5231); $n = 52$; $r^2 = 0.1129$.

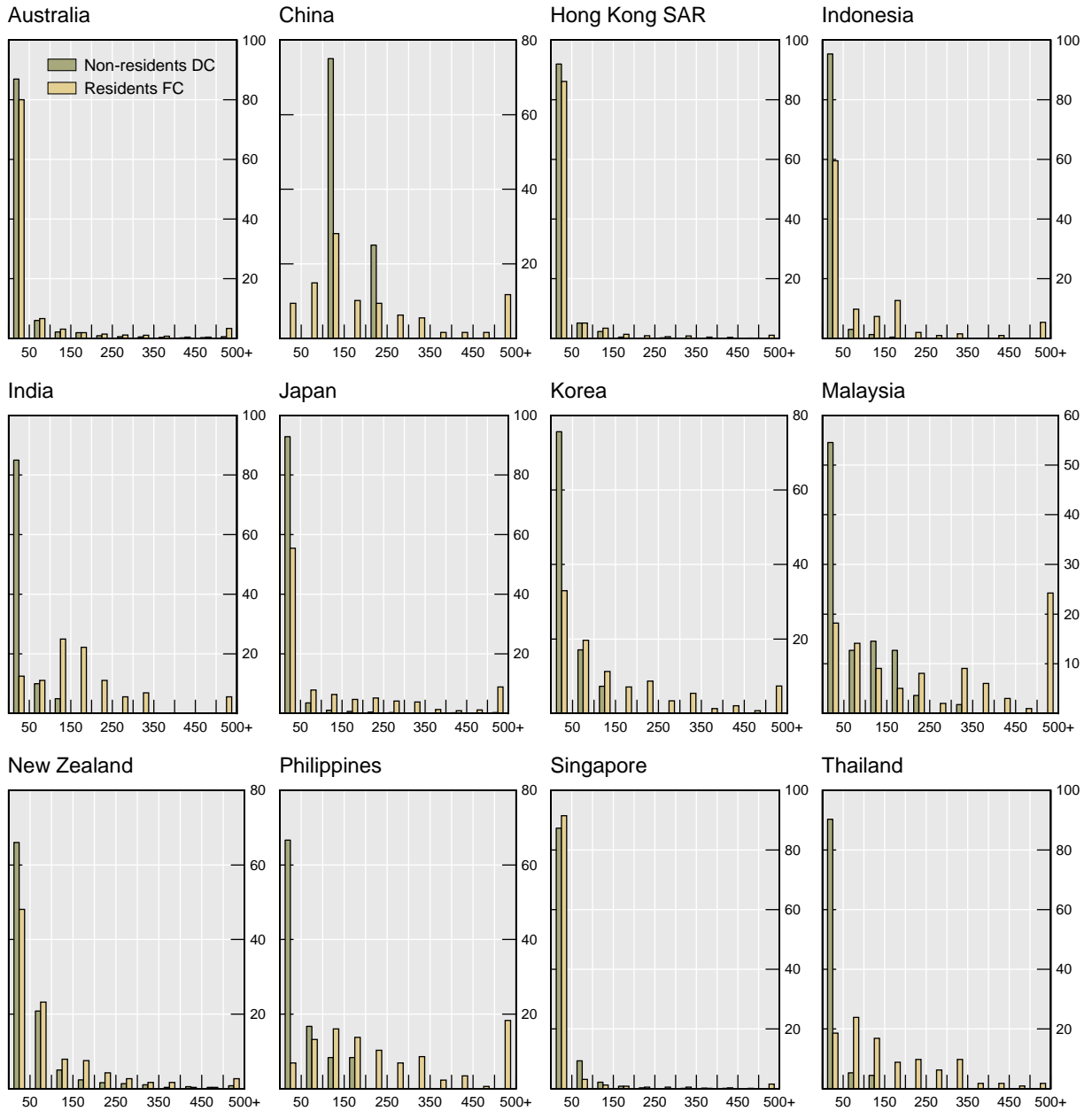
^b Horizontal axis: monthly gross issuance (during the April–June period of the year specified) of bonds and notes denominated in foreign currencies by residents of the specified countries, as a percentage of national annual GDP; vertical axis: monthly turnover (in April of the year specified) of currency swaps denominated in the local currency of the specified country, as a percentage of national annual GDP.

Sources: BIS Triennial Central Bank Survey; Dealogic; Euroclear; ICMA; IMF; authors' calculations.

Figure 6

Issue size^a

Foreign currency bonds issued by residents versus local currency bonds issued by non-residents

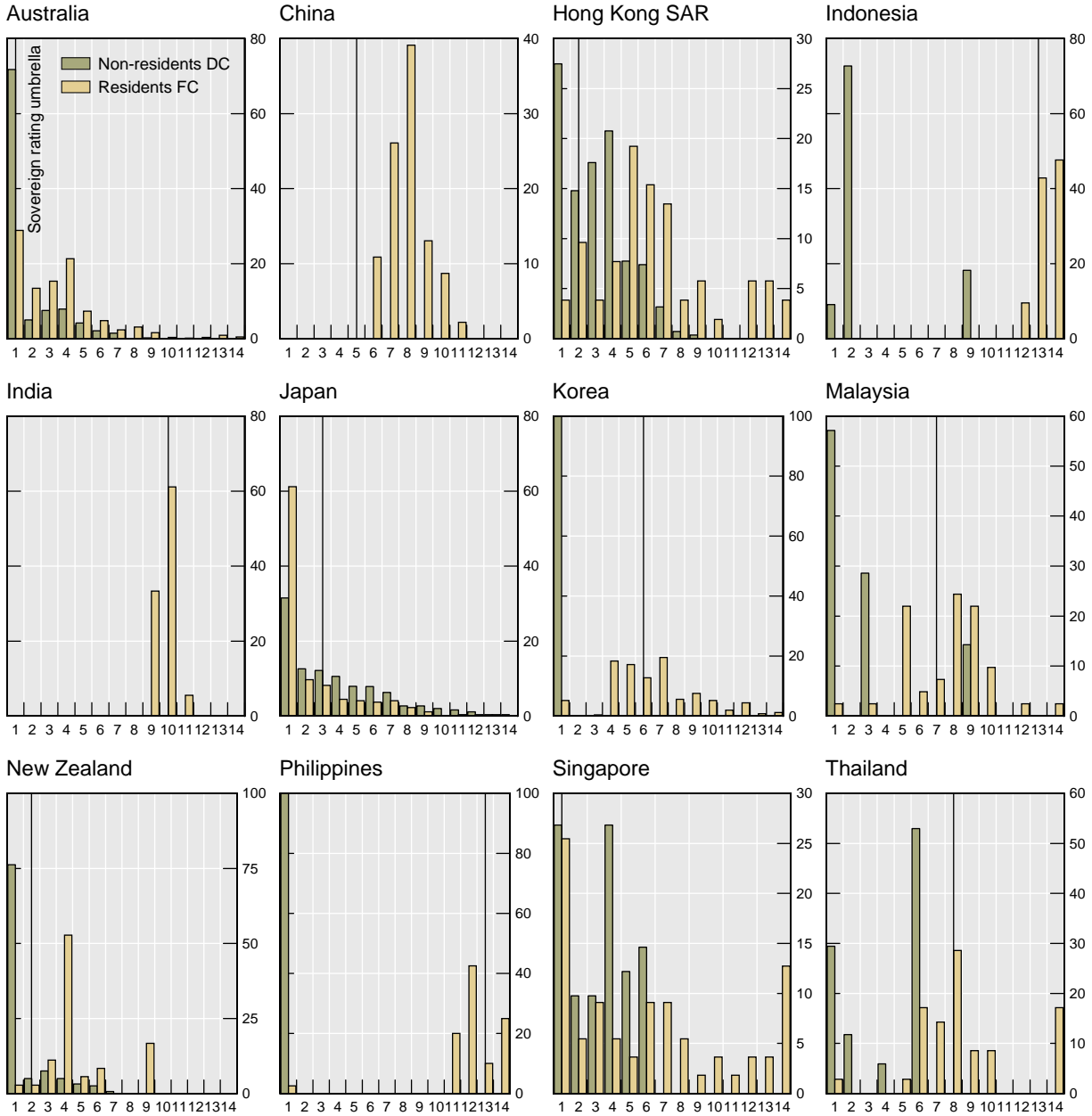


DC = local currency; FC = foreign currency.

^a Horizontal axis = issue size, in millions of US dollars; vertical axis = percentage of bonds.

Figure 7
Credit ratings^a

Foreign currency bonds issued by residents versus
local currency bonds issued by non-residents



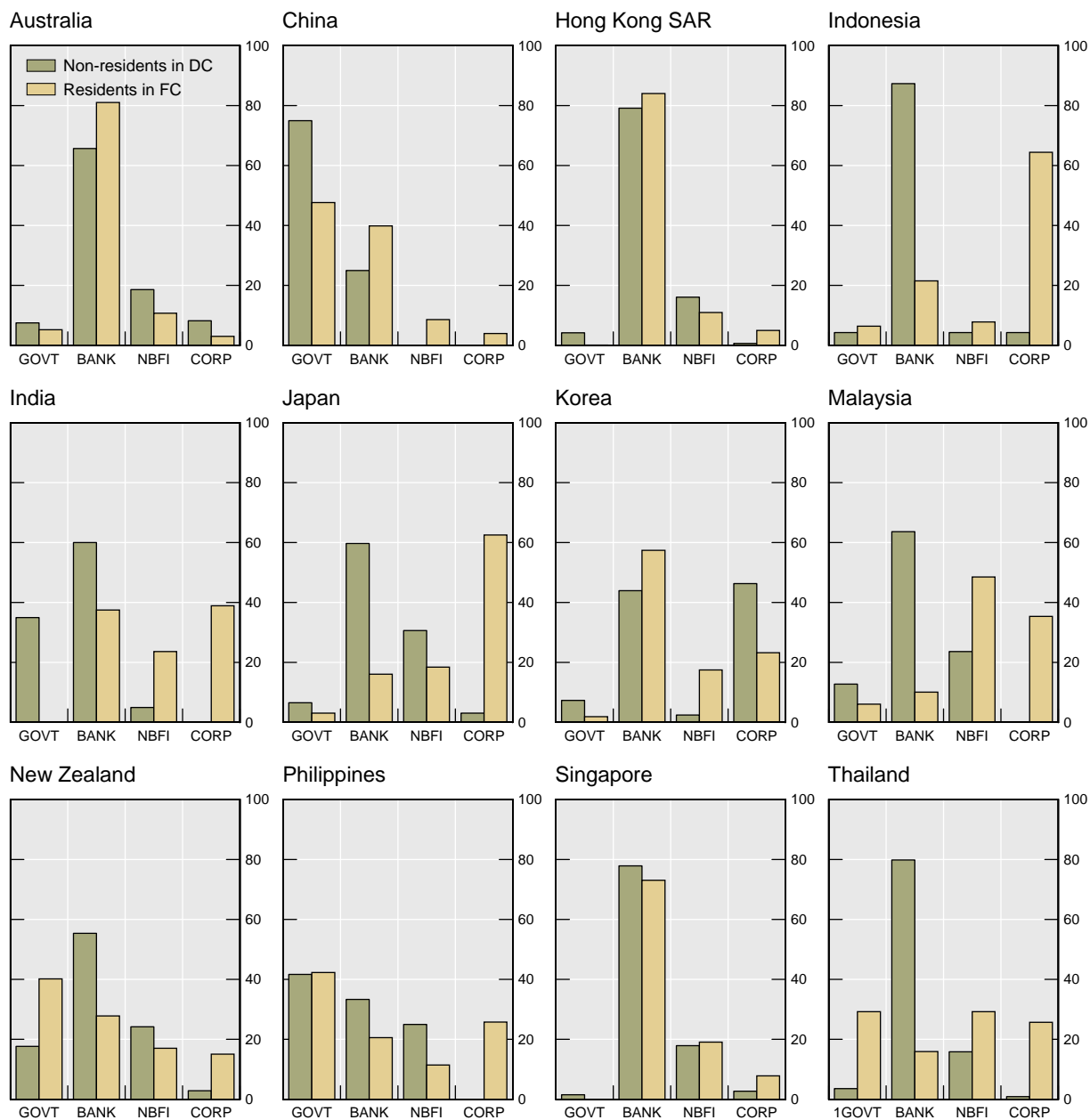
DC = local currency; FC = foreign currency.

^a 1 = AAA/Aaa; 2 = AA+/Aa1; 3 = AA/Aa2; 4 = AA-/Aa3; 5 = A+/A1; 6 = A/A2; 7 = A-/A3; 8 = BBB+/Baa1; 9 = BBB/Baa2; 10 = BBB-/Baa3; 11 = BB+/Ba1; 12 = BB/Ba2; 13 = BB-/Ba3; 14 = lower than BB-/Ba3.

Figure 8

Industry sector of issuer^a

Foreign currency bonds issued by residents versus local currency bonds issued by non-residents



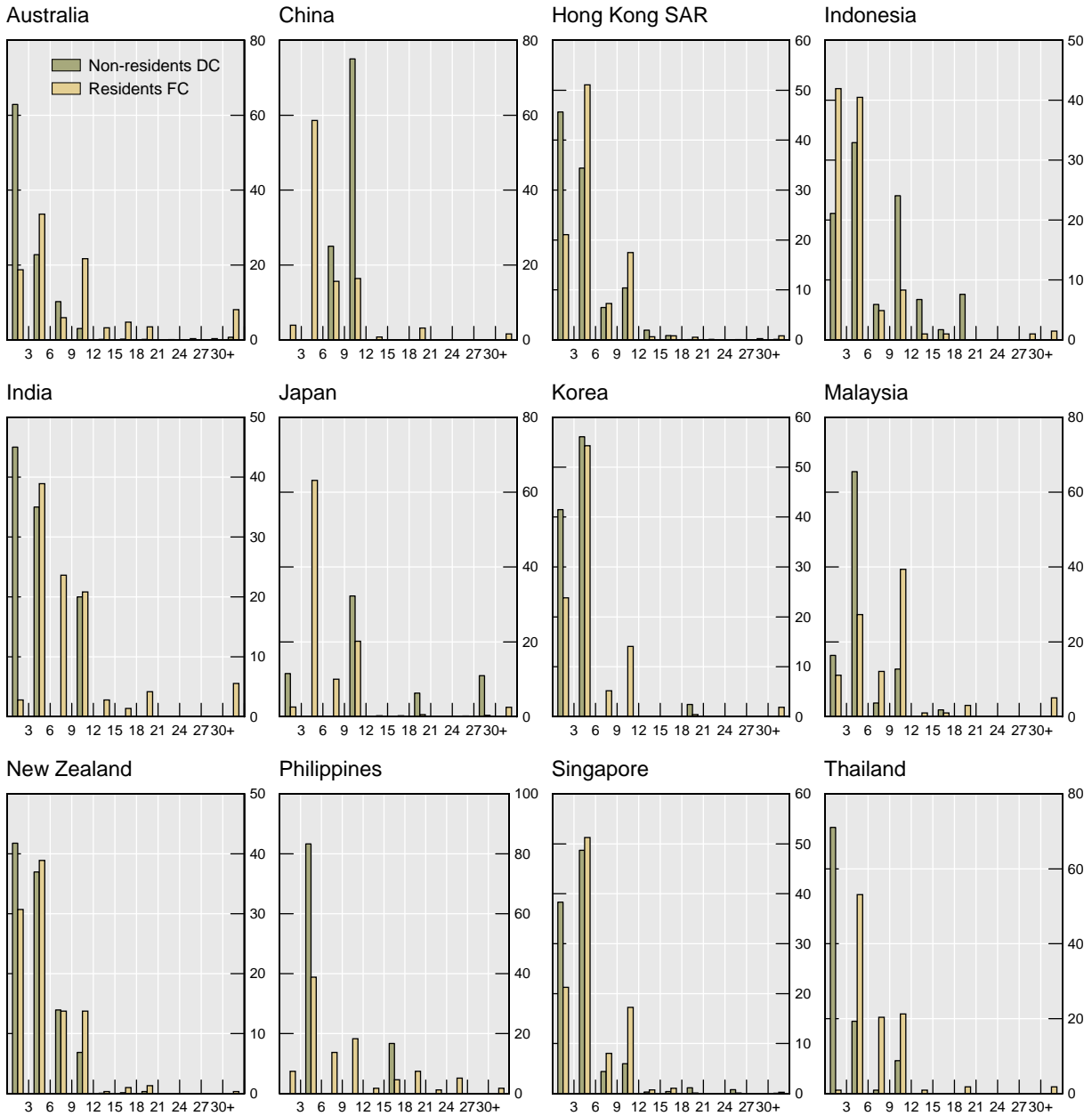
DC = local currency; FC = foreign currency.

^a GOVT = supranational institutions, central governments and sub-national governments; BANK = banks; NBFI = non-bank financial institutions; CORP = non-financial corporations.

Graph 9

Maturity^a

Foreign currency bonds issued by residents versus local currency bonds issued by non-residents



DC = local currency; FC = foreign currency.

^a In years. 30+ refers to bonds of maturity equal to or greater than 30 years.

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Private information, stock markets, and exchange rates¹

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1. Introduction

The determination of exchange rates has long been an important but vexatious topic in international finance and economics. The recent exchange rate literature has demonstrated that exchange rates are determined importantly by investors' private information, and that macroeconomic data and other public information items play a comparatively minor role once order flow, which conveys private information to the market, is incorporated in the models. We define order flow as the difference between the volume of buyer- and seller-initiated trades in a financial market.⁶

In recent years, economists have become increasingly aware that not all components of order flow in foreign exchange (FX) markets are equally important; some components matter far more for price formation than others. Progress on identifying which order flow components convey the most private information has been slowed by the fact that private information is, by its nature, rarely observed directly. In this paper, we propose and provide strong empirical evidence for the view that the private information of relevance for exchange rate determination is associated far more with stock markets than with other financial markets, such as government bond markets.

Our view is consistent with three main findings reported in the literature regarding the importance of various types of order flow for the exchange rate; see Osler (2008, pp 30f) for an overview. The first finding is that customer order flow carries more information than inter-dealer order flow. The second related finding is that financial customer order flow carries more information than commercial customer order flow. The third finding is that order flow driven by leveraged investors carries more private information than other institutional investor order flow does. Thus, our view is also consistent with empirical claims that (i) FX market order flow related to equity market transactions to a large extent tends to be initiated by leveraged financial-sector customers and (ii) FX market order flow related to bond market

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⁶ This is also the definition proposed by Lyons (2001, pp 6f).

transactions is driven more by other financial-sector participants, such as pension funds and insurance companies.

The basic intuition for our view is that equity market order flow to a large degree reflects transactions by investors who are very active in collecting private information, whereas investors in other asset classes rely less on private information. Clearly there are various types of private information that stock market investors, domestic as well as foreign, may have about the fundamental determinants of a firm's value. These include knowledge of the quality of the firm's products, the prospects for successful product innovation, management quality, and the strength and likely strategies of the firm's competitors. However, as suggested by Lyons (2001), Evans and Lyons (2002), and Evans and Lyons (2007), private information may also include passively collected information about macro-variables and other exchange rate fundamentals which may be dispersed among customers. Private but dispersed information characterises many variables at the centre of exchange rate modelling, such as output, money demand, and consumer preferences. These variables are first realised at the micro or household/firm level and only later aggregated by markets and/or governments. For some of these measures, such as risk preferences and money demand functions, government-provided aggregations of the underlying micro-level shocks do not exist, leaving the full task of aggregation to markets. For other variables, government-provided aggregations exist, but their publication lags the underlying realisations by weeks and months, leaving room for market-based aggregation in advance of their eventual publication.

The transmission of private information from capital markets to the FX market is done by FX dealers, who observe their own customers' FX transactions. In addition, the dealers frequently have a reasonably good idea as to why their customers undertake these transactions. In particular, they may know (or may be able to infer) whether their customers' FX order flow is driven by private information, if it occurs in response to public information, or if it is a "noise" trade. To build some intuition for the decision-making problem that FX dealers face, consider the following stylised stories that focus on the information content of order flow. First, suppose that an FX dealer based in Thailand believes that her customer's purchase of baht for dollars will be used to acquire shares of one or more firms listed on the Stock Exchange of Thailand (SET). This transaction conveys not only information about the investor's beliefs about the value of the firms in question, but also about the longer-term demand for baht-denominated assets in general. It is straightforward to infer that the dealer's optimal response to such order flow is to adjust her quoted bid and ask rates for the baht towards an appreciation of the baht.⁷

Alternatively, suppose that the FX dealer knows that a customer has sold Thai government bonds and is now selling the baht proceeds for dollars in order to comply with government regulations that limit permissible baht bank account balances. If the FX dealer has reason to believe that the underlying bond market transaction is a liquidity trade and is therefore not driven by her customer's private information about future government bond returns, the dealer will not be induced to adjust her bid and ask quotes for the baht against the dollar other than for a transitory period, thus generating only transitory inventory and liquidity effects. In the foreign exchange market, in addition to order flow reflecting private information, liquidity and "pure" inventory effects generated by order flow can certainly occur. In fact, as we report below, statistically significant short-run dynamics are clearly present in exchange rate returns. We interpret them as inventory and liquidity effects generated by order flow. We also show that these effects are transitory in nature and that they are numerically smaller than those of information-induced order flow.

⁷ Models that derive explicit optimal decision rules for FX traders have been proposed, inter alia, by Richards (2005), Evans and Lyons (2005), Bacchetta and van Wincoop (2006), and Vitale (2007).

We establish our results by formulating and empirically testing three hypotheses about the relationship between the exchange rate and components of FX market flows. The first hypothesis is that FX market flows that are induced by investors' transactions in the stock market, which we find are driven mainly by investors' private information, should have a larger contemporaneous impact on the exchange rate than other FX market flows have. The second hypothesis is that if FX market flows are known not to be driven by investors' private information, they should have at most only a small contemporaneous effect on the exchange rate. The third hypothesis is that the portion of FX order flow that conveys private information should have a permanent impact on the exchange rate; in contrast, other order flow should have at most a transitory impact on the exchange rate.

Our empirical work strongly supports all three hypotheses. First, we report that flows in the two-day spot segment of the FX market that are driven by equity market variables have a contemporaneous effect on the exchange rate that is three to four times as large as that of other components of two-day spot order flow. Second, we find that FX flows related to foreign investors' bond market transactions do not have a statistically significant contemporaneous effect on the exchange rate. Third, we find that the effect on the exchange rate of stock-market related FX flows is permanent, whereas that of other FX flows is transitory. We interpret these results as providing strong support for the view that investors' private information that induces FX flows and drives the exchange rate is largely centred on the stock market.

We obtain our results using novel and comprehensive datasets on nearly two years' worth of daily-frequency capital flows of non-resident investors in the onshore FX, stock, and secondary bond markets of Thailand. The data and the structure of these markets are sufficiently rich and diverse for us to be able to generate our results without having to have direct knowledge of either the private or the public information sets that influence investors' decisions. A key identifying assumption, which we verify empirically, is that foreign investors' transactions in the bond markets of Thailand (which involve mainly trading in government and central bank paper) is driven either by public information or by liquidity or "noise" trades, but not by private information. The second assumption, which is also supported empirically, is that foreign investors' order flow in the Stock Exchange of Thailand (SET) – while also responding to public information and being subject to liquidity or noise trades – is driven mainly by private information related to the firms whose shares are bought and sold.

Because of government regulations that strictly limit permissible baht-denominated bank balances of non-resident investors in Thailand, foreign investors' transactions in the stock and bond markets are associated fairly closely with related flows in the FX market. This lets us construct simple proxies for the portions of FX order flow that are driven by foreign investors' stock and bond market order flow. This, in turn, lets us run order flow regressions in which we include these proxies as explanatory variables, and it enables us to test which parts of the order flow have larger influences on the exchange rate than others, both contemporaneously and in the long run.

The structure of the financial system in Thailand provides an excellent basis for uncovering systematic relationships between the exchange rate, order flow in the FX market, and order flows in the domestic capital markets. Licensed FX dealing banks in Thailand must report on a daily basis all transactions with all counterparties to the Bank of Thailand (BoT), the country's central bank. This allows the construction of comprehensive daily-frequency capital flow series, in which one can distinguish between FX dealers' transactions with other dealers, their foreign customers, their domestic customers, and the BoT. For this study, we were given access to the series of transactions between FX dealers and their foreign customers, which are mainly financial companies. We obtained similarly comprehensive daily-frequency datasets of the transactions of foreign investors in the stock and bond markets of Thailand. Government regulations in Thailand place strict limits on foreign investors' participation in domestic money markets and on their permissible bank balances. These regulations create unusually close and synchronous linkages between foreign

investors' net purchases of assets in the domestic capital markets and their order flow in the FX market. This feature of the financial system, combined with the high frequency and quality of the data, enabled us to inquire which subsets of order flow have especially large effects on the exchange rate, using data from a relatively short period of two years during which structural breaks in the data generating processes did not appear to occur. In economies with less restrictive rules governing the ability of foreign investors to participate in the banking system and money markets, one would likely not be able to detect such effects unless one has access to data spanning much longer time periods. Of course, having to rely on data that span longer periods raises the likelihood that structural breaks occur during the sample period, calling into question the validity of the econometric analysis.

Our study contributes to the exchange rate literature in several ways. First, we provide a previously missing piece to the exchange rate determination puzzle, by showing that the stock market provides much of the private information of relevance to the determination of the exchange rate. To be sure, we do not claim to be the first to notice the existence of statistically significant links between foreign investors' order flow in a stock market and exchange rate returns. For instance, FX dealers routinely state that they study their own customers' order flow carefully in order to discern its information content.⁸ However, previous empirical studies of these links have generally lacked the comprehensive high-frequency flow data that are needed to fully establish the nature of the dependence of exchange rate fluctuations on stock market variables and their relationship to investors' private information. Second, to the best of our knowledge, our study is the first that analyses the exchange rate determination puzzle empirically by combining comprehensive data on order flow and returns from three separate financial markets – FX, stock, and bond markets. Third, our study broadens the geographical range of data used in exchange rate determination studies by utilizing data from Thailand, a major emerging market economy. The vast majority of existing studies on this issue have used data from industrial economies.

The remainder of the paper is structured as follows. The following section reviews the related literature and presents the hypotheses tested in this paper. Section 3 provides an overview of the three Thai financial markets of interest and introduces the datasets. In Section 4, we examine the empirical evidence related to the hypotheses presented in Section 2. Section 5 concludes.

2. Related literature and hypotheses

2.1 Related literature

Portfolio balance models of the determination of exchange rates, which began to be formulated from the second half of the 1970s, occupy an important place within the international economics field in part because they provide plausible scenarios in which capital flows should help explain both the sign and the magnitude of exchange rate fluctuations.⁹ Early attempts to verify empirically this implication of these models were generally unsuccessful; see, eg Frankel (1983). This lack of empirical support reflected, in part, the fact that many of the early studies relied on low-frequency data. Because capital flows can fluctuate considerably from day to day and are somewhat mean-reverting at high frequencies, the use of lower-frequency data – such as monthly or quarterly data – reduces

⁸ See, eg Goodhart (1988) and Gehrig and Menkhoff (2004).

⁹ In Gyntelberg, Loretan, Subhanij, and Chan (2009) we consider the impact of equity market portfolio rebalancing on the exchange rate, employing framework suggested by Hau and Rey (2006).

the signal-to-noise in the data and makes the detection of links between capital flows and exchange rates more difficult. In addition, the use of low-frequency data makes it more difficult to distinguish between short-run phenomena, such as liquidity and inventory effects caused by the microstructure of financial markets, and longer-run issues such as information effects. Finally, users of early portfolio balance models, whether they worked with asset demand functions that were postulated or derived explicitly from investors' optimising behaviour, did not yet possess the analytical tools (as these tools were developed only subsequently) to investigate rigorously how one might incorporate demand for risky assets, such as equity claims on capital stocks, into these models. It was therefore unclear how phenomena such as private information about asset returns and differences in sophistication across investors should be modelled or what their effects on exchange rates might be. Moreover, the early portfolio balance models – as well as the earlier “monetary” models of exchange rate determination – were found to perform poorly out of sample, and their ability to forecast exchange rates was no better and often worse than that of the random walk model; see Meese and Rogoff (1983) and Cheung, Chinn, and Garcia Pascual (2005).

Subsequent research focused on developing models of the cross-border demand for risky assets that explicitly incorporate important institutional features, ie the microstructure of asset markets and of the information held by investors.¹⁰ The market microstructure literature and the noisy rational expectations literature established the critical importance of taking into account both the structure and organisation of markets as well as the heterogeneity of information held by investors in order to explain price formation. A fundamental insight that emerged from these studies is that traded quantities and prices reflect institutional constraints as well as the heterogeneity of information held by market participants. Thus, both aspects need to be modelled in order to understand fully the price formation process. The market microstructure literature also established that order flow is a key factor in explaining asset prices.

Beginning with the work of Evans and Lyons (2002), a number of studies have shown that models of exchange rate determination that include contemporaneous order flow as an explanatory variable vastly outperform models which rely exclusively on public information, such as macroeconomic data.¹¹ Osler (2008) groups the reasons why order flow helps explain asset returns into three categories: (i) inventory effects, (ii) liquidity effects, and (iii) private information effects. In the FX market context, inventory effects arise because foreign exchange dealers, who provide liquidity to other dealers and to their customers, may experience unwanted fluctuations in their desired inventories as a result of order flow and thus incur inventory risk. Dealers charge a bid-ask to compensate for this risk. The existence of a bid-ask spread as well as the need of FX dealers and market makers to restore their inventories to desired levels following shocks can create systematic short-run relationships between order flow and returns; see Stoll (1978) and Cao, Evans, and Lyons (2006). Liquidity effects in FX markets can stem, for instance, from the tendency of the FX dealer

¹⁰ For general introductions to the market microstructure literature, see O'Hara (1995) and Madhavan (2000). For introductions to the market microstructure analysis of FX markets, see Lyons (2001), Sarno and Taylor (2002), Osler (2006), and Osler (2008).

¹¹ Brooks, Edison, Kumar, and Sløk (2001) provide an early discussion of some of the empirical relationships between exchange rate fluctuations and portfolio capital flows. More-recent studies that consider linkages between stock markets, private information, and exchange rates are Richards (2005), Froot and Ramadorai (2005), Dunne, Hau, and Moore (2006), Francis, Hasan, and Hunter (2006), Vitale (2007), Albuquerque, de Francisco, and Marques (2008), Berger, Chaboud, Chernenko, Howorka, and Wright (2008), Bjønnes, Osler, and Rime (2008), Chai-Anant and Ho (2008), Chinn and Moore (2008), Evans and Lyons (2008), Gradojevic and Neely (2008), Love and Payne (2008), Reitz, Schmidt, and Taylor (2008), Siourounis (2008), and Tille and van Wincoop (2008). Of these, the contributions of Richards and Chai-Anant and Ho consider Asian emerging market economies, and the others consider mainly developed economies.

community as a whole to take on relatively little overnight FX risk, requiring other market participants to supply overnight liquidity; see, eg Bjønnes, Rime, and Solheim (2005).

Turning to private information effects, Evans and Lyons (2007) have noted that order flow aggregates and conveys investors' private information that is only revealed later in aggregate economic statistics. Information of relevance to market makers and FX dealers is therefore not only publicly-available news but also what they can learn from the order flow initiated by customers acting on (what the dealers believe to be) private information. A number of recent studies, such as Bacchetta and van Wincoop (2006), have modelled the behaviour of FX dealers as solving a dynamic signal extraction problem, in which their optimal strategy is to change their bid and ask quotes permanently if the order flow comes from informed market participants but not to change their quotes if the flows are initiated by liquidity traders, because the latter transactions are not based on information about the value of the asset.

This model of price formation is generally made in the context of a stock exchange with designated market makers; see, eg Kyle (1985) and Glosten and Milgrom (1985). However, it is applicable to other organisational models of financial markets as well. For instance, Anand and Subrahmanyam (2008) show that market intermediaries in a fully-electronic stock exchange without market makers – such as the Tokyo Stock Exchange – contribute disproportionately to the price discovery process. Similarly, in many over-the-counter markets (including many FX markets) there usually are dealers that act as de-facto market makers. Theoretical models that explain how market makers in organised exchanges should set prices in reaction to various types of news should apply, with only minor adjustments, to such markets as well.

Froot and Ramadorai (2005) use an approach to categorising the relationships between FX market order flow and exchange rate movements which differs somewhat from that of Osler (2008). According to what Froot and Ramadorai label the “strong” flow-centric view, order flow may be related to exchange rate movements because it is correlated with the fundamental value of the currency and hence conveys fundamental macroeconomic and other market-wide pieces of information to market participants. In contrast, according to what Froot and Ramadorai call the “weak” flow-centric view, order flow could be related to deviations of the exchange rate from its fundamental value rather than to the fundamental value itself. In their framework, information effects conform to the “strong” flow-centric view and inventory and liquidity effects fall into to the “weak” flow-centric category.

As Berger, Chaboud, Chernenko, Howorka, and Wright (2008) note, it is of course possible that order flow could fit into both categories, with a portion of order flow being informative about economic fundamentals and the remainder reflecting only deviations from fundamentals.¹² Killeen, Lyons, and Moore (2006) observe that if order flow does convey information about the fundamental value of the exchange rate, cumulative order flow should be cointegrated with the log level of the exchange rate. Conversely, if order flow does not convey such information but is only related to short-run deviations from exchange rate fundamentals, cumulative order flow should not be cointegrated with the log level of the exchange rate. In Section 4, we report that whereas a large fraction of observed order flow is indeed “weakly flow-centric” – in the sense that its cumulated series is not cointegrated with the exchange rate – the relatively small portion of FX order flow that is related to foreign investors' activity in the stock market is cointegrated with the exchange rate and hence has a permanent effect. In the terminology of Froot and Ramadorai, we would conclude that the portion of foreign investors' FX market order flow that is explained by stock market variables is strongly flow-centric whereas the remainder is (at most) weakly flow-centric.

¹² The model of Bacchetta and van Wincoop (2006) analyses the case of order flow having both weak and strong flow-centric components.

2.2 Empirical regularities and hypotheses

A preliminary analysis of the FX, stock, and bond market data revealed several empirical regularities that we wish to explain and relate to each other.¹³ First, the order flow patterns of non-resident customers in the FX and stock markets in Thailand exhibit mild short-term flow momentum and return chasing; this is consistent with them being driven by private information.¹⁴ Second, foreign investors' trading patterns in the Thai bond market do not exhibit these features, suggesting that foreign investors' bond market order flow is not driven by private information but only by public information (as well as, possibly, by liquidity or noise trades).¹⁵ Third, the contemporaneous correlation between foreign investors' stock and bond market order flow is only 0.05 in the sample. If stock market order flow was determined importantly by macroeconomic data releases and other pieces of public information as well, one should find that stock market and bond market order flow were more highly correlated. The fact that the correlation, although positive, is so low indicates either that vast portions of the two order flow series consist of noise trades not linked to either public or private information or, far more likely, that only a small portion of foreign investors' stock market order flow is based on public information and that a much larger portion reflects investors' private information.¹⁶

The link between these empirical regularities and foreign investors' activity in the foreign exchange market stems from their need to conform to government regulations that strictly limit their permissible baht-denominated bank account balances. These regulations induce an unusually close link in Thailand between capital-market order flow and foreign exchange market order flow. To explain these phenomena and their implications for the determination of the exchange value of the baht, we propose three hypotheses. The first two concern the contemporaneous effects (or lack thereof) of stock and bond market-related order flow on the exchange rate, and the third posits that only order flow that is based on and conveys private information should have a long-term or permanent effect on the exchange rate.

Because the stock market order flow of foreign investors appears to be based largely on private information, FX order flow that is induced by their stock market order flow should be a valuable source of information to FX dealers as they set their bid and ask quotes.

Hypothesis 1 FX order flow of foreign investors that is driven by their Thai stock market operations should have a large contemporaneous impact on the Thai baht.

¹³ These empirical regularities are established in greater detail in an earlier version of this paper. It is available from the authors on request.

¹⁴ For much of our analysis to go through, we only require that there be systematic asymmetry in the amounts of private information held by domestic and non-resident stock market investors. As we discuss in greater detail at the end of Section 4, our data are actually consistent with foreign stock market investors in Thailand being at an informational disadvantage relative to domestic investors. Similar informational asymmetries are reported by Hau (2001) for Germany, Dvořák (2005) for Indonesia, and Choe, Kho, and Stulz (2005) for Korea.

¹⁵ While corporate bonds exist in Thailand, trading in the secondary bond markets during the sample period was overwhelmingly concentrated in central bank and government paper.

¹⁶ FX dealers are presumably also aware of these patterns. If dealers are able to adjust their foreign currency inventories across days, they will find it advantageous to try to buy baht and sell dollars from customers and other dealers (leading to an appreciation of the baht) on a day when they observe an upswing in stock market-related capital inflows of their non-resident customers. This adjustment puts the dealers in a position to sell further baht to (and buy dollars from) their foreign customers over the next few days as the capital inflows continue. This mechanism helps explain the small amount of positive serial correlation in baht returns that was revealed in our preliminary analysis of the data. We note that while this transmission mechanism works in the same direction as the basic information story, it is a liquidity-provision rather than a "pure" information story.

Conversely, because the bond market transactions of foreign investors that induce order flow in the FX market are assumed not to be based on private information, they should not provide a reason to FX dealers to adjust their quoted bid and ask prices other than for inventory and liquidity reasons. Such flows should have at most only a small contemporaneous influence on the baht.

Hypothesis 2 FX order flow that is driven by foreign investors' Thai government bond market operations should have at most a small contemporaneous impact on the Thai baht.

In addition to studying differences in the contemporaneous impacts of subsets of FX order flow on the exchange rate, we may also examine whether the long-run influences of these order flow subsets are the same. If stock market investors act on private information about firms, their induced FX order flow should not only have a contemporaneous effect on the exchange rate but also a permanent effect. In contrast, order flow that does not convey private information should have, at most, a transitory effect. Our third empirical hypothesis is therefore:

Hypothesis 3 FX order flow that is driven by foreign investors' Thai equity market transactions should have a permanent effect on the exchange rate, whereas other portions of FX order flow should have at most a transitory effect on the exchange rate.

3. The markets and the data

In this section, we provide a brief overview of the onshore FX, stock, and government bond markets in Thailand, focusing mainly on aspects of the markets and data that are important for the empirical analysis conducted in Section 4. We also note certain regulatory features of the financial markets in Thailand that induce a relationship between foreign investors' capital market transactions and their FX market transactions that is closer in Thailand than in many other economies.

3.1 Sample period and definition of non-resident investors

All observations are daily. The data cover the period from the beginning of January 2005 through Friday, 15 December 2006. The data we received initially run through mid-2008. However, after conducting a preliminary analysis we decided not to use data after mid-December 2006. On Tuesday, 19 December 2006, the Thai authorities imposed additional and very stringent capital control measures, highlighted by a 30% unremunerated reserve requirement (URR) on non-resident investors' financial holdings apart from stock market holdings. The introduction of these measures caused a severe structural break in the behaviour of financial markets in Thailand. For instance, following the introduction of the URR measures, foreign investors' participation in the onshore financial markets of Thailand dropped off sharply, the volume of offshore baht trading increased, and a large differential opened up between onshore and offshore baht-dollar quotes.¹⁷

Throughout this paper, we focus on the transactions of foreign or, more precisely, non-resident investors in Thailand. Formally, non-resident investors comprise (i) corporations, institutions, funds, financial institutions or juristic persons located outside Thailand; (ii) entities of foreign governments located outside Thailand; (iii) branches and agents of

¹⁷ The URR regulations were repealed by early March 2008. However, the stretch of post-URR data available at the time of the initial writing of this paper was not long enough to allow us to conduct a reliable econometric analysis with them.

domestic juristic persons located outside Thailand; and (iv) natural persons not of Thai nationality who do not have alien identity or residence permits. According to information we received from the BoT's Data Management Group, financial institutions are the dominant group – with a share well in excess of 90% of total transactions – among the non-resident end-users in Thailand.

Non-resident investors that hold bank balances in Thailand are required to do so by holding so-called non-resident baht accounts, or NRBA. During the sample period, NRBA regulations were broadly stable.¹⁸ For our paper, the most important of the NRBA rules is that balances held in NRBA may not exceed THB 300 million per non-resident customer at the end of each day.¹⁹ This upper bound covers all accounts of that customer with all domestic financial institutions.²⁰

If non-resident investors in Thailand, as a group, wish to build up (or unwind) their positions in long-term baht-denominated financial assets such as bonds or shares, they can do so in the short run only in the following three ways: (i) by drawing down (or building up) their existing baht-denominated bank balances held in NRBA; (ii) via selling (buying) of shorter-term fixed income assets, including money market claims, to domestic market participants, or (iii) by engaging in baht-denominated FX transactions. Because of the fairly stringent limits on allowable balances in NRBA and a general lack of liquidity in the private money markets in Thailand, the most straightforward method by which non-resident investors may acquire (or liquidate) the funds involved in the purchase (or sale) of baht-denominated shares and bonds is by transacting in the FX market. This institutional feature is one of the keys to our ability to link foreign customers' order flow across markets.

3.2 The onshore FX market

The structure of the onshore FX market in Thailand is similar to that in many other countries. There is no single organised exchange that handles FX transactions. Rather, the wholesale market is over-the-counter. Licensed currency dealers, which can be domestic or foreign-owned banks and brokers, provide wholesale FX trading services in Thailand.²¹ In addition to conducting interdealer transactions, the FX banks also conduct FX purchases and sales with both domestic and non-resident customers.

The onshore FX market in Thailand is closely monitored by the BoT. First, onshore commercial banks are required by the BoT to limit their net FX positions in any one currency to no more than 15% of capital (individual currency limit) and also to maintain a net overall FX position across all foreign currencies of no more than 20% of capital (aggregate currency limit) at the end of each day. The position limits tend to be particularly important for the branches of foreign banks that operate in Thailand. FX dealers usually manage to adhere to these limits by conducting FX swaps.

Second, all licensed FX dealing banks must submit detailed reports of all FX transactions on a daily basis to the BoT. In the banks' daily reports, each transaction record states the

¹⁸ The NRBA regulations went into effect in October 2004, ie shortly before the start of the sample period.

¹⁹ At the exchange rates that prevailed during the sample period, this limit amounted to US\$7.1–8.6 million.

²⁰ Foreign currencies converted into baht by non-resident customers are normally (though not necessarily) credited to their NRBA before being spent on equities and bond securities and, conversely, the proceeds of sales of equities and bonds by non-residents are frequently credited first to NRBA before being converted into foreign currencies.

²¹ Licensed FX dealers: 21 were domestic financial institutions, and 18 were subsidiaries of foreign financial institutions. After some mergers in late 2005, the number of FX dealers in Thailand was 37 during all of 2006 (20 domestic and 17 foreign).

counterparty, its type (other dealer, domestic customer, non-resident customer, and BoT), the volume (in dollar equivalent), the currencies involved (by far the majority of all transactions are in Thai baht vs U.S. dollars), the applicable exchange rate, and the type of transaction. The five types of transactions are spot (separated further into same-day, “tomorrow” or T +1, and “next” or T + 2 transactions), outright forwards (T ≥ 3), and FX swaps. Of crucial importance for our study is that each transaction is classified as either a “buy” or a “sell.” Because transactions are recorded from the point of view of the reporting bank, a “buy” consists of a purchase of dollars (or other foreign currency) by the reporter and hence a sale of baht to the counterparty.²²

Based on this information, the BoT constructed for us daily-frequency gross and net capital flow series for all five types of FX contracts. This was done by aggregating across reporters to obtain the gross series and taking the difference between aggregate buys and sells to obtain the net capital flow series. This measure of net capital flows does not match perfectly the theoretical definition of order flow, which focuses on which counterparty initiates the buy or sell transactions. From conversations we held with FX dealers in Thailand, however, we believe that the vast bulk of “spot-tomorrow” (T + 1), “spot-next” (T + 2), and outright forward transactions between dealers and their non-resident customers is initiated by customers. Hence, the net capital flow series should match the theoretical concept of order flow very well for these types of transactions. In contrast, FX dealers told us that FX swaps tend to be initiated by either the FX dealing banks or their non-bank customers. In consequence, in the case of FX swaps our net capital flow measure may not be a good proxy for order flow. This feature may help explain some of the results reported in the following section, such as the fact that net purchases of FX swaps by foreign investors do not help explain exchange rate fluctuations.

In addition to aggregating the FX dealers’ transaction reports into daily-frequency time series according to whether they are “buys” or “sells” and according to their settlement maturity, they may also be aggregated by the type of counterparty – other FX dealers, non-resident customers, domestic customers, and the BoT.²³ For this study, our access to the aggregate data was limited to gross and net flows between dealers and their non-resident customers.

The daily average transaction volume between dealers and non-resident end-users was US\$780 million in 2005 and US\$1,155 million in 2006. In both 2005 and 2006, two-day spot transactions made up roughly 45 percent of the non-resident customer total, FX swaps accounted for an additional 33–35%, spot-tomorrow transactions contributed 11–13% to the total, and spot-today (same-day settlement) and outright forwards (T ≥ 3) each accounted for about 4% of the total transaction volume between dealers and their non-resident customers. In both 2005 and 2006, all three daily spot FX net capital flow series were positive on average, ie non-resident customers were net buyers of spot baht in both years. Conversely, non-resident customers were net sellers of baht through outright forwards and FX swap contracts in both years.

As is the case with most other emerging market economies, FX trading in Thailand occurs almost exclusively during Thai business hours, and virtually no transactions occur overnight. The bilateral THB/USD spot exchange rate used in this study is collected by the BIS as of

²² The banks’ daily transaction records do not contain information on which counterparty – the reporter or the customer – was the initiator of the transaction, the bid-ask spread, or whether the transaction took place at the bank’s bid or ask quote. In addition, the transaction records do not contain time-stamp information. We therefore could not reconstruct intraday times series of prices or volumes.

²³ Transactions between the BoT and FX dealer banks generally consist of intervention operations. See Bank of Thailand, Financial Markets Operations Group (2005) for an overview of its goals with respect to the conduct of its FX interventions. To the extent that the BoT’s intervention operations conform to the “leaning against the wind” metaphor, the findings we report in this paper would be even stronger if BoT intervention did not occur.

7.15 pm Bangkok time (corresponding to 2.15 pm Central European time). This choice of collection time – shortly after equity, bond and onshore FX trading has ended in Bangkok – allows the daily FX returns series to reflect all relevant intraday information without being affected by global market developments that occur after the close of business in the onshore market.²⁴

3.3 The equity market

Our stock market price data consist of the daily closing values of the SET index, which is the main share price indicator of the Stock Exchange of Thailand. The SET index is a market capitalisation-weighted index and is based on the stock prices of companies listed on the main board of the exchange. The mean daily return of the SET index was very close to zero in both 2005 and 2006. Other than during a brief bout of heightened global market volatility during May and June 2006, stock price volatility was fairly low and constant during the sample period.

We also have daily-frequency gross buy and sell transaction volumes on the SET by non-resident investors.²⁵ Investors can trade securities on the SET through any of 39 brokerage houses, many of which are foreign-owned. Settlement for equities is performed on a T +3 basis. As with the FX datasets, we terminate the sample period on 15 December 2006. Average daily gross transaction volume (buys+sells) on the SET by non-resident investors in 2005 and 2006 was the equivalent of US\$229 million and US\$286 million, respectively, or less than a third of average daily gross FX flows between dealers and non-resident customers.

3.4 The bond market

Non-resident investors' participation in the Thai bond markets in 2005 and 2006 was quite limited. Daily transaction volumes by non-resident investors averaged only US\$55 million and US\$88 million in these two years, amounting to roughly 15% and 19%, respectively, of all bond market trades. In 2005 and 2006, trading volume in the secondary bond markets was overwhelmingly (about 98%) concentrated in BoT paper and in government bonds and bills. Even though the stock of outstanding corporate bonds in Thailand has grown rapidly in recent years, trading in corporate bonds was very limited during the sample period.

Our bond market dataset consists of daily-frequency buy and sell transaction totals by non-resident investors in the secondary bond market. Bond market transactions are classified according to whether they are "outright" (or ordinary) or "other" transactions. In our sample, "outright" transactions make up about 70% of all transactions. According to information we received from private-sector dealers and staff of the Bank of Thailand, these transactions are mainly associated the one-day (T +1) settlement segment of the spot FX market, although some transactions settle on a T +2 or T +3 basis.

"Other" bond trades occur mainly in connection with banks' financing transactions; we were told that they settle mostly on a same-day or a T +1 basis. They make up about 30% of the total bond market volume of non-resident customers. A preliminary data analysis revealed

²⁴ Other data sources generally report FX rates as of 5 pm New York time, the conventional end of a 24-hour trading day in major FX markets.

²⁵ Albuquerque, de Francisco, and Marques (2008) used firm-by-firm equity transactions data to construct proxies for firm-specific and marketwide private information. Because of the aggregate nature of our data, we could not perform such calculations and hence cannot distinguish separately between these motives for trading activity.

that “other” bond transactions of non-resident investors are closely associated with contemporaneous FX swap transactions. As we noted earlier, during our sample period FX swaps transactions tended to be initiated by banks. Our data suggest that a large part of foreign investors’ “other” bond market transactions appear to be related to banks’ money market operations.

We found that foreign investors’ net stock market flows were nearly uncorrelated over the sample period with their “outright” bond flows as well as with their “other” bond flows (with correlations below 0.05). In addition, foreign investors’ net flows in “outright” and “other” bonds were also only slightly positively correlated with each other, with a correlation coefficient of about 0.15. These low numbers suggest that these three forms of domestic capital market transactions are driven by different considerations.

During the sample period, non-resident investors did not appear to hedge – or did so only to a minor degree – the FX risk they incurred when undertaking either equity or “outright” bond transactions. This may be because non-resident investors in Thailand face binding restrictions – such as prohibitions on short-selling of many classes of financial assets – that make the hedging of FX market risk either expensive or unfeasible. In contrast, the FX risk embedded in “other” bond transactions does appear to be hedged, mainly through offsetting FX swap transactions. This is again consistent with “other” bond market transactions being used mainly in conjunction with banks’ local money market operations. We discuss the possible role that differences in hedging behaviour may have for explaining our results at the end of Section 4.

4. Empirical results

4.1 Methodological preliminaries

If each FX transaction record submitted by the FX dealing banks to the BoT contained auxiliary information to denote whether the customer’s transaction was associated with a transaction in the domestic stock or bond markets, it would be straightforward to test our hypotheses directly: One would run an order flow regression with FX returns as the dependent variable and the FX order flow series as regressors; the latter would be split into components related to stock market transactions, bond market transactions, and a remainder. The null hypothesis to be tested would be that the coefficients of the three components are equal to each other, and the alternative hypothesis of interest would be that the coefficient on the stock market-related component of FX order flow is larger (in absolute value) than either of the other two. Unfortunately, the transaction records do not contain these auxiliary pieces of information.

FX dealers, of course, observe their customers’ order flow in real time, and they presumably “know” from experience whether or not the components of their customers’ order flow have the same influence on the exchange rate.²⁶ Our data do not let us reconstruct the FX dealers’ information about their customers’ transactions. Relative to the FX dealing banks, though, we possess the important informational advantage of having complete rather than only partial data on each day’s aggregate order flow of all non-resident customers in the FX, stock, and bond markets. Having data from these three financial markets enables us to construct simple proxies for the subsets of non-resident investors’ FX order flows that are driven by their stock

²⁶ In addition, quants in the banks’ back offices may have solved the applicable signal extraction problem and derived precise rules on how dealers should adjust quotes in response to various types of order flow.

and bond market transactions.²⁷ Of course, because the constructed series are proxies rather than the unobservable series of interest, they will contain measurement error. From basic regression theory, it is known that if regressors are measured with error, their coefficient estimates are biased toward zero, ie one will underestimate the regressor's effect on the dependent variable. In our study, one would tend to underestimate the effect of the constructed order flow components on the exchange rate. However, if one does find statistically significant effects using the proxy regressors, one may conclude safely that the effect of the "true" (but unobserved) order flow variable is also non-zero.

To be sure, transactions of non-resident customers in the stock market and the FX market need not be driven solely by investors' private information. Their transactions could also be driven by public information releases or by hedging and liquidity needs that are unrelated to economic conditions in Thailand. We do not include measures of contemporaneous public information in our regressions. Given that the public and private information sets are orthogonal by construction, the omission of variables that proxy for public information, while causing the R^2 numbers to fall, does not create bias or inconsistency in the estimates of the coefficients and their standard errors.

If the measurement error in the order flow series is stationary or $I(0)$, the measurement error in the cumulative order flow series will be $I(1)$. This has important consequences for testing for cointegration. Suppose that a series $X^* = \chi_j$, where the innovations $\{\chi_j, j=0, 1, \dots\}$ are $I(0)$, is cointegrated with an $I(1)$ series Y_t , but that the series X^* is not observed directly. Instead, one observes a series $X_t = (\chi_j + \xi_j) = X^* + \Xi_t$, say. Unless the $I(1)$ variable Ξ_t is $j=0$ t also cointegrated with Y_t , the long-run relationship between X_t and Y_t is spurious in the sense of Granger and Newbold (1974) and Phillips (1986), and the cointegrating vector between X^*_t and Y_t is not estimable consistently. In consequence, the null of a unit root in the residuals from the cointegrating regression of Y_t on X_t will not be rejected asymptotically, ie a unit root test has asymptotically no power against the alternative of cointegration. In finite samples, the tests will be biased towards non-rejection of the null of a unit root in the residuals of a cointegrating regression, ie the tests' true size will be smaller than their nominal size. In the context of testing for cointegration with significant $I(0)$ measurement errors, Fischer (1990) recommends raising the critical level of the tests above the conventional values of 5% or 10% in order to preserve power against the alternative hypothesis of cointegration. This recommendation should apply, a fortiori, if the measurement error is $I(1)$.²⁸ Table 1 lists the acronyms, descriptions, and units of measurement of all variables shown in Tables 2, 3, and 4. The reported standard errors in Tables 2 and 4 are based on the assumption that the regression model errors are homoskedastic and serially uncorrelated. None of the inferences we make would change if the standard errors were computed using methods that are robust to heteroskedasticity and serial correlation.²⁹ The models used in the first-stage regressions and in the main order flow regression also passed several tests for structural breaks and other forms of misspecification.

²⁷ In economics, the practice of splitting a time series into two components – one constructed as the fitted part from a preliminary regression and the other defined as the residual from that regression – and using both the fitted and residual components as explanatory variables in lieu of the original series, dates back at least to Barro (1977).

²⁸ A recent, rigorous treatment of the case of testing for cointegrating relationships in the presence of $I(0)$ measurement error is provided by Hassler and Kuzin (2008). How to test for cointegration in the presence of $I(1)$ measurement errors in one or more of the cointegrated variables appears to be a subject that has not yet been studied in depth by econometricians.

²⁹ We checked this by using the robust methods proposed by White (1980) and Newey and West (1987), the latter with a Bartlett-type smoothing kernel and a choice of 5 for the lag-length parameter.

4.2 Contemporaneous impact of FX order flow

We tested hypotheses 1 and 2 using a two-stage procedure. In the first stage, we constructed proxies for the portions of daily FX order flow that are driven by stock and bond market variables. In the second stage, we regressed daily baht-dollar returns on these constructed order flow series as well as on additional control variables and tested the null hypothesis that the coefficients on constructed regressors are equal.

Table 1

Description of variables shown in Tables 2, 3, and 4

All order flow series refer to transactions between banks and non-resident customers. Order flow is defined as the difference between banks' "buy" and "sell" transactions with customers.

Variable name	Description	Units
THB SET	First difference of log of baht-dollar exchange rate. First difference of log SET stock market index, in dollar terms	
OF SPOT TOM OF SPOT NXT	Order flow, FX spot-tomorrow Order flow, FX spot-next (T + 2)	USD million USD million
OF SPOT TOM FIT BND	Fitted values from regression of spot-tomorrow order flow on bond market variables	USD million
OF SPOT TOM RES BND	Residuals from regression of spot-tomorrow order flow on bond market variables	USD million
OF SPOT TOM FIT SET	Fitted values from regression of spot-tomorrow order flow on stock market variables	USD million
OF SPOT TOM RES SET	Residuals from regression of spot-tomorrow order flow on stock market variables	USD million
OF SPOT NXT FIT SET	Fitted values from regression of spot-next order flow on stock market variables	USD million
OF SPOT NXT RES SET	Residuals from regression of spot-next order flow on stock market variables	USD million
CUMUL(•)	Cumulative sum series	
OF FX SWAPS OF SET OF OUTR BOND OF OTHR BOND	Order flow, FX swaps Order flow, Stock Exchange Order flow, "Outright" bonds Order flow, "Other" bonds	USD million USD million USD million USD million

To determine which of the five FX order flow series are affected by either the stock or bond market (or both), we regressed the FX order flow series on our bond and stock market variables. The stock and bond-market variables used in these regressions consisted of the contemporaneous and 3 lagged values of own-market order flow and returns.³⁰ We found that two-day spot, or spot-next, FX order flow was related systematically to stock market variables but not to bond market variables. We also found that one-day spot, or spot-tomorrow, FX order flow was related systematically to bond market order flow generated by non-resident investors "outright" bond transactions, but not to investors' "other" bond transactions, and only barely to stock market variables. The R2 statistic of the regression of

³⁰ In all cases, the contemporaneous regressors had the statistically largest influences.

the spot-next series on the stock market variables alone was 0.19, and the R2 of the regression of the spot-tomorrow series on the bond market variables was 0.11. For comparison, the R2 value for the regression of spot-tomorrow order flow on just the stock market variables was only 0.05.³¹

Table 2

FX order flow regression

The dependent variable is the log-first-difference of the baht/dollar exchange rate. The regressors are measured in millions of US dollars. Positive values of the regression coefficients imply a depreciation of the baht versus the dollar. The numbers in the p-value column denote the significance of the associated t-statistics against the two-sided alternative that the coefficients in question are different from zero.

Regressor	Coeff.	Std. Error	t-statistic	p-value
OF SPOT TOM FIT BND	0.08×10^{-5}	8.98×10^{-6}	0.083	0.934
OF SPOT TOM RES BND	-0.78×10^{-5}	2.36×10^{-6}	-3.286	0.001
OF SPOT NXT FIT SET	-3.06×10^{-5}	2.54×10^{-6}	-12.084	0.000
OF SPOT NXT RES SET	-0.99×10^{-5}	1.14×10^{-6}	-8.668	0.000
	R ²	0.487	F-statistic	18.71
	Adj. R ²	0.461	F-statistic Prob.	0.00

Additional regressors: constant term, two lags of dependent variable, same-day spot FX order flow, outright FX forwards order flow, FX swap order flow, first lag of all order flow regressors.

Number of observations: 332 after adjustments.

In the second stage, we ran an order flow regression with baht-dollar returns as the dependent variable and the constructed FX order flow series as the regressors.³² Because

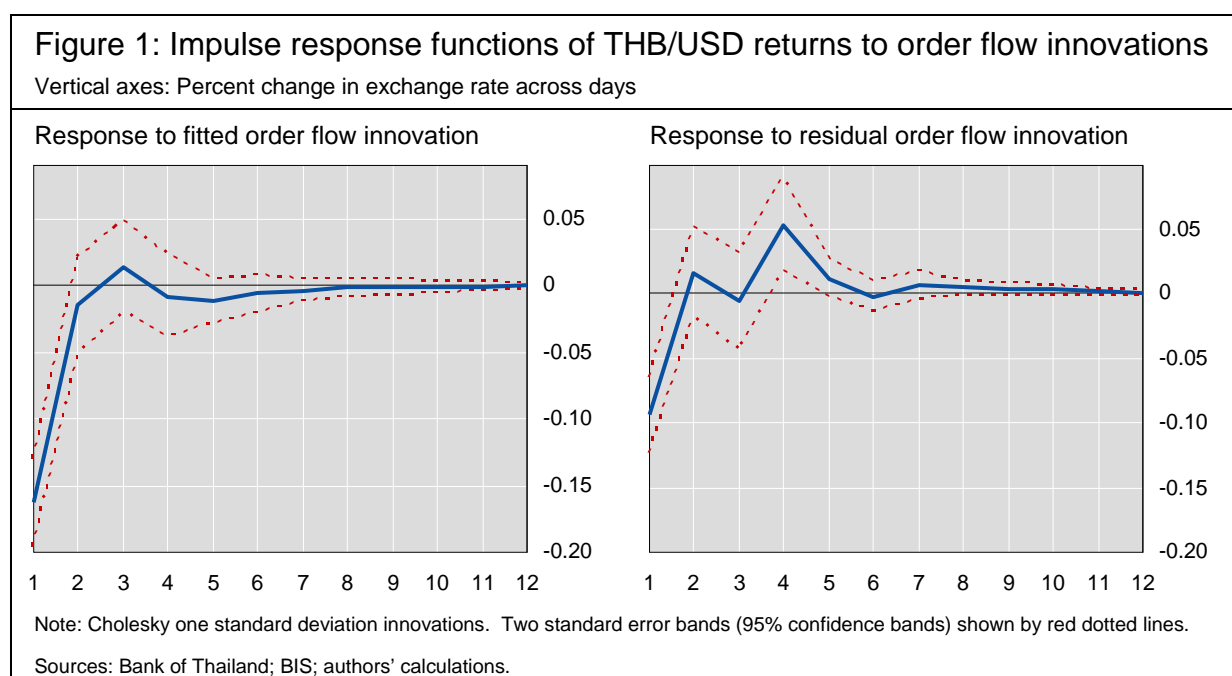
³¹ In addition, we determined that foreign investors' FX swap order flow was linked statistically to investors' "other" bond market transactions. We also found that the overall influence of FX swap order flow on baht-dollar returns is insignificant. Splitting the overall swap order flow series into two components – a portion that is explained by bond market variables alone, and a residual – yields statistically insignificant coefficient estimates for both the fitted and the residual regressors.

We offer two, not mutually exclusive, interpretations of this (negative) result: First, the lack of influence of the FX swap order flow variable (and its components) on the exchange rate could be due to the fact that FX swaps are used frequently in banks' money market operations; such transactions do not convey investors' private information about future baht-denominated asset returns. Second, the lack of influence could also be due to the fact that our net purchase series is not a good proxy for order flow in the case of FX swaps, because FX swaps tend to be initiated by banks as well as by their customers; the lack of statistical significance could therefore also be due in part to measurement error.

³² In this regression, we also included – but do not report separately in Table 2 – a constant term, two lags of the dependent variable, contemporaneous same-day, outright-forward and FX swap order flow, and 1 lag of each of all order flow regressors. Adding several regressors that serve as proxies for public information led to a small increase in the overall goodness of fit of the model, but the quantitative and qualitative results for the order flow regressors were unchanged.

the fitted values and residual values of the spot-tomorrow and spot-next series are generated from first-stage regressions, the resulting dependence between the generated regressors and the regression's error term renders analysis using OLS-based standard errors invalid. In consequence, we estimated the equation using a two-stage least squares procedure, in which we used instruments for the fitted regressors to obtain consistent estimates of the standard errors.³³

Hypothesis 1 is strongly supported by the data. The coefficients of both the fitted and the residual regressors for spot-next order flow derived from the first-stage regressions, shown in Table 2, are both statistically significant and are negative. However, the coefficient of the fitted spot-next regressor is more than three times as large in absolute value the coefficient of the residual spot-next regressor, and the difference between the two estimated coefficients is statistically significant. The coefficient estimates, which show the marginal influence of the various order flow types, indicate that an increase in the fitted portion of foreign customers' spot-next order flow of US\$100 million would, on average, lead to an appreciation of the baht against the U.S. dollar of about 0.31%, whereas an equal-sized increase in the residual portion of this series would generate an appreciation of the baht of 0.10%.



We interpret these results as clear evidence that – dollar for dollar – the portion of spot-next FX order flow that is driven by equity market activity has a more pronounced contemporaneous effect on the exchange value of the baht than the residual component of spot-next order flow has. Given that private information appears to be an important driver of equity market activity, it also exerts an important influence on FX market activity and returns as well.

³³ See, eg Mishkin (1982) and Pagan (1984) for a thorough discussion of issues that arise in models with constructed regressors. Pagan shows that whereas the OLS-based estimates of all coefficients as well as the OLS-based standard errors of the residual regressors are consistent in such a model, the OLS-based standard errors of the fitted regressors are inconsistent.

Hypothesis 2 is also supported by the regression results: the portion of spot-tomorrow order flow that is related to foreign investors' transactions in the bond market does not have a statistically significant impact on returns. Instead, all of the explanatory power of the overall spot-tomorrow order flow variable is contained in the residual component. We interpret this as indicating that because private information is known not to drive non-resident investors' activity in the bond market, the portion of FX order flow that is induced by foreign investors' bond market activities does not induce FX dealers to change their quotes in response to such order flow; hence, it does not systematically affect the baht's exchange value.³⁴

4.3 Permanent versus transitory influences of FX order flow

Do the effects on the exchange rate of the fitted and residual portions of spot-next order flow differ not only in their initial magnitude but also in their persistence? To answer this question for the case of spot-next order flow, which constitutes by far the largest segment of the spot FX market, we estimated a three-variable vector autoregressive (VAR) model that includes the fitted values of the regression of spot-next order flow on stock market variables, the residual portion of spot-next order flow, and baht-dollar returns. Three lags of all variables were included in the VAR. We orthogonalized the impulse response function using the Cholesky decomposition to let innovations in the order flow series drive FX returns, but not vice versa. The two order flow series were found to be weakly exogenous to the exchange rate returns series;³⁵ hence, our choice of ordering of the variables in the Cholesky decomposition is supported by the data.³⁶ We then computed the impulse response functions (IRFs) and cumulative response functions (CRFs) to trace the effects of innovations in the fitted and residual components of spot-next FX order flow on baht returns. The IRFs and CRFs show the effects out to 12 days after an innovation. At longer time horizons, the functions are essentially flat and do not provide additional information about the system's dynamic properties.

The IRFs in Figure 1 show that a 1 standard deviation innovation in the portion of spot-next order flow that can be attributed to equity market variables has an initial impact on baht returns that is almost twice as large (-0.16% vs -0.09%) as that of a 1 standard deviation innovation in residual spot-next order flow. Taking into account that in the sample period the standard deviations of the fitted and residual portions of two-day spot order flow were US\$58.6 million and US\$126.6 million, respectively, it follows that – dollar for dollar – innovations in the fitted portion of FX order flow have an initial impact on the baht that is almost four times as large as that of innovations in the residual portion.

The longer-term effects of these innovations on the level of the Thai baht's exchange value are shown by the CRFs in Figure 2. The left-hand panel shows that the initial impact of an innovation in spot-next FX order flow that is driven by equity market activity is not reversed and that it remains statistically different from zero. Hence, an innovation in the portion of spot-next order flow that is linked to stock market variables has a permanent and statistically significant effect on the level of the baht.

³⁴ Since September 2003, non-resident investors who bought bonds issued by domestic financial institutions in Thailand have been required to hold these bonds for at least three months. Although the size of non-resident investors' holdings of such bonds is small, it is possible that this constraint could be partly responsible for this empirical result.

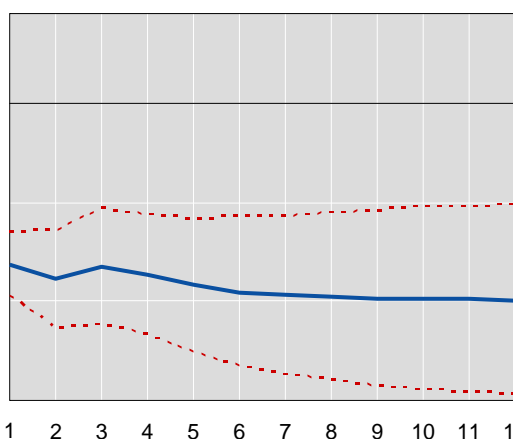
³⁵ Killeen, Lyons, and Moore (2006) also found weak exogeneity of order flow with respect to exchange rates, for the case of French franc/Deutsche mark exchange rate pair.

³⁶ To check the robustness of our conclusions to the choice of specification, we re-estimated the VAR with 6 lags instead of 3 lags, and we also constructed the IRFs and CRFs using a "structural" decomposition instead of the commonly-used Cholesky decomposition. Our conclusions were not affected by these alternative specifications.

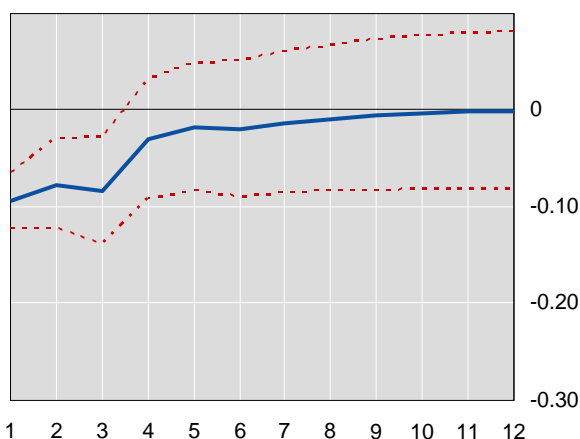
Figure 2: Cumulative response functions of THB/USD level to order flow innovations

Vertical axes: Percent change in exchange rate across days

Response to fitted order flow innovation



Response to residual order flow innovation



Note: Cholesky one standard deviation innovations. Two standard error bands (95% confidence bands) shown by red dotted lines.

Sources: Bank of Thailand; BIS; authors' calculations.

In striking contrast, the right-hand panel of Figure 2 shows that the initial impact of an innovation in the residual portion of spot-next FX order flow on the level of the baht's exchange value is quickly undone over the next few days. The cumulative impact of such an innovation on the level of the baht is zero. Hence, even though the contemporaneous effect of the residual component of spot-next order flow is statistically significant (see Table 2), this variable has no lasting influence on the level of the baht. The purely temporary influence of the residual component of spot-next order flow on the exchange rate suggests that its influence on the exchange rate is composed of inventory and liquidity effects, rather than information effects which should be permanent. These results therefore confirm Hypothesis 3, which held that the portion of FX order flow that reflects transactions related to stock markets should have a permanent effect on the exchange rate, whereas other portions should not. We infer that capital flows driven by private information have a permanent effect on the exchange rate.

4.4 Cointegration analysis

A different way of examining which components of FX order flow have a permanent influence on the exchange rate has been proposed by Killeen, Lyons, and Moore (2006). They argued that if FX order flow, an $I(0)$ variable, has a permanent effect on the level of the exchange rate, an $I(1)$ variable, then cumulative FX order flow and the exchange rate must be cointegrated. Conversely, if a cumulative FX order flow series and the exchange rate are not cointegrated, then any effect this order flow series has on the exchange rate must be purely transitory.

Table 3 shows the results of unit root tests performed on several univariate time series and on the residuals from bivariate cointegrating regressions between the log exchange rate level and several cumulative order flow series.³⁷ Unsurprisingly, we find that the null hypothesis of

³⁷ We used Augmented Dickey-Fuller tests. We included a constant term and 10 lags of the dependent variable to eliminate the effects of short-run dynamics. We found that our results were not sensitive to slight variations in the number of lags.

a unit root in the log exchange rate and in the cumulative spot-tomorrow and spot-next order flow series is not rejected (lines 1–3). The same result holds for the cumulative series of the fitted values from the regressions of spot-tomorrow and spot-next on stock market variables (lines 4 and 6). For the residuals from these first-stage regressions, the null of a unit root can be rejected, at the 8% and 4% levels of significance, respectively. Therefore, the components of the spot-tomorrow and spot-next order flow series that are uncorrelated with stock market variables cannot have a long-run effect on the exchange rate. Because series of different orders of integration are trivially cointegrated, we do not report the results of cointegration tests for residuals of cointegrating regressions between the log exchange rate (an I(1) series) and the two components of spot-tomorrow and spot-next order flow that are not explained by stock market variables, as they appear to be I(0) series.

Table 3

Augmented Dickey-Fuller unit root tests

We show the ADF t-statistics of the null hypothesis that the series in question has a unit root. The associated p-values are for the one-sided alternative that the series in question is stationary.

(a) Univariate unit root tests	t-statistic p-value	
LN(THB/USD)	0.875	0.995
CUMUL(OFF SPOT TOM)	-0.487	0.891
CUMUL(OFF SPOT NXT)	-1.621	0.471
CUMUL(OFF SPOT TOM FIT SET)	0.410	0.983
CUMUL(OFF SPOT TOM RES SET)	-2.658	0.082
CUMUL(OFF SPOT NXT FIT SET)	-1.960	0.305
CUMUL(OFF SPOT NXT RES SET)	-2.917	0.044
(b) Unit root tests performed on residuals from cointegrating regressions	t-statistic p-value	
LN(THB/USD) vs. CUMUL(OFF SPOT NXT)	-0.646	0.437
LN(THB/USD) vs. CUMUL(OFF SPOT NXT FIT SET)	-1.565	0.111
LN(THB/USD) vs. CUMUL(OFF SPOT TOM)	-1.671	0.090
LN(THB/USD) vs. CUMUL(OFF SPOT TOM FIT SET)	-1.547	0.115

Applying the same test procedure to the residuals from the cointegrating regressions, we find that cumulative total spot-next order flow is not cointegrated with the exchange rate (line 8). In contrast, the null hypothesis that the portion of cumulative spot-next order flow that is explained by stock market variables is not cointegrated with the exchange rate can be rejected (line 9), but only with a nominal p-value of 0.11. As we noted earlier, this cumulative order flow series must have an I(1) measurement error component because the order flow series is not observed directly but is estimated and is subject to estimation error. This biases the statistical tests towards non-rejection of the null hypothesis of no cointegration, even if the null hypothesis is false. To preserve some power against in a finite sample against the alternative of cointegration, one has to be willing to increase the Type I error rate or, equivalently, raise the critical p-values. We therefore judge that the exchange rate is indeed cointegrated with the portion of cumulative spot-next order flow that is explained by stock market variables. We also conclude that cumulative spot-tomorrow order flow and the spot exchange rate are cointegrated (line 10). Interestingly, even though the regression of spot-tomorrow order flow on stock market order flow has an R² value of only 0.05, the long-run

stable relationship between cumulative overall spot-tomorrow order flow and the exchange appears to be due mainly to the portion of order flow that is fitted to the stock market variables (line 11).

4.5 Discussion

One might view differences in hedging of FX market risk across asset classes as a possible alternative explanation for our findings. If FX risk incurred by holding Thai equities is not hedged whereas FX risk incurred by holding baht-denominated government bonds is, would this not generate the same observations? If private information is driving changes in equity values, then it should generate order flow in the equity and, indirectly, in the FX market regardless of whether FX risk is hedged or not; hedging will only determine who bears FX risk. In our view, hedging of FX risk would only eliminate the need to execute FX flows that would be induced by investors' portfolio rebalancing across countries, but that is not a function of information.

Table 4

Determinants of FX swap order flow

The dependent variable is the FX swap order flow by nonresident investors in Thailand. The numbers in the p-value column denote the significance of the associated t-statistics against the two-sided alternative that the coefficients in question are different from zero.

Regressor	Coeff.	Std. Error	t-statistic	p-value
SET	-525.613	687.958	-0.764	0.445
OF SET	0.380	0.217	1.750	0.081
OF OTR BOND	0.313	0.138	2.262	0.024
OF OTHR BOND	0.830	0.215	3.865	0.000
	R ²	0.180	F-statistic	4.63
	Adj. R ²	0.142	F-statistic Prob.	0.00

Additional explanatory variables: Constant term and first three lags of regressors shown.

Number of observations: 353 after adjustments.

Moreover, in the onshore Thai FX market, any hedging of FX risk typically takes place via FX swaps. If there is hedging of outright bond positions but not of equity positions, FX swap order flow should be driven more by outright bond flows than by equity flows. However, when we regress FX swap order flows on equity, outright bond, and other bond market order flow, we find that during the sample period non-resident investors did not appear to use FX swaps differently for hedging their equity and "outright" bond transactions; see Table 4 for the results of this regression. The point estimate of the coefficient on contemporaneous stock market order flow is actually slightly larger than that of outright bond order flow, but the difference between the point estimates is not statistically significant. The low extent to which FX risk incurred by holding equities or "outright" bonds is hedged may owe to the fact that non-resident investors in Thailand face binding restrictions that make the hedging of FX

market risk either expensive or unfeasible. Differences in hedging behaviour therefore cannot explain our finding that FX order flow associated with stock market variables has a large and permanent effect on the exchange rate whereas FX order flow associated with outright bond transactions appears to have no effect.³⁸

Another alternative explanation for our finding that bond market order flow does not appear to convey information relevant for the exchange rate, which does not necessarily contradict our explanation, is that foreigners could be buying and selling Thai bonds as part of a carry trade strategy. During the sample period, Thailand was an emerging market economy with strong economic growth and attractive interest rate differentials. If non-resident investors' bond transactions are mainly carry trades, their order flow would contain no private information. During the sample period, however, we found that interest rate differentials were not significant drivers of exchange rate movements. Thus, carry trades cannot explain our findings.³⁹

We found that fluctuations of the Japanese yen against the US dollar help explain contemporaneous baht-dollar movements, with a 1 percent appreciation of the yen against the dollar being associated with a same-day 0.3 percent appreciation of the baht against the dollar. However, the inclusion of this regressor in order flow regressions has only a negligible impact on the coefficients of the order flow variables. This indicates that information conveyed by equity market order flow is an important driver of the exchange rate.

Some might suspect that econometric specification choices could be driving the results. In particular, one might be concerned that our proxies for the portions of FX order flow that are induced by investors' order flow in the stock and bond markets are too simplistic. The construction of our proxies is indeed very simple. Of course, one cannot gauge precisely how good the proxies are, as it is not possible to determine exactly which equity and bond market order flows drive which FX flows. However, the fact that the time series of the portions of spot-next and spot-tomorrow FX order flow that are driven by stock market variables are cointegrated with the exchange rate suggests that the proxy variables are in fact quite good. Nevertheless, it remains an open question whether more-precise proxies would weaken or strengthen our findings.

A final, more general point is that our assumption that non-resident investors in Thailand engage in the generation of private information does not imply that they are either better or worse informed on average than domestic investors, or that they earn higher or lower profits on average from their equity market strategies. In fact, for our analysis to apply, we only require that there be heterogeneity between non-resident and domestic investors with respect to private information that gives rise to transactions between these investor groups in the stock market and, indirectly, the FX market. In our dataset, we found that the patterns present in foreign investors' stock market order flow indicated that they had, on average, less private information about SET-listed firms than domestic investors had. This finding is consistent with the studies by Choe, Kho, and Stulz (2005), Dvořák (2005), Chan, Menkveld, and Yang (2007), and Taechapiroontong and Suecharoenkit (2008), who report that non-resident investors tend to have less private information in the local equity markets of Korea, Indonesia, China, and Thailand, respectively.

³⁸ Table 4 also shows that the FX risk embedded in "other" bond transactions does appear to be almost fully hedged through offsetting FX swap transactions. This is consistent with "other" bond market transactions being used mainly in conjunction with banks' local money market operations as well as our finding that our inferences are not sensitive to the removal of "other" bond transactions from the order flow regressions.

³⁹ Sarno and Sojli (2008) and Sarno and Valente (2008) review the "feeble" or "footloose" connection between exchange rates and economic fundamentals such as interest rate differentials.

5. Concluding remarks

In this paper, we have proposed that what drives the exchange rate, other than public information, is investors' private information related to the stock market. We tested this proposition using daily-frequency data from three financial markets in Thailand, and we presented compelling evidence in favour of the proposition. As George Orwell (1945) might have been tempted to observe, some FX flows are more equal than others: The relatively small portion that is related to and conveys investors' private information about the stock market has lasting effects on the exchange rate, whereas the much larger portion of FX flows that is not explained by stock market variables plays at most a transitory role in determining the exchange rate.

Our findings suggest that data collection efforts on external capital flows might be made more informative if they were categorised according to their private-information content. Having such data would enable economists and policy makers to distinguish more readily between information-driven flows and those that are driven by liquidity or "noise" trades. Our results suggest that analysts should focus their attention on those flows that convey private information.

We close by mentioning several limitations to the generality of our findings. First, our empirical results are based on data from Thailand. It remains to be determined if similar results can be established for more-developed economies and for other emerging market economies. Second, there was very little trading in Thai corporate bonds by foreign investors during the sample period. It will be interesting to examine whether exchange rates are related systematically to order flow induced by investors' order flow in economies with active corporate bond markets, as private information should also be relevant for investors' decisions in this segment of the capital markets. Third, our FX order flow dataset currently consists of the aggregate transactions between non-resident end-users and FX dealers, and thus covers only a part of the overall onshore Thai baht market. Going forward, it may become possible to broaden our analysis to transactions between domestic end-users and FX dealers and to inter-dealer transactions. Finally, our study covers a period of two years, 2005 and 2006. The structural break that occurred following the imposition of the URR capital control measures in mid-December 2006 made it impossible for us to model the subsequent data satisfactorily using the framework we developed for the pre-URR data. In March 2008, the URR controls were lifted and the system of capital market controls reverted roughly to its pre-URR state. An interesting issue is to determine whether the results we established for the pre-URR period in Thailand also apply to the post-URR period.

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Discussant remarks: development of financial markets in Asia and the Pacific

Sukudhew Singh¹

1. Introduction

Your Excellencies, Governors and Governor-in-waiting, Mr. Jaime Caruana, Colleagues from the BIS and regional central banks. I have no slides to show you and will therefore, with your Excellencies' permission, make my remarks from where I am sitting. My remarks will touch on some of the issues raised in the presentations this morning, and I will also use this opportunity to elaborate my own thoughts on some of those issues

2. Exchange rates and financial systems

In the paper on "Private information, stock markets and exchange rates", the authors conclude that FX flows related to the stock market have a more lasting impact on exchange rates than do other types of flows. This is attributed to private information about the stock market, whereas other types of flows presumably do not contain similar information. It is an empirical paper, and the authors openly admit the limitations of the results. I encourage the authors to explore the extensions – in terms of both the length of the sample as well as the number of countries included in the study. In my own mind, the impact of such portfolio flows on the exchange rate depends on a number of factors, including the intensity and persistence of central bank intervention and the depth and sophistication of the financial system.

On this particular point, reading this paper reminded me of another one that I read a few weeks ago. It is a paper published this year in the Journal of Monetary Economics and co-authored among others by Philippe Bacchetta and Kenneth Rogoff. It was interesting because it provided some counter evidence to the commonly accepted view that exchange rate volatility does not have a significant effect on real activity. The authors tested whether a country's level of financial development matters in choosing how flexible an exchange rate system should be if the objective is to maximise long-run productivity growth. They find that exchange rate volatility has a negative impact on long-run growth when countries are less developed financially. Conversely, the more financially developed an economy is, the less adversely it is affected by exchange rate volatility. If these findings are validated they would complement earlier work by researchers such as Sebastian Edwards which suggested that, for countries to benefit from capital account liberalization, they must have achieved a certain level of institutional and financial development. Premature liberalisation can lead to more risks than benefits for the economy and financial system.

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3. Capital flows and financial systems

In the paper on the “Internationalisation of Asia-Pacific bond Markets,” the authors explore the issue of the motivations of borrowers in raising foreign currency debt and swapping the proceeds into local currency, rather than borrowing the local currency directly. My take from the paper is that much of the motivation has to do with the imperfections or underdevelopment of the domestic markets. While this may provide a cheaper source of financing for economic agents, there are also associated risks. Many of these risks are noted in the paper. From the perspective of policymakers, there are two main risks. First, it could potentially weaken monetary policy. For example, in a period of high interest rates, residents may resort to cheaper foreign borrowing – potentially undermining the central bank’s efforts to cool the economy. Secondly, such external borrowing could also create a drain on the central bank’s foreign exchange reserves. This is especially so if the borrowers have no source of foreign exchange earnings. As amply shown during the Asian Financial Crisis, the central bank could become caught between the pressures on the exchange rate and the demands on its reserves. Therefore, it is crucial that central banks monitor the size of such borrowings. These risks should also create incentives for regional authorities to further develop and deepen their financial markets. While regional financial markets have certainly become deeper, especially after the Asian financial crisis, progress has not been uniform. In many countries, the financial systems continue to be dominated by banking institutions, with banks still playing a dominant role in financing the economy.

4. What type of financial system will we build in Asia?

I concur with the keynote speaker that the current crisis is an opportunity for us to think about the future development of our financial systems. In particular we need to ask what will be the nature of financial systems in Asia. Given the wealth and economic potential of this region there is plenty of opportunity for robust financial systems to develop in the region. However, as highlighted in the keynote address, we need to think carefully about the link between the development of the financial markets and their role in economic development. I do not believe this link would happen if we merely reproduce in the region replicas of the existing global financial centres. We do not want to create financial systems that end up becoming originating centres for speculative forces that promote instability in other regional countries. Essentially, “beggar-thy-neighbour” financial systems that create national prosperity at the expense of regional neighbours. We should avoid creating systems which have a tendency to create financial bubbles that rise like hot air balloons to stratospheric heights before bursting. More fundamentally, we need to think about what the economies and diseconomies of scale for our financial systems would be. How big can a financial system become while remaining anchored in real economic activity, without getting involved in the “walking on water” type of activities that ultimately have submerged the advanced financial systems below a sea of risks? Are our financial systems being built to serve our economies, or are our economies being made subservient to the needs of the financial system?

I have noticed that there is growing interest in the region in having financial centres. The attraction of such centres is fairly obvious. They contribute to diversifying the sources of growth. Financial centres create various positive spillovers to other industries, ie tourism, legal, accounting, communications. They are a source of high-paying jobs and higher tax revenues. Some may even see them as a source of economic power and influence.

However, financial centres also come with some costs. I will briefly mention a few that relate directly to macroeconomic policy: a steep rise in asset prices; the influx of financial firms and rich financiers results in an increase in the prices of housing and office space; an appreciating exchange rate can make the non-financial sectors of the economy less competitive; increase in social inequality and income gaps; increased cost of living (eg having to commuting from

further away due to high cost of accommodation closer to the centre of activity); a reduction in quality of life (eg traffic congestion and pollution); the relatively high pay in the financial sector will attract the best talent to that sector, potentially to the detriment of other sectors of the economy; and large financial centres within national borders could also potentially affect the efficacy of monetary policy.

It is important for national policymakers to internalise some of these externalities as they consider the benefits of these financial centres. Also, as regional countries compete for the advantage of their national financial centres, there is the risk that they could become vulnerable to the risk of regulatory arbitrage. Only a couple of days ago, the same copy of the Financial Times newspaper carried two stories that are relevant to this topic. One was about the Chairman of the US Congress financial services committee proposing to exclude financial groups based in countries that have more lax regulatory regimes than the US. This was due to concerns that tighter regulation in the US may put its financial system at a competitive disadvantage relative to other countries. The other piece discussed the concern that, as the Commodity Futures Trading Commission in the US imposes tougher speculative limits, it may push traders to migrate to London, where apparently the Financial Services Authority is less convinced about such restrictions. There is no reason to believe that regional policymakers would not be affected by similar concerns as they focus on developing their national financial systems. With so many countries wanting to create financial centres, large global financial institutions could essentially play national regulatory authorities against each other to gain the best concessions. This must be avoided. It would not be in the regional interest and may not even be in the national interest of the countries involved. Therefore, it may be beneficial to recognise the potential for regulatory arbitrage, and possibly, try to develop a regional consensus on how to deal with it. It is an area where cooperation could be highly beneficial in creating well regulated and stable regional financial systems.

5. Lesson of vigilance from current crisis

In the current crisis, there are plenty of reasons for Asian policymakers to feel vindicated given the preaching that the region received during the Asian financial crisis and the years since. However, the main lesson that all should take away from the current crisis is that, as policymakers responsible for regulating and supervising financial systems, we have no room for complacency and we have to be careful about putting too much weight on conventional wisdom. We do not really know when conventional wisdom is going to be turned on its head – and that includes conventional wisdom about regulatory and supervisory best practices. A healthy dose of scepticism should be part of the DNA of every financial system regulator.

It is indeed a credit to regional authorities that the regional financial systems have withstood the current crisis in the manner that they have, but the crisis is not over yet. New risks could emerge. With economic growth expected to be low for some time, there would be pressure on bank profits and we have to ensure that it does not lead to short-sighted behaviours. Also, with the current low interest rate environment, we must be vigilant that the combination of a search for yield and the availability of cheap credit do not lead to the build-up of risk within the financial system. The markets are also vulnerable to episodes of euphoria about emerging markets. We must be vigilant that the large inflows that accompany such episodes are properly managed. There is potential for this to happen given the prevailing market belief that emerging markets (especially in Asia) would lead in the recovery from the current global recession.

If we look at the sources of the current crisis, whether it be home mortgages, and, increasingly now, commercial mortgages, a key contributory factor was the availability of ample cheap credit. It may be the case that, in the crisis-affected countries, despite the large

injections of central bank liquidity, the credit spigots continue to remain tightly shut. However, in Asia, the fact that our financial systems have not been significantly affected and are still functioning well should not only be a source of justifiable pride, but also concern. Concern, because interest rates in Asia have also fallen to very low levels and our functioning banking institutions – unless mitigated by appropriate risk management practices and regulations – could very well feel pressured into what may later turn out to be less than prudent lending. A sustained period of low interest rates could also put pressure on other financial market players, such as the life insurance companies. The risk of asset price bubbles developing is also real.

6. Monetary policy and asset prices

Which leads me to my final point on the role of central banks in managing asset prices. Central banks should relook at the paradigm that we can focus on price stability and that, when it comes asset prices, our role is to go in and clean the mess once it all blows up. As is obvious now, the cleaning up comes with a hefty bill – not just in terms of financial cost, but also the economic and social costs. Within the context of regional countries, the experience of the Asian financial crisis should also carry lessons about the role that large capital inflows play in creating such bubbles.

Dealing with asset prices certainly leads to issues of public and political acceptance of actions undertaken by central banks to manage them. But we should ask ourselves how a consensus developed around the issue that a key task of central banks is to manage inflation. As the inflationary episodes in the 1970s and 1980s were crucial in creating a consensus around managing inflation, it may be that the current crisis has created a similar opportunity to develop a consensus around the role of central banks in managing asset prices.

However, for that to happen, a consensus must first develop within the central banking community itself. And we must put serious effort into designing mechanisms to identify and address developing asset price bubbles. Professor Sundaresan has alluded to certain possibilities in this respect. Apart from the RBI, I know of other regional central banks that have taken a proactive role in managing asset price bubbles. At the very least we should take this as an opportunity to re-examine the monetary paradigms and frameworks that we have come to accept as conventional wisdom. Without such efforts, it is unlikely that we would be able to influence the views of key stakeholders on this issue. For regional policymakers, it presents an opportunity to show thought leadership – looking at the issue from the perspective of emerging markets, rather than leaving the issue to be decided solely by institutions in the more developed countries.

Thank you.

High-level policy panel on the development of financial markets

Joseph Yam¹

As I was thinking about what to say at this high level policy panel, against the background of the financial crisis we are experiencing, I kept feeling that there was a need for finance to go back to basics, or at least for everybody to be reminded of them. I recalled something that I wrote in August 2006, in which I said: “Finance is not a mysterious or esoteric subject, but it often misunderstood. As prices of financial instruments go sharply up and down, and the opportunity for profit multiplied through leverage and the use of derivative products, mesmerises all concerned and provides employment and income for many, the basic purpose of finance is often ignored or even forgotten. There is then a risk of finance taking on a life of its own, behaving in a manner inconsistent with the public interest. It is necessary from time to time for all concerned in finance to be reminded of the basic purpose of their existence.”

This is the beginning of an article I wrote entitled “A Basic Law of Finance”. There are 13 or 14 articles in that Basic Law and one of them states that: “The private interests of financial intermediaries, who are understandably motivated by profit, are not necessarily aligned with the public interest of effective financial intermediation. Where there is conflict, it is the role of financial regulation and supervision to ensure that the public interest is protected.”

In yet another article that I wrote, entitled “The Alphabet Soup”, I questioned the role that such financial derivatives as CDO, CDS, ABCP and SIV were playing in promoting the efficiency of financial intermediation that is so important for supporting the economy. Furthermore, when confronted with the bowl of thick alphabet soup, one finds it very difficult to see the bottom of it and, when one eventually reaches the bottom, one has probably consumed too much of it.

There is indeed a need for finance to go back to basics. Finance is about financial intermediation, or the matching of the needs of those with surplus money with those in need of it. This is the role of the financial system and it is for the authorities, through conduct regulation and supervision of the financial intermediaries, to ensure that financial intermediation is conducted with a high degree of stability, integrity, diversity and efficiency. There is also a need for the authorities to be involved in the provision of a safety net, in crisis resolution and in the development of the financial infrastructure, which is very much a public good, the provision of which cannot be relied upon when left to the initiative of the private sector.

Let me, in this connection, share with you a few observations that I have accumulated over the years as head of the Hong Kong Monetary Authority. First is the conflict between the private interests of the financial intermediaries and the public interest of promoting effective financial intermediation. The financial intermediaries, be they in the form of banks or securities houses, actually have an interest in financial inefficiency. They would like the intermediation spread, their take so to speak, to be as wide as possible; but then the wider the intermediation spread the less efficient is financial intermediation. Often financial intermediaries, presumably because they control where the money comes from and where it goes to, have very strong political influence, to the extent of being able to dictate the reform

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agenda for the financial system and make sure that reform measures are promulgated without undermining too much their private interests as financial intermediaries. The authorities should have a response to this phenomenon.

The second observation is the dilemma of financial openness. Financial openness is of course good in that, in accepting international mobility of capital, domestic capital can achieve a higher risk-adjusted rate of return, and domestic borrowers can enjoy diversity of funding sources. But openness often comes with risks to financial stability that are difficult to manage, which brings me to my third observation concerning the relationship between size and vulnerability. I have found that medium-sized markets are the most vulnerable. While there is enough liquidity to attract international capital, their size is small relative to the volume of international capital that is being mobilised by the profit motive, often without regard to financial stability. They are therefore most vulnerable to the volatility of international capital, not to mention the predatory character that it takes on from time to time.

My third observation is that financial markets do fail. No matter how efficient they are, when greed and fear take hold, the risk of failure is there, and this occurs all too often. Very simply, the authorities have a responsibility to take decisive action to prevent failure from occurring or to put things back on track. Market interventions of one type or another are needed in the light of circumstances and such intervention should not be blindly condemned as wrong. Hong Kong had its unfair share of criticisms in its market intervention in 1998, but the action is of the same nature as the massive intervention in the developed markets in the current crisis.

My last observation is that there are elements of the financial infrastructure that are simply public goods, the provision of which by the public sector is well justified, even though there is a lot of resistance from the private sector, particularly the financial intermediaries having an interest in sustaining financial inefficiency for their own benefit. Governments spend large sums of money building the physical infrastructure to move people from one place to another safely and efficiently in support of the economic activity they are engaged in. But they do not spend quite enough to make sure that money is moved around from one holder to another with the same safety and efficiency.

I should apologise for not having a formal presentation for you. Running the monetary authority of an international financial centre at a time of global financial crisis is demanding enough, but I also have another job which is to prepare for retirement after sixteen and a half years as head of the Hong Kong Monetary Authority. I hope, nevertheless, that my observations are useful.

Let me now pass over to Grant Spencer.

High-level policy panel on the development of financial markets

Grant Spencer¹

It is a pleasure to be here, and thank you to the People's Bank of China and the BIS for inviting me to the conference.

Panel members have been asked to frame our comments within three questions.

The first question is: "How did market developments worsen or mitigate the impacts of the current crisis?" In other words: "What characteristics of the New Zealand financial system assisted or detracted from our ability to handle the crisis?"

- In the case of New Zealand, the positive factors included: soundly managed mortgage books at the major banks; the fact that the external debt of the banks and the country was fully hedged in terms of foreign exchange risk; and to some extent the internationalised nature of the New Zealand dollar was also a plus, in that it facilitated hedging and funding activity by the banking system.
- The negatives were: first, the fact that there had been a housing boom over the 2003–07 period, which meant that the household sector and the banking sector were somewhat stretched in terms of their balance sheets; second, and this is quite important from New Zealand's point of view, the banks' balance sheets were 40% funded offshore, and a large part of that was funded in the short-term wholesale markets. This left the New Zealand banking system vulnerable to the liquidity shock and credit contraction arising from the financial crisis. Finally, the fact that the NZ dollar was internationalised, ie commonly traded in the international markets, also meant that the NZ dollar was somewhat exposed following Lehman's failure and the very sharp reversal of risk appetite in the international financial markets. So, as a consequence, the NZ dollar substantially depreciated in late 2008/early 2009.

Those are the sort of characteristics that either assisted or detracted from New Zealand's ability to respond to the crisis.

The second question asks: "What measures were taken to restore confidence, and what exit strategies are planned from those measures?"

- As seen in the slide (Q2. 3x3 table), we have had three broad categories of crisis policy responses. The first one was the macro policy easing, where both monetary policy and fiscal policy were eased in response to the global crisis. The exit strategy is reasonably clear. Monetary policy would be expected to start tightening once we see a cyclical adjustment back to normal following the recession that we are currently experiencing in 2009. We would also expect fiscal policy to start to come back to normal, or at least return to a more sustainable position, in order to give long-term debt ratio projections that are stable. If that is not achieved then we would be at risk of seeing a potential credit downgrade for New Zealand.
- The second category of policy responses involved boosting liquidity management operations and widening the access to those operations by broadening the range of discountable assets. The exit strategy here, once liquidity returns to a more normal

¹ Deputy Governor & Head of Financial Stability of Reserve Bank of New Zealand

situation and confidence returns to the financial system, is to return towards where we were before, but not fully. We will probably continue with a broader range of discountable assets that are acceptable as collateral than we have before. And one of the key reasons for this is a desire to support the liquidity of key markets which we see as an important role for the central bank, and a role that has been underlined by the events of the global crisis.

- The third category of policy responses is the bank funding guarantees, where both retail and wholesale guarantees were introduced post-Lehman in September/October 2008. Our definite intention is to remove these guarantees as confidence returns to the financial system. The sooner these can be removed, the sooner we can remove the distortions and moral hazard that inevitably result from such policies.

The third question put to the panel is: “What is the attractiveness of international currencies from our own national perspective?”

- I would firstly say that the internationalisation of the NZ dollar overall has been positive from our perspective. Not all aspects are positive and the internationalisation of the currency has made domestic monetary policy more difficult to implement because of the scope for higher interest rates in New Zealand to attract foreign interest, which means that our exchange rate has been relatively sensitive to domestic monetary policy actions. However, the international currency has facilitated adjustment in the New Zealand economy to external shocks. It has also facilitated foreign exchange hedging of debt and therefore helped to insulate domestic balance sheets from foreign exchange fluctuations.
- My second point relates to the internationalisation of other currencies. Our view is that internationalisation of the Renminbi would be welcome. At present we are seeing rebalancing of the external imbalances, ie reductions in the US deficit and the Chinese surplus through expenditure reduction in the US and expenditure expansion in China; we are not seeing expenditure switching. More flexibility in currencies would obviously promote this adjustment by adding in a switching component to the rebalancing. Furthermore, if the Renminbi was internationalised, it would take the pressure off the NZ dollar and also similar currencies such as the Australian and the Canadian dollars, which because of their commodity nature, have become proxies for the Renminbi. If the Renminbi itself was made more flexible, this would take some of the pressure away from proxy currencies such as our own NZ dollar.

These are some New Zealand perspectives on the three questions posed to the panel. I thank you very much for your attention.

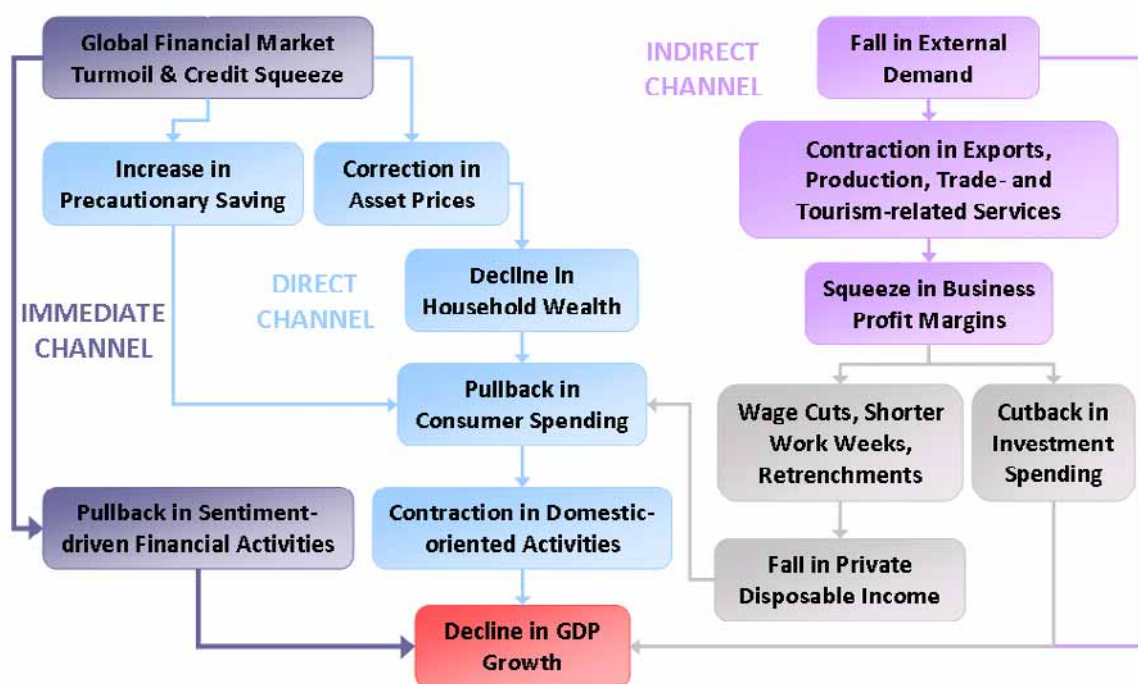
High-level policy panel on the development of financial markets: macroeconomic and financial stability amidst the global financial crisis – the Singapore experience

Ong Chong Tee¹

1. Introduction

Singapore is one of the most open economies in the world. Given its deep and extensive integration with international markets, the economy was significantly hit by the global financial crisis.

Chart 1
Transmission of global financial shock to Singapore



There are three broad channels through which the financial crisis and the attendant squeeze in liquidity and credit have impinged on domestic economic activity.

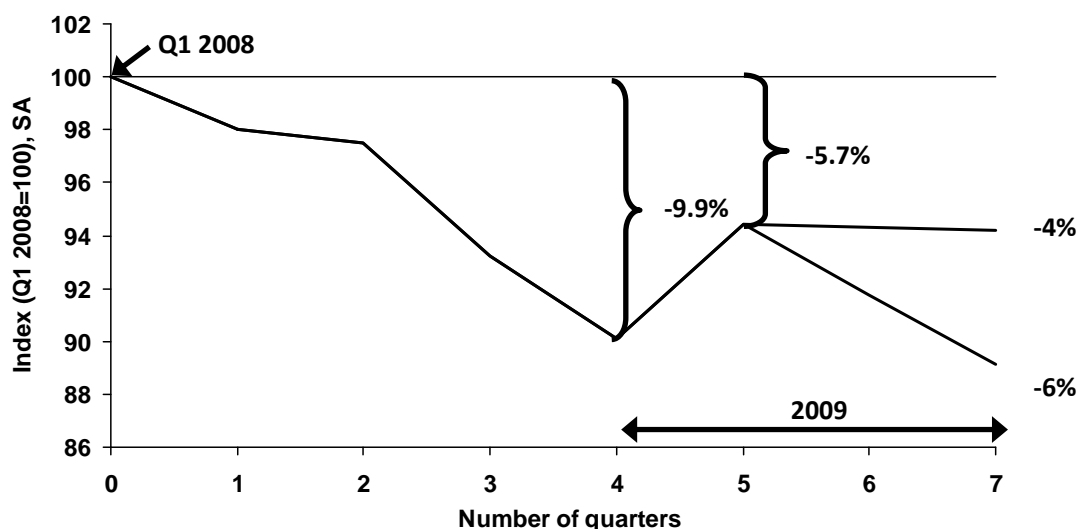
Immediate channel: the impact from the shock was most immediately felt via a pullback in the sentiment-sensitive segments of the financial sector, such as stock broking and wealth advisory.

Direct channel: the weakening in consumer sentiment had a direct bearing on domestic-oriented activities, such as retail trade and the property market.

¹ Deputy Managing Director of Monetary Authority of Singapore.

Indirect channel: in an open economy, the repercussions on the external-oriented sectors also came indirectly as external economies contracted. Sagging foreign demand affected industries such as manufacturing, transport-hub and tourism services. In turn, companies cutting back on investment, jobs and wages further dampened consumer sentiment and consumption, feeding back to domestic-oriented industries.

Chart 2
GDP profile

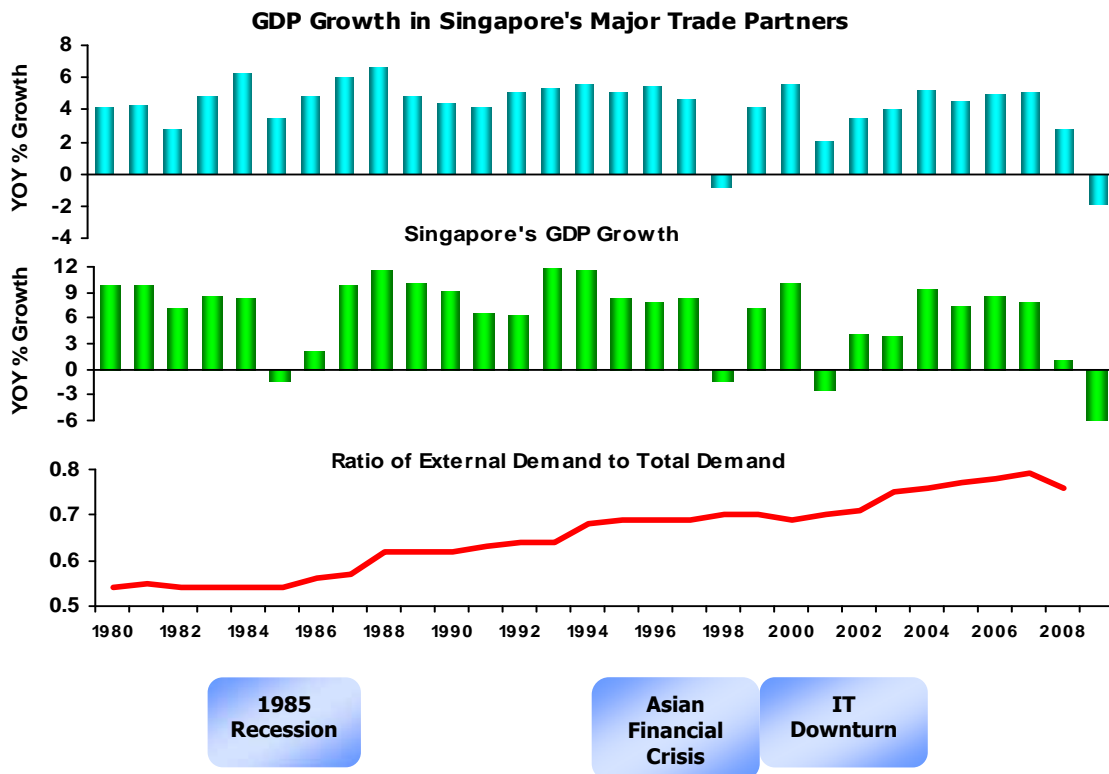


As of Q1 this year, GDP had already fallen by about 10% from its peak. In Q2, some of the previous output losses were reversed, bringing economic activity to levels last seen in H1 2007, resulting in a switch from contraction to stabilisation. However, the next shift to a sustained expansion mode is not expected to be very sharp. A strong once-and-for-all decisive upturn is not expected at this stage. For 2009 as a whole, GDP is expected to contract by 4-6%.

Chart 3 shows that external demand as a share of total demand has increased over the past decade. The Singapore economy has been highly vulnerable to global headwinds, and the recovery path will be heavily predicated on external departments. A decisive recovery will not be possible if global and regional demand does not improve.

Chart 3

GDP growth & external demand



Note: 2009 numbers are consensus forecasts.

2. Government responses to the crisis

While Singapore cannot be insulated from the global financial crisis given the openness of the economy, it is crucial to ensure the soundness of the financial institutions and stability of financial markets, as well as maintain the confidence of investors. There is also a need to put in place appropriate macroeconomic policy settings.

The Singapore economy is currently facing an aggregate demand shock on a global scale, not an erosion of Singapore's competitiveness. Against this backdrop, it is not the aim of fiscal measures to fill in the economy's output gap. Instead, the aim is to facilitate cost adjustments in the business sector and provide supplements to household income where needed, to help businesses and households cope with the downturn and adjust to this new reality.

The assessment has been that fiscal policy is most effective in this situation, and should therefore take on the greater part of the adjustment burden in the overall macro policy stance, while monetary policy maintains its focus on its anchor of stability role. The government budget was brought forward by a month to January this year and is a substantial package, amounting to 8.2% of GDP. It contains a diversified suite of targeted measures with multiple impact points for workers, households and businesses.

In the financial sector space, immediately following the Lehman collapse, the Monetary Authority of Singapore (MAS) put in place measures to instill market confidence and ensure the stability of the financial system. Ample liquidity was kept in the system and the Standing Facility was strengthened, so that banks could operate normally in Singapore. There were

also collaborative efforts to ensure adequate US dollar liquidity in the system by establishing necessary arrangements with the US Federal Reserve. In addition, regulation of financial institutions was enhanced and internal macroprudential assessment stepped up through high-frequency macroprudential surveillance meetings.

In addition, MAS made monetary policy adjustments with policy actions underpinned by the objective of maintaining price stability over the medium term and confidence in the Singapore dollar (Singapore dollar).

The following paragraphs elaborate on some of these policy measures.

2.1 Business financing schemes

As part of the S\$20.5 billion Resilience Package announced, S\$5.8 billion was set aside for the purpose of stimulating bank lending. With the decline in credit arising from the crisis, there was a need to help good and viable companies obtain funding to enable them to stay afloat and grow.

To address this, the government decided to take on a significant share of the risks of bank lending and extend support to a broader segment of the credit market beyond SMEs. This support comes in the form of enhancements to existing bank lending schemes and the Special Risk-Sharing Initiative (SRI).

The two components are set out in Table 1. Key enhancements include broadening the scope of eligible companies, increasing the government's share of default risk and increasing the maximum loan quantum. It is important to note that while the government is taking on a significant share of the risks of bank lending, the lending business and credit decisions remain with the banks, which have the direct relationships with customers and expertise in credit assessment.

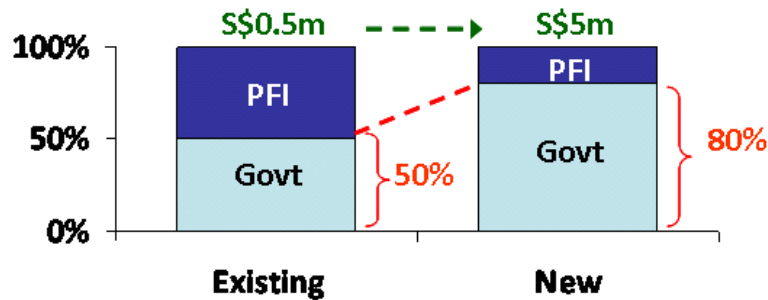
Table 1
Special risk sharing initiative

Scheme	Description
New bridging loan programme	<ul style="list-style-type: none"> For local companies and foreign SMEs Maximum loan quantum increased from S\$500,000 to S\$5 million Government default risk sharing increased from 50% to 80%
Trade Financing	<ul style="list-style-type: none"> Domestic facilities: companies with at least 30% local shareholding Export facilities: companies incorporated in Singapore with at least 3 strategic business functions in Singapore Government co-shares 75% of default risk Maximum loan quantum of up to S\$15 million per borrower group

Chart 4 provides an illustration of the new Bridging Loan Programme (BLP), which has been substantially enhanced from the scheme introduced in November. The new BLP caters to loans of up to S\$5 million, up from S\$500,000 currently, and meets the working capital needs of most mid-sized firms and some of the larger ones. The government's share of risk on these loans has been raised from 50% to 80%. Further, the new BLP enables banks to set their own interest rates, allowing higher-risk borrowers to gain access to credit, even if it is at a higher interest rate.

Chart 4

Bridging Loan Programme



While it may be too early to assess the effectiveness of these schemes, the number of government-backed loans has increased significantly following their introduction.

2.2 Deposit guarantee

In October last year, the Singapore Government announced a blanket guarantee on all deposits in banks, finance companies and merchant banks licensed by the MAS. These include deposits with overseas branches of the local banks that fall under the Singapore legal entity. All Singapore dollar and foreign currency deposits of individuals and corporates are covered.

This is an extension of the deposit insurance scheme administered by the Singapore Deposit Insurance Corporation. While the banking system was, and continues to be, sound and resilient, this was a precautionary move taken to guard against erosion of banks' deposit base.

3. Enhancing market resilience

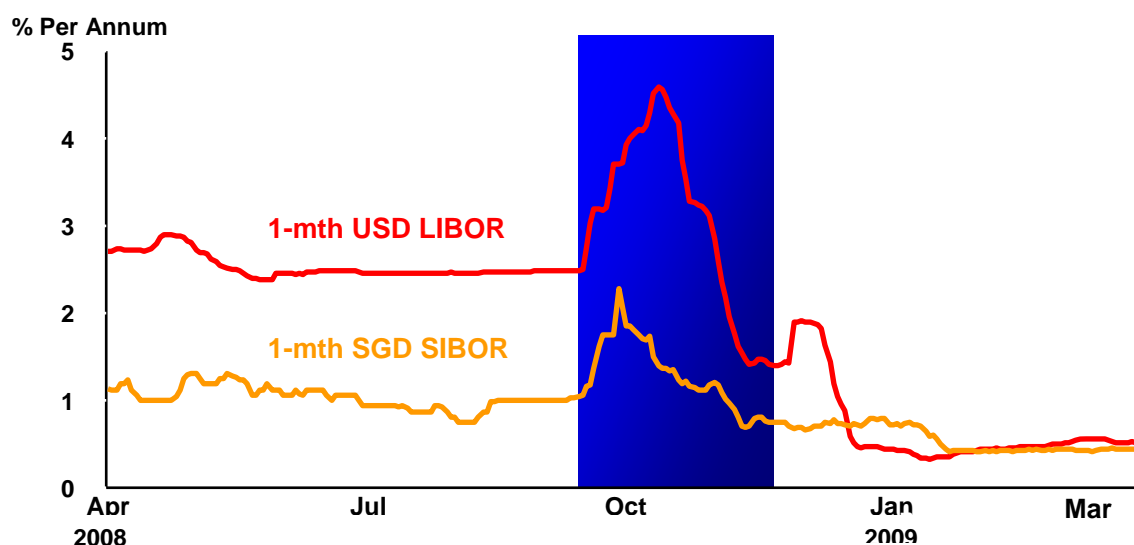
3.1 Money market and liquidity management

Singapore was not immune to the effects of global deleveraging in the aftermath of the Lehman collapse. Tighter credit conditions in the Asian dollar market inevitably spilled over into local currency money markets in Asia. Chart 5 shows the impact of higher US dollar borrowing rates on the Singapore dollar market in September 2008.

To ease pressure in the Singapore dollar money market, MAS kept a higher level of liquidity in the banking system through its market operations and enhanced its monitoring of market functionality through closer contact with financial institutions. MAS also reassured financial institutions that it would continue to anticipate the market's funding needs and would consider the unique liquidity needs of individual banks on a case-by-case basis.

Chart 5

Impact of US dollar borrowing rates on Singapore dollar rates



3.1.1 Enhancements to MAS standing facility

MAS also introduced enhancements to the MAS Standing Facility, which has been a key channel through which MAS provides liquidity to financial institutions. In line with major central banks and recommendations by the Financial Stability Forum, the pool of eligible counterparties and collateral was expanded in July 2008 to help financial institutions operating in Singapore to better manage their risk and liquidity and provide them with greater access to Singapore dollar liquidity.

Even prior to opening up participation in the Standing Facility to all RTGS members, the facility had already covered 80% of the market through the eleven Primary Dealers. The expansion of the Standing Facility has increased market efficiency by shortening the path through which Singapore dollar liquidity reaches non-Primary Dealer banks from MAS and vice versa.

The pool of eligible collateral was expanded in July 2009 to include AAA-rated Singapore dollar debt securities issued by sovereigns, supnationals and sovereign-backed corporates. The MAS has also started the process of entering into cross-border collateral arrangements with major central banks to accept well-rated foreign currencies and government debt securities as collateral.

3.1.2 Cross-border collateralisation arrangements

Under these cross-border collateralisation arrangements, banks operating in Singapore are able to tap on MAS for Singapore dollar liquidity by placing foreign currency cash and securities in MAS account facilities with a correspondent central bank via either a swap, repo or under pledge (and vice versa). The MAS has signed an MOU with the Dutch Central Bank and discussions are ongoing with several other central banks to establish similar arrangements. Singapore's cross-border collaboration efforts on the liquidity front go beyond the establishment of such arrangements.

3.1.3 US federal reserve swap line

In line with global US dollar interbank markets, banks in Singapore faced some US dollar funding pressures following the onset of the crisis. In an effort to ease these pressures, MAS established a temporary reciprocal currency arrangement with the Federal Reserve last

October. This was a precautionary measure to boost market confidence by reassuring financial institutions in Singapore, many of which have international operations, that they would have access to US dollar liquidity amidst the global US dollar funding shortage.

Under the arrangement, the Federal Reserve committed up to US\$30 billion, to be made available at MAS' request, and each swap between MAS and the Federal Reserve can be for up to 84 days. The arrangement was extended further in June and is now valid until 1 February 2010.

This has helped to enhance the robustness of the US dollar funding and foreign exchange markets in Singapore. MAS has not needed to draw on the swap facility as money markets remained relatively orderly.

3.1.4 *Enhancing the resilience of Singapore government securities*

With the rise in government bond issuance globally as governments broadened fiscal measures and banks' balance sheets shrank, the volatility in government bond markets has risen with the unfolding of the financial crisis. The rising supply risks and deteriorating financial sector conditions have led to volatile government bond yields and poor government bond primary auctions.

Singapore is unique, and privileged, as the government issues bonds for the sole purpose of building a risk-free yield curve for the corporate sector to price its debt and not to finance any budget deficit. However, the Singapore Government Securities (SGS) market can be affected by weak sentiment spilling over from other markets. While there is very limited risk of an uncovered auction occurring, since SGS primary dealers are obliged to underwrite auctions fully, there remains the risk that unexpected changes in financial market conditions on the day of SGS auctions may result in unexpectedly skewed auction results. This risk has increased as global market volatility has risen and banks' balance sheets come under strain.

A skewed auction result would be detrimental to a market that is already volatile. The effects of a poor auction with an unusually high cut-off yield could include an upward shift in the entire yield curve, the marking down of banks' SGS portfolios and a knock-on repricing of Singapore dollar-denominated debt. Any or all of these would hurt investor confidence and impinge on Singapore dollar-denominated debt as a reliable investment class. The effects could be prolonged and perpetuate higher yields for future bond auctions in all tenors.

As such, pre-emptive safeguards were put in place to strengthen the SGS market's resilience and reduce the risk of outlandish and disruptive auction results, where yields cut off either well above or well below prevailing market yields. Under the safeguards, MAS is empowered to vary its subscription amount if the auction cut-off yield falls outside a 25 basis point corridor around the prevailing market yield at each auction. This mitigates the risk of disorderly trading in specific securities or volatility in the secondary market. It is noteworthy that while the yield corridor of ± 25 bps is set in advance, the reference rate (ie. prevailing yield that serves as mid-point) is determined by the market. This is important as MAS does not have an interest rate policy framework and does not take a view on rates.

4. Monetary policy

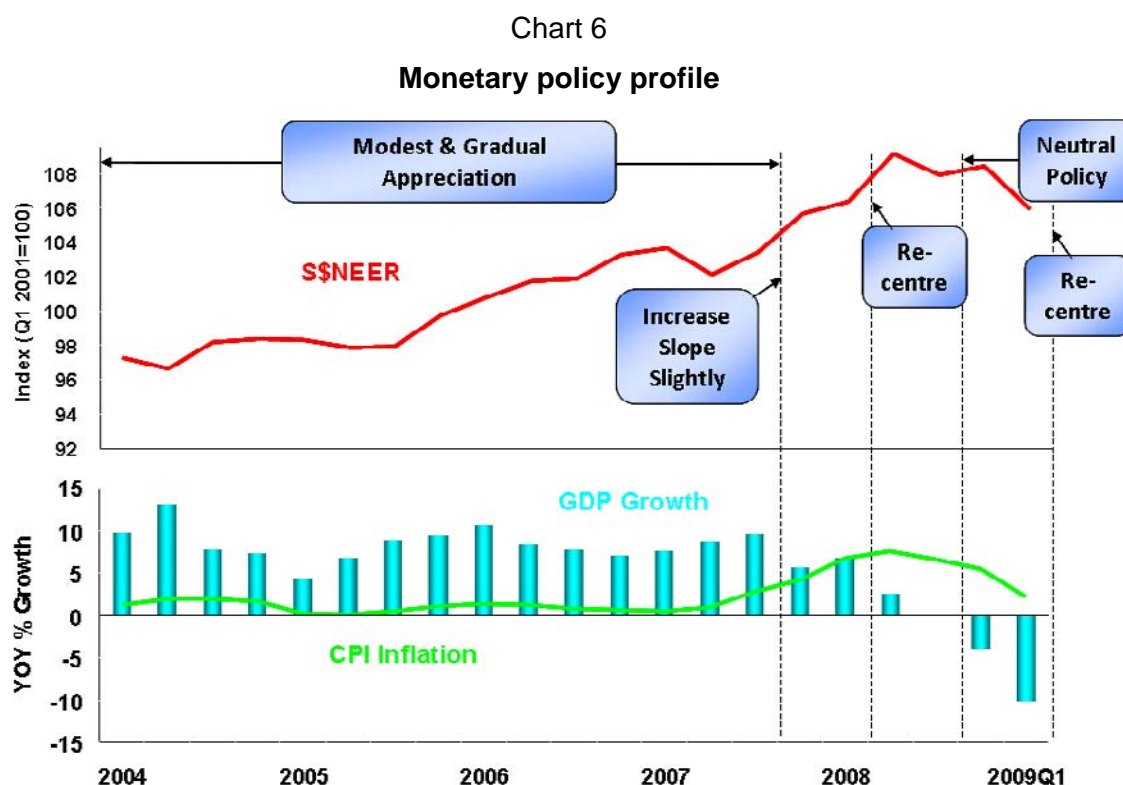


Chart 6 shows Singapore's exchange rate, GDP growth with inflation and monetary policy responses since 2004. A calibrated and moderated response to the global inflation and demand shock has been taken, and is guided by a number of factors, including:

1. External-demand-drive nature of the shock;
2. Medium-term objective of maintaining price stability;
3. Need to ensure that the Singapore dollar remains an anchor of stability.

MAS' monetary policy has focused on medium-term price stability. Chart 7 shows the results of counterfactual simulations if a more vigorous response to commodity price inflation had been adopted in 2007.

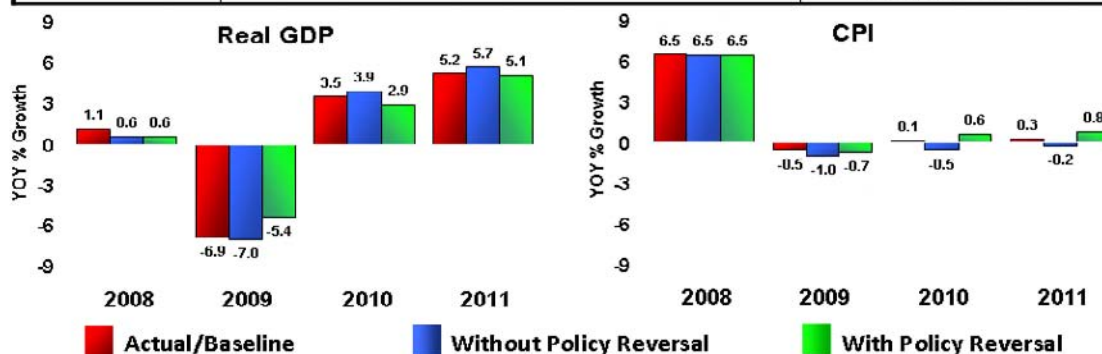
First, the tighter policy would not have had an immediate impact on the high inflation rates. Second, the abrupt and significant strengthening in the exchange rate would have led to a sudden loss in competitiveness, leaving the economy vulnerable to an unanticipated sharp decline in external demand in the latter half of 2008. Under the tighter policy, GDP growth would have come in lower at 0.6% in 2008, compared to 1.1% in the actual outcome. Third, if the tighter policy had been reversed in Oct 2008, the macroeconomic outcome in 2009 would have been similar to that under the actual policy.

Based on this understanding, a drastic easing in policy stance would have been required to offset the effects of the tighter policy. However, such a policy reversal could have tarnished the credibility of MAS and affected investors' confidence in the Singapore dollar. Domestic interest rates could have risen sharply, partially offsetting the initial stimulus from a weaker exchange rate.

Chart 7

Simulated impact of tighter policy to 2007 commodity price inflation

Policy Response	Actual	Tighter Policy Without Policy Reversal	Tighter Policy With Policy Reversal
Oct 2007	Increase slope of \$NEER policy band <u>slightly</u>	Increase slope of \$NEER policy band by a <u>greater extent</u>	
Apr 2008	Re-centre \$NEER policy band upwards		
Oct 2008	Flatten \$NEER policy band		Flatten \$NEER policy band & re-centre \$NEER policy band downwards



In conclusion, if policy had been further tightened in response to the inflation threats, the policy setting could have become inappropriate with the subsequent onset of the global economic downturn, given the inherent lags in monetary policy transmission.

4.1 Pillars of monetary policy

MAS' response to this crisis has shown the relevance of several principles that serve as pillars of monetary policy:

1. medium-term orientation on price stability – a medium-term orientation on price stability means that policy direction is not changed each time there is a fluctuation in business activity, to avoid introducing unnecessary volatility.
2. Singapore dollar as anchor of stability – this ensures that the Singapore dollar remains an anchor of stability for Singapore's small and open economy.
3. maintain confidence in Singapore dollar – in times of volatility in the financial markets, it is important to maintain confidence in the Singapore dollar.
4. understanding economic realities – policy has to be anchored in an understanding of the underlying realities behind economic shifts, and on what monetary policy can influence and what it cannot.
5. limited role in demand management – monetary policy plays a limited role in aggregate demand management. Internal estimates show that Singapore's exports are significantly more responsive to income effects than price effects. While depreciation may provide a short-term buffer for domestic firms facing cash flow problems, it would at the same time increase their costs of production.
6. does not work in a vacuum – lastly, monetary policy does not work in a vacuum. Policymakers continue to ensure that the macroeconomic response from fiscal and monetary policy is complementary and supports the economy.

5. Challenges ahead

Looking ahead, as policies that will continue to ensure a stable and conducive business and financial environment are reviewed, broad structural shifts in the economic landscape and the challenges presented by globalisation have to be taken into account.

Global trade flows have steadily trended upwards in the last 140 years, accelerating further since the 1950s. Meanwhile, capital flows have surged even more rapidly after the 1980s, although accompanied by frequent sharp reversals, reflecting the pernicious effects of financial crises.

Indeed, this financial crisis has highlighted the tighter links that have developed between emerging market economies and the global financial system over the past decade, as a result of globalisation and greater capital flows. While greater diversification of funding sources should have made emerging markets more resilient to some shocks, the greater integration can also transmit severe global shocks further and faster.

At the global level, this suggests the need for further research to understand the financial linkages between, as well as within, different financial systems. It also points to the need to develop toolkits to help identify potential imbalances or asset bubbles at an early stage, as well as research on appropriate policy responses.

For emerging markets, greater financial integration has led to higher and more volatile capital flows. Going forward, further consideration may need to be given to how policy should respond to these flows. For example, volatile capital flows can induce volatility into the exchange rate, complicating monetary policy. Also, given the importance of maintaining market confidence, more volatile capital flows implies that a fall in confidence in one economy could quickly prompt outflows from neighbouring economies. International contagion remains a risk.

Against this backdrop, Singapore's openness to capital flows poses a challenge. Large and volatile capital flows could potentially cause excessive volatility in exchange rates and domestic liquidity conditions, leading to asset price bubbles.

In this context, Singapore's managed float exchange rate framework has proven robust and adaptable to capital flows and volatility in markets. Short-term capital flows, which can be highly volatile and quickly reversible, are accommodated in the first instance by the policy band, with the nominal exchange rate bearing most of the adjustment burden. However, if the capital flows were to cause undue volatility in Singapore dollar and domestic liquidity conditions, MAS would intervene in the foreign exchange markets and step up money market sterilisation operations. More stable and persistent capital inflows have typically been associated with periods of strong expansion in the domestic economy and these are then accommodated by an appropriate appreciating crawl in the policy band.

Dealing with large capital flows and asset price bubbles cannot be the burden of monetary policy alone. Singapore's experience has shown that it is effective to use targeted prudential, administrative, and fiscal measures to deal with asset price bubbles and mitigate the threats to macroeconomic and financial stability.

Exchange rate policies

Charles Engel¹

A debate has continued over many years on the desirable degree of foreign exchange rate flexibility. One side of the debate has sometimes made the case that the exchange rate should be freely determined by market forces, independently of any foreign exchange intervention or targeting by central bank monetary policy. This argument takes the stance that the market can best determine the appropriate level of the exchange rate.

From the standpoint of modern macroeconomics, particularly from the view of New Keynesian economics, that stance is potentially self-contradictory. Markets are able to achieve efficient, welfare-maximising outcomes when they operate without distortions – that is, when markets are competitive and prices adjust instantly to reflect underlying costs. But in such a world, the nominal exchange rate regime is of no consequence in determining the real allocation of resources. The real exchange rate (the consumer price level in one country compared with the level in another country, expressed in a common currency) and the terms of trade (the price of a country's imports relative to its exports) could adjust freely to efficient levels under a floating nominal exchange rate regime, a managed float, or even a fixed exchange rate regime if goods markets were perfectly efficient. Nominal prices could respond to market pressures even if the nominal exchange rate does not. In a world of perfect markets, relative prices can allocate resources efficiently independently of the determination of any nominal prices or the nominal exchange rate.

If the nominal exchange rate regime matters for the determination of relative prices such as the real exchange rate or the terms of trade, it must matter because there is some kind of nominal price stickiness. For example, if the US dollar/euro exchange rate is to affect any real prices, it must be because there are some nominal prices that are sticky in dollar terms and others that are sticky in euros. From the standpoint of modern macroeconomics, the question should be posed: what policy best deals with the distortions – from sticky prices and other sources? Is it a fully flexible exchange rate, or some sort of exchange rate targeting? Moreover, the relevance of an exchange rate policy is only for the “short run.” Once enough time has passed for nominal prices to adjust to any economic imbalances, the nominal exchange rate regime is irrelevant – the nominal price adjustments can bear the load of relative price changes without any help from the exchange rate.

The political case for fully flexible exchange rates is sometimes made to rest on the notion that floating exchange rates can achieve “external balance.” External balance is an ill-defined term, but usually what its proponents mean is trade balance or current account balance. Sometimes the term refers to “sustainable external balances,” another vaguely defined term. What is clear is that the proponents of this point of view believe that floating exchange rates will eliminate large current account deficits or surpluses.

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However, there is very little empirical support for this notion. The idea probably is not based on experience, but instead on open-economy models of the 1950s and 1960s that assumed the exchange rate would adjust to eliminate trade imbalances if it were freely floating.

I will discuss the evidence on the role of exchange rates in achieving trade balance. In fact, exchange rate adjustment may have a modest effect on current account imbalances in the short run, but even that modest claim is not firmly established in the evidence. It is important to recognise that evidence on the long-run effects of the terms of trade on imports and exports is not particularly relevant to the issue of which nominal exchange rate regime is appropriate. The nominal exchange rate regime only matters – only can influence real prices – at the horizon of price adjustment. Once enough time has passed for nominal prices to adjust, relative price changes can occur under any nominal exchange rate regime.

The second point relates to the notion of external balance. A current account deficit or surplus does not necessarily represent any inefficient outcome in financial markets. The current account is not only the country's trade balance (with the addition of net foreign asset returns), but it is also the difference between the nation's total saving and its investment in capital goods. It is natural for some countries to borrow to finance investment, or in some cases, consumption.

Instead, I will discuss a different notion of external imbalance – an imbalance in the level of the exchange rate. If global markets allocate resources efficiently, then prices should reflect underlying resource costs (costs of labour, technology levels, efficiency in production, etc.). The competitiveness of firms should not depend on the nominal exchange rate. A currency is misaligned when the exchange rate moves to a level where a country's competitiveness in world markets is altered. I will discuss how currency misalignments can be inefficient even though exchange rates do not have large short-run effects on trade balances.

The modern Keynesian literature makes the case that the exchange rate may rightly be a target of monetary policy, along with domestic goals such as inflation and the output gap. Exchange rates do not automatically settle at a level that eliminates external imbalance as I have just defined it. Exchange rates are asset prices that are driven not only by current economic considerations, but also by news about the future (and possible market sentiment or bubbles). Markets cannot reliably deliver external balance when there are distortions such as nominal price stickiness, so it may be desirable to consider exchange rate objectives in determining monetary policy.

However, any country acting on its own has an incentive to manipulate its currency – perhaps depreciating it to enhance the competitiveness of its own firms. There is a case for monetary policy coordination on broad currency targets.

I then turn to two issues that are of special interest to emerging markets. First is the determination of the exchange rate target. Even among advanced economies that have similar production structures, it is difficult to pinpoint the exchange rate that eliminates currency misalignment (just as it is difficult, for example, to determine the “full-employment” level of unemployment). But the task is much harder for the exchange rate of an emerging market than for one of a high-income country. To some extent, as I will discuss, the problem is one of data limitations.

The second important point is credibility of monetary policy. Countries with a history of high inflation may find it difficult to undertake reform of monetary policy. One very visible way of establishing central bank credibility is to fix the nominal exchange rate fully. Policymakers in this situation face a trade-off: The cost of this quick route to credibility is giving up other objectives of monetary policy. Sometimes fixing the exchange rate can leave the country with an inflation rate that differs from the target that a fully credible central bank would desire, and fixing the exchange rate can sometimes make it more difficult to achieve a target for the output gap.

Finally, I briefly review special questions that arise under sterilised intervention, when the policymaker can target the exchange rate but still leave some room for other monetary policy objectives. The evidence strongly suggests that sterilised intervention can only be effectively used when private capital markets are unable to offset the effects of the intervention. This can occur when the government imposes controls on private flows of capital or when a country's private capital markets are not deep enough to compete with large-scale intervention by central banks.

A country undertaking general economic liberalisation may find it desirable to keep capital controls in place until internal markets are sufficiently liberalised – this is a well-known conventional argument. During the period in which capital controls are effective, the central bank has the luxury of determining exchange rate policy somewhat independently of monetary policy.

But there are three dangers. First, if exchange rate policy is divorced from monetary policy, then stabilising the exchange rate may not earn any credibility for monetary policy (though perhaps it does lend credibility for the overall stability of economic policy). Second, policymakers are particularly vulnerable to the charge of “currency manipulation.” If internal nominal prices can be set by monetary policy, and the nominal exchange rate can be set separately by sterilised intervention, then the policymaker may be able to influence real external prices for a long period of time. This exposes the country to the charge that its external competitiveness is determined by monetary and exchange rate policy, rather than by its underlying comparative advantage. Third, a policy of sterilised intervention requires a policy regarding foreign currency reserves.

The contentious issue of management of foreign currency reserves is far too complex for me to address in this paper. I will briefly touch on three points. First, while it was commonly argued before the recent global financial crisis that many Asian countries were wasting resources in accumulating large foreign currency reserves, it has been widely noted that countries with large reserves fared relatively well during the crisis. Second, the odd thing about the crisis was that even though it originated primarily in the US financial sector, the immediate effect of the crisis was to strengthen the dollar. The logic is that holders of dollar assets were unwilling to sell them, so that there was a worldwide shortage of dollars. In this case, at least, it is dollar reserves that protected some countries – SDRs or euros would not have been as useful. Third, the willingness of the Federal Reserve to extend swaps to central banks around the world perhaps requires us to re-examine the need for foreign exchange reserves as a buffer in times of crisis.

This note really is an opinionated survey of current research on exchange rate policy, but it does not offer a specific recipe for policymakers. Instead, the single most important point is that there is a strong case with firm analytical foundations for policy to manage fluctuations in exchange rates. Macroeconomic theory does not support the claim that a policy which allows a fully flexible exchange rate with complete hands-off by policymakers will deliver an efficient market outcome.

1. The exchange rate and current account balance

If exporters set prices in their own currency, and there is nominal price stickiness, then exchange rate movements will alter a country's terms of trade. For example, consider a world of two countries – Europe and the United States. If European exporters set prices in euros, $P_{E,X}^{\epsilon}$ (the subscript E refers to Europe, X refers to export prices, and the superscript refers to the currency of pricing), then the dollar price of US imports, $S^{S/\epsilon} P_{E,X}^{\epsilon}$, is directly influenced in the short run by the dollar per euro exchange rate, $S^{S/\epsilon}$. Likewise, if US exporters set their prices in dollars, $P_{U,X}^{\$}$, then the euro price of European imports, $P_{U,X}^{\$} / S^{S/\epsilon}$, moves inversely

with the exchange rate. A dollar depreciation (an increase in $S^{\$/\epsilon}$) directly and instantaneously raises the price of imports in the United States, and lowers the price of imports in Europe. If the elasticity of demand for imports is sufficiently high, and all other influences on the trade balance are held constant, then a depreciation of the dollar should raise the US trade balance. Its exports should increase relative to its imports.

Alternatively, consider a small open economy. That country may have no influence on the world prices of traded goods. For example, Korea (which is not so small, but perhaps too small to set prices of traded goods) may compete in a world in which all traded goods prices are set in dollars. It imports goods from the United States that are priced in dollars, and when it exports to the United States, it must price in dollars. The level of the dollar/won exchange rate would not influence Korea's terms of trade in the short run because both prices are set in dollars. But prices of non-traded goods and services in Korea are set in won and sticky in won terms in the short run. A depreciation of the won relative to the dollar, according to this analysis, should increase the price of traded goods relative to non-traded goods within Korea. We might then expect that a depreciation of the won would switch demand toward Korean non-traded goods and away from traded goods. Potentially, this depreciation could improve the Korean trade balance if it leads to a decline in imports. The depreciation may also induce an expansion of Korea's export industry. As the won prices of exports increase, resources will move into Korea's export industries. (In contrast to the example of the United States and Europe in the previous paragraph, this type of analysis assumes that Korea is a small enough force in world markets that it can increase its supply of exports to the world without any reduction in its export price.)

These theories imply that currency depreciations should improve trade balances for large and small economies. But the economic evidence is not so encouraging. First, it should be noted that it is very difficult to assess the effect of exchange rates on trade balances. There are few if any cases of "exogenous" changes in the exchange rate. The econometrician cannot perform a controlled experiment, depreciating a currency and then gauging its effect on trade. Instead, any co-movements between exchange rates and trade quantities are confounded by the forces that cause the exchange rate to change in the first place. In the simplest case, one might believe that a country with a trade deficit will experience a depreciation, and the depreciation will help to eliminate the trade deficit. But then it is hard econometrically to separate out the effect of the depreciation on the trade balance and the effect of the trade balance on the depreciation.

Empirical studies that have undertaken the challenge have tended to find a very low response of trade to exchange rate changes. The elasticity of import demand with respect to exchange rates in the short run is frequently found to be in the inelastic range – below one.² Exchange rate movements will not have a large effect on the trade balance in the short run. Or put another way, if we were to rely on the exchange rate alone to equilibrate large imbalances, the exchange rate change required may be very large.³

Again, I will emphasise that the relevant statistic we are trying to measure is the short-run elasticity of demand – the adjustment that can occur in response to the exchange rate at business-cycle frequencies. Take the US/Europe example above. The terms of trade, $S^{\$/\epsilon} P_{E,X}^{\epsilon} / P_{U,X}^{\$}$, may over the course of several years have a relatively large influence on imports and exports. Some estimates from the international trade literature put the elasticity

² For example, see Rose and Yellen (1989); Hooper, Johnson, and Marquez (2000); Chinn (2004); Chinn and Lee (2009); and Lee and Chinn (2006). Also see Reinert and Roland-Holst (1992), Blonigen and Wilson (1999), and Heathcote and Perri (2002).

³ See, for example, the calculations in Obstfeld and Rogoff (2000b, 2005, 2007).

of import demand as high as six or eight or even larger.⁴ But those long-run effects occur over a period of time when nominal prices should have had time to adjust. Even with the nominal exchange rate, $S^{S/\epsilon}$, fixed, the terms of trade can increase if either $P_{E,X}^{\epsilon}$ rises or $P_{U,X}^S$ falls.

Moreover, it is mistaken to conclude that the terms of trade can adjust under a fixed exchange rate only with a general inflation in one country or a general deflation in another. If the prices of goods that a country exports rise over time, general price stability is still attainable. Other components of the consumer price index – prices of non-traded goods and services, and prices of imported goods – may fall. Over long periods of time, countries with relatively stable overall prices, such as the US, still find some prices – such as food and electronics – falling while other prices rise.

Given the difficulties in measuring the impact of exchange rate changes on import demand, perhaps of more interest is the recent study by Chinn and Wei (2008) that directly addresses the question of whether the exchange rate regime matters for current account adjustment. They examine the speed of adjustment of current account imbalances in 171 countries, using annual data in the 1971–2005 period. They measure the persistence of current account imbalances by the speed at which the current account returns to its long-run average. They classify countries by exchange rate regime: floating, fixed and intermediate regimes according to the system developed by Reinhart and Rogoff (2004). The study finds that there is no strong or robust relationship between the exchange rate regime and the speed of adjustment.

The first two paragraphs of this section laid out the traditional models of why a depreciation should improve the country's current account balance. The advocates of purely flexible exchange rates believe that a country with a large trade deficit will experience a nominal depreciation that will play a significant role in equilibrating the trade balance. Why does the evidence not support this view?

There are two main problems. First, the economic behaviour described in these two paragraphs is not consistent with actual economic behaviour. Second, the underlying presumption that exchange rates move to eliminate trade balances is not well grounded in theory and defies common sense observation.

In terms of the economic behaviour, there are three differences between the traditional "models" (based on the 1960s-style analysis) described in the first two paragraphs and reality. First, it is well understood that short-run elasticities of import demand can be low. Because of the costs of doing international trade, import contracts are often written with significant lead times. It is difficult to cancel contracts in the short run if there are adverse exchange rate movements. Moreover, a large quantity of non-oil trade among advanced economies – perhaps two-thirds – is in durable consumer and capital goods.⁵ Even if firms and households immediately adjust their desired stock durables in response to price changes, the aggregate accumulation or decumulation of these stocks occurs gradually over time due to the costs of adjusting durable stocks. Indeed, as I have already noted, long-run import demand elasticities are estimated to be much higher than short-run elasticities.

Second, there is now a large body of empirical evidence of pricing to market and low pass-through of exchange rates to prices. Contrary to the analysis above, prices of imported goods do not change very much in the short run in response to exchange rate changes. The US price of imported goods from Europe is sticky in US dollars. As the dollar/euro exchange

⁴ See, for example, Feenstra and Levinsohn (1995), Head and Ries (2001), Lai and Trefler (2002), and Ruhl (2005).

⁵ See Engel and Wang (2008).

rate changes, the dollar price of imported goods changes very little in the short run. This type of price stickiness leads automatically to pricing to market. If the price of a European good is set in euros when it is sold in Europe and dollars when it is sold in the US, then the price of the good in US markets in dollar terms can deviate from the (dollar) price in European markets.⁶

Using the example in the first paragraph of this section, the euro price of the European good sold within Europe, $P_{E,C}^{\epsilon}$ (the subscript C refers to the consumer price, as distinct from the export price), is sticky in the short run. The dollar price of the European export, $P_{E,X}^{\$}$, tends to be sticky also. The price in the United States of European goods, $P_{E,X}^{\$}$, does not fluctuate with the exchange rate and therefore does not move closely with the price in Europe, translated into dollars using the exchange rate: $S^{\$/\epsilon} P_{E,C}^{\epsilon}$.

It is important to recognise that consumer prices of imported goods are particularly unresponsive to exchange rates. There is a large empirical literature that looks at the currency of invoicing of exports and the price of imports at the dock. There is mixed evidence on the measurement of pass-through of exchange rates directly to import prices. While US import prices are not very responsive to exchange rate changes, there is more responsiveness in other countries – particularly smaller countries. But that pass-through does not continue on to the prices paid by final users. The consumer prices, even in smaller countries, are not so responsive to exchange rates. Apparently, the distributors and retailers that take the good from the dock and bring it to the consumer absorb the effects of exchange rate changes. Prices paid by the final user are not very responsive to the exchange rate, which implies that demand for imports will not be very responsive to exchange rates unless the distributor/retailer is able to change sources (from other exporting countries or from internal producers) as the exchange rate changes.⁷

A third consideration that might explain why current account balances overall – rather than imports per se – are not very responsive to exchange rates is that many export goods are produced using imported intermediate goods. A depreciation may increase the price of imported goods, but if those goods are inputs into the export sector, the country's competitiveness may not be strongly affected. Putting together these three elements – low short-run elasticities, low pass-through, and imported intermediate goods – into a macroeconomic model calibrated to match Asian economies, Devereux and Genberg (2007) conclude that a depreciation of the currency will have little effect (and possibly perverse effects) on the current account balance.

It is equally important to note that there is no strong economic rationale for the case that exchange rates should move to eliminate trade imbalances. The textbook models of the 1960s defined external balance as a zero balance in trade in goods and services or a zero current account balance. But subsequent developments in economic thinking – the logic of economic models developed in the past forty years – have tended to emphasise the weaknesses in this notion of external balance.

It is a matter of simple accounting identities that a country's current account balance equals the difference between national saving and investment in capital goods. National saving in

⁶ My own work is among the earliest to emphasise the unresponsiveness of consumer prices to exchange rates and the deviations from the law of one price. See Engel (1993, 1999) and Engel and Rogers (1996). See also, for example, Parsley and Wei (2001). A great deal of subsequent analysis supports these findings. See, for example, these very recent papers: Gopinath and Rigobon (2008), Gopinath, Itskhoki, and Rigobon (forthcoming), Burstein and Jaimovich (2009), Crucini, Shintani, and Tsuruga (2008, 2009) and Gopinath et al. (2009).

⁷ See Burstein, Eichenbaum, and Rebelo (2005).

turn is the sum of private saving (household plus corporate saving) and government saving (taxes less government spending on goods and services). In the first place, the economic link is weak between exchange rates on the one hand and saving and investment on the other hand. Saving and investment are much more strongly determined by other economic variables, particularly the level of GDP and expected future growth rates, than they are by real exchange rates.

Moreover, it may be an efficient global equilibrium for some countries to run current account deficits and others to run surpluses. Global “balance” does not mean that current accounts need to be balanced. Efficient global capital markets will reallocate funds from countries whose saving exceeds their internal investment needs to those that desire to borrow to finance current consumption and investment.

This is not to say that international capital markets are, in fact, efficient. There is a strong case to be made that capital markets failed badly, especially in the US, in the run-up to the crisis. Lenders, and the financial system as a whole, did not adequately provision for the riskiness of their loans. There was too much borrowing in the US, and that surely contributed to the large US current account deficit.

But exchange rates are not primarily determined by the current imbalance between imports and exports or between output and expenditure. Exchange rates are asset prices – the price of one currency in terms of another. Like any asset price, they are forward-looking. They are determined not only by current economic “fundamentals,” but also and primarily by expectations of future fundamentals. This has been standard economic theory since the late 1970s, when the so-called asset market approach to exchange rates was developed. But somehow, the policy implications have been ignored. By this, I mean simply that if exchange rates are forward-looking asset prices, then equilibrium in foreign exchange markets is not reached when the trade balance is zero.

Put another way, if foreign exchange were traded only to finance imports, then the demand for foreign exchange would be determined by the demand for imports. Foreign demand for domestic currency would then equilibrate with domestic demand for foreign currency when trade was in balance. But casual observation tells us that only a very tiny fraction of foreign exchange trade is generated by import demand. Instead, foreign exchange trade is almost entirely for hedging and speculation purposes. The equilibrium in the foreign exchange market is not determined by trade balance. Instead, the foreign exchange rate will be determined as the expected present discounted value of current and future economic fundamentals.⁸

Before turning to a new perspective on external balance, I want to address briefly a different channel through which recent literature has suggested the exchange rate may equilibrate external imbalances. Gourinchas and Rey (2007a) have noted that the net external position of a country – its net indebtedness – depends not only on the accumulation of its past borrowing, but also on the valuation of that debt. A country may have borrowed extensively in the past, but if the debt has fallen in value, the country’s net debt to the rest of the world may be substantially less than its accumulated borrowing.

Put another way, a country can afford borrowing and debt if valuation changes work to its advantage. The United States has been a net borrower from the rest of the world for most of the past four decades. But, Gourinchas and Rey argue, the US debt position may be sustainable if, as the country accumulates debt, the value of the debt deteriorates. In particular, since the US is able to borrow in dollar-denominated debt, the foreign currency

⁸ A recent extensive examination of the exchange rate from an asset market perspective is in Engel and West (2005).

value of its debt will fall when the dollar depreciates. Gourinchas and Rey present evidence that, indeed, in periods in which US debt has risen substantially, the dollar has tended to depreciate. Valuation effects have worked as a mechanism of adjustment.

It is not clear whether this mechanism works for other countries or whether the empirical relationship is very robust for the United States.⁹ But, even if it is true that in the past the US has successfully relied on valuation changes to ease adjustment in its financial position, it is unlikely that many countries could rely on this channel of adjustment. If we expect a country's currency to depreciate, then borrowers should incorporate that expectation into asset prices. Countries that lend to the United States in dollar terms should require a higher nominal interest rate on US debt to compensate for this expected depreciation. This outcome is mitigated substantially only if US dollar-denominated debt is considered to be a very good "safe haven". Then foreigners are willing to accept a lower expected return on US debt, so that the expected depreciation of their dollar assets is an acceptable cost for holding such a safe asset.

But not many countries can enjoy this safe haven privilege. Most countries borrow externally in debt denominated not in their own currency, but in foreign currency. Gourinchas and Rey (2007b) have used the term "exorbitant privilege" to describe the ability of the United States to borrow in its own currency, potentially at a lower expected rate of return than other countries.¹⁰

Finally, on this point, economic logic suggests that a country can enjoy the safe haven privilege even if it had a fixed exchange rate. Under a fixed exchange rate system, the safe haven currency would simply have a lower interest rate or higher face value to reflect its value as a safe haven. The point here is that "valuation effects" do not just operate through the exchange rate, but through the price of the underlying assets as well.

2. Currency misalignment

Modern Keynesian macroeconomics follows the general theme that policy – especially monetary policy – should be aimed at correcting or at least combating economic inefficiencies. In particular, monetary policy is particularly useful in working to offset short-run sticky price distortions.

In the open-economy setting, sticky prices can lead to currency misalignments if they cause international prices to deviate from their underlying resource costs. Prices allocate goods efficiently when the relative price of goods reflects the relative marginal costs for producing those goods (the marginal rate of transformation). Moreover, the prices paid by different consumers should differ only because the costs of delivering the goods to the consumers may differ. The efficient equilibrium requires that the marginal rate of substitution between any two goods for any household should equal the relative marginal costs of those goods (inclusive of the costs of distributing the goods to households).

⁹ See, for example, Curcuru, Dvorak, and Warnock (2008, forthcoming).

¹⁰ Curcuru, Dvorak, and Warnock (2008, forthcoming) argue that, in fact, there is no exorbitant privilege. They find instead that to the extent that the United States is able to earn higher returns on its foreign investments than foreigners earn on US investments, it is attributable both to the mix of assets in the portfolios (US investments abroad are in riskier assets) and poor investment timing by foreigners in US assets. Devereux and Sutherland (forthcoming) cast doubt from a theoretical perspective on whether valuation effects can be a channel for external adjustment from an ex ante perspective.

When goods prices are sticky, short-run changes in exchange rates generally will deliver relative price changes that do not have an efficiency rationale. The exchange rate may move because of expectations of some future change in fundamentals, but those expectations do not reflect any current change in the resource costs of producing goods. Additionally, some have argued that exchange rates in the short run are influenced by investor sentiment, or bubbles, and of course those changes also do not reflect underlying true economic costs.

I will say that an exchange rate or a currency is misaligned when the exchange rate change, in combination with nominal price stickiness, has led relative prices internationally to deviate from the efficient levels that represent underlying costs. External balance means the currency is not misaligned. This is a notion of external balance that is not arbitrary and simply assumed, but rooted in economic logic.

Even if exchange rate changes lead to changes in relative prices that are inefficient, it is not necessarily the case that monetary policy should target exchange rates as a separate objective beyond its domestic objectives. Obstfeld and Rogoff (2000a, 2002) and Clarida, Gali, and Gertler (2002) have developed well-known and influential models, with the implication that currency misalignments should not be a separate goal of monetary policy. According to these models, if monetary policy targets its familiar internal objectives – inflation and the output gap – then the exchange rate will adjust to eliminate any misalignments.

Those papers build simple models that rely on the economic assumption discussed above, that export prices are set in the exporter's currency and adjust only slowly. To recap the example given previously, assume European exporters set prices in euros, $P_{E,X}^{\epsilon}$, and American exporters set prices in dollars, $P_{U,X}^{\$}$. Then the terms of trade, $S^{\$/\epsilon} P_{E,X}^{\epsilon} / P_{U,X}^{\$}$, will fluctuate with changes in the nominal exchange rate. As Devereux and Engel (2006) discuss, when exchange rates are asset prices and subject to fluctuations based on news about future fundamentals, the terms of trade will not reflect underlying resource costs of the traded goods. Exchange rate fluctuations will affect the relative competitiveness of European compared with American producers, and there can be currency misalignments.

But in the simple models of Obstfeld and Rogoff (2000a, 2002) and Clarida, Gali, and Gertler (2002), these misalignments do not require that central banks directly target exchange rates. When the dollar depreciates relative to the euro, for example, there will be an increase in aggregate demand for US goods and a switch in demand away from European goods. If the central banks target internal aggregate demand, as reflected in producer price inflation and the gap between actual output and its efficient level (the “output gap”), then the policy is automatically working to eliminate the currency misalignment. When aggregate demand returns to its optimal or efficient level, the exchange rate will have adjusted back into place where it is no longer leading to misalignments in demand for US relative to European-produced goods.

In essence, these models are similar to the models of the 1960s – exchange rates directly affect aggregate demand by affecting import prices – but they dispense with the archaic notion that the exchange rate will automatically adjust to achieve external trade balance. Instead, the onus is on monetary policy to restore balance in markets. But in these models, when internal balance is restored, the currency will adjust so it is no longer determining the relative international competitiveness of producers.

Another strand of the open-economy New Keynesian literature has emphasised that currencies can be misaligned even if internal markets are in balance. Devereux and Engel (2003), Corsetti and Pesenti (2005), and Engel (2009), among others, have focused on the role of incomplete pass-through of exchange rates to consumer prices. Again, we can recap an example given above. Suppose European goods are priced in euros for sale in Europe ($P_{E,C}^{\epsilon}$) and priced in dollars for export sale in the United States ($P_{E,X}^{\$}$). Then the prices paid by US consumers are not equal to the prices paid by European consumers (when the latter are

expressed in comparable dollar terms, $S^{\$/\epsilon} P_{E,C}^{\epsilon}$). Abstracting from transportation, distribution, and marketing costs, these price wedges imply that resources will be distributed inefficiently. For example, if the dollar is extremely weak ($S^{\$/\epsilon}$ is very high), then the price paid by Europeans may be high compared with the price paid by Americans. $S^{\$/\epsilon} P_{E,C}^{\epsilon} / P_{E,X}^{\$}$ may rise to high levels that cannot be explained by differences in distribution costs.

This inefficiency does not get reflected in demand for the good in either Europe or the United States in the short run. As the evidence indicates, prices faced by consumers do not vary much in the short run even when exchange rate changes are large. How, then, is the inefficiency manifested? Suppose the dollar depreciates for reasons unrelated to current economic costs. $S^{\$/\epsilon} P_{E,C}^{\epsilon} / P_{E,X}^{\$}$ rises, so that the price Europeans pay for the European good rises relative to the price Americans pay. The European producer finds his margin on US sales slipping. The revenue per unit sold in euro terms is given by $P_{E,X}^{\$} / S^{\$/\epsilon}$, which falls as the dollar deteriorates. Owners of European firms – who are primarily European – will earn less profit, and the value of European firms will deteriorate. Conversely, American exporters to Europe will gain when the dollar depreciates – each euro in sales will be worth more dollars. The relative profitability of the firms, and therefore the relative wealth of the firms' owners, is driven by changes in the nominal exchange rate that may have little or nothing to do with the productivity or efficiency of those firms.

It is crucial to recognise that almost all movements in foreign exchange rates are inefficient from the criterion of resource allocation. Even in the absence of financial market inefficiency – even if financial markets are efficient and there are no bubbles – there are essentially no market forces to drive the nominal exchange rate toward the level that would reflect underlying real costs. The basic market failure is the failure of nominal prices to adjust to shocks. Nominal exchange rates are determined by expectations of the future, as any asset price should be, so they are not determined by the current factors that affect the relative competitiveness of firms in different countries. The foreign exchange market cannot be relied on to somehow magically offset the distortions introduced by sticky nominal prices. It is up to policymakers to do their best to combat currency misalignments (while focusing on their other, perhaps primary, goals of inflation and the output gap).

Why do firms not adjust nominal prices? The lost profit for an exporter could be large given the size of exchange rate changes we commonly observe. In essence, this is the question that all Keynesian economists must confront, though perhaps it is heightened in the international context where the incentives to change prices might be large.

Part of the answer is the standard one given in the Keynesian literature. There may be costs to adjusting prices. Firms must undertake substantial research to determine the optimal price that the market will bear for their good. Firms update their research only infrequently – quarterly, or even annually. The gain in profits from optimal price adjustment in the interim may be small. This is particularly true when price setting is not synchronised. A firm thinking about resetting its price this week must take into account that many other firms are not on the same pricing cycle as it is. If the firm finds it is optimal, given market conditions, to raise its price, it must consider that it will lose market share until other firms react to conditions and adjust their prices. So the firm only partially adjusts its price to current conditions. But then other firms that subsequently set their price must take into account that this first firm has not raised its price fully. Overlapping pricing cycles can substantially lengthen the price adjustment process.

We might consider the market share of a firm as a sort of capital. Firms need to advertise to attract customers. The stock of customers is costly to acquire, so firms are reluctant to let go of their customers when market conditions turn against the firm temporarily. In particular, a temporary change in the exchange rate may hurt the competitive position of a firm. But the firm may be willing to suffer lower temporary profits, or even losses, to avoid losing its customer base and market share. Drozd and Nosal (2008) have demonstrated that firms may

change prices very slowly and tolerate large differences in prices and profitability across markets because of the incentive to retain customers.

Monetary policy should consider these currency misalignments. Engel (2009) specifically has shown that the exchange rate is a separate concern of policy from its goals of low inflation and low output gaps.

A considerable literature has shown that monetary policymakers have another reason to target the exchange rate – to move the terms of trade in their favour.¹¹ For example, the Federal Reserve, if it were acting in competition with the European Central Bank, might find it optimal to depreciate the dollar when there is local currency pricing. Such a policy would benefit US producers at the expense of European producers. But the European Central Bank would have a similar incentive to depreciate the euro. The Nash equilibrium of this policy game would resemble the prisoner's dilemma. Because the objectives of the central banks are competing, their efforts on the exchange rate are offsetting. But the efforts devoted to using monetary policy to influence the exchange rate distract attention from the other goals of the central banks such as inflation. The outcome could be improved if central banks cooperate on exchange rate goals.

Indeed, I think it is realistic to describe current central bank policy among the richest countries as cooperation on the exchange rate. There is an understanding among them that policy will not be used for competitive devaluations. But the work of Engel (2009), building on the earlier research in this area, shows that optimal cooperation does not generally take the form of leaving hands off the exchange rate. Instead, policymakers should agree on a target for exchange rates that they would like to achieve cooperatively.

It is commonplace to state that a country that fixes the exchange rate through monetary policy gives up monetary policy independence. In other words, if monetary policy is devoted toward fixing the exchange rate, then policy cannot be used to achieve domestic targets on inflation and output. The recent open-economy monetary policy literature does not, however, favour fixing exchange rates. As Engel (2009) puts it, currency misalignment should be one goal of policy along with its other goals on inflation and output. There is a trade-off – to the extent that policy pays attention to exchange rates, it must give less attention to other goals. The importance of the exchange rate target will depend on the degree of misalignment of the currency and the openness of the economies. More open economies suffer more from large misalignments.

Experience suggests that any attempt to announce a narrow target band for the exchange rate may stimulate speculation, and such a band will be difficult to enforce. Instead, central banks should agree on exchange rate goals, enunciate those clearly, and also make clear the priority of the exchange rate goal relative to inflation and employment targets. In that case, I do not see any reason why there should be more speculation in the foreign exchange market engendered by the foreign exchange target than there is in the inflation-indexed bond market generated by inflation targets.

I have consistently used the dollar/euro rate in my examples of currency misalignment. It is tempting to think that this example is misplaced or at least that it shows that exchange rates are a minor concern for policymakers. I say that because one might look at the volume of trade between the United States and Europe, see that it is small relative to the size of GDP in each region, and conclude that the size of the problem is small. But this is not the right comparison.

¹¹ See Corsetti et al. (2000); Clarida, Gali, and Gertler (2002); and Benigno and Benigno (2003) for analysis of this incentive in the context of non-cooperative monetary policy among “large” countries. Very similar analysis arises in models of small open economies that have some monopoly power in their export market. See, for example, de Paoli (2009) and Faia and Monacelli (2008).

First, the size of actual trade is a poor measure of international competition. A better measure requires an assessment of the size of the sectors that produce goods that potentially compete on international markets. A European firm can be hurt directly by a very weak dollar even if it does not export to the United States. That is because it may be unable to compete in the US market precisely because of the misaligned dollar. The firm may be efficient enough to overcome the costs of engaging in international trade, and so, with a correctly aligned currency, may be able to compete with US firms for the US market. When the dollar is too weak, the firm might not even enter the US market.

Second, if the dollar/euro rate is misaligned, then other currencies by necessity must be misaligned with either the dollar or the euro or both. The renminbi cannot be efficiently priced against both the dollar and the euro when the dollar is out of line with the euro. So the amount of trade, even potential trade, between the United States and Europe is not a sufficient statistic to capture the possible losses from a misaligned dollar/euro exchange rate.

Third, commodities whose prices are determined efficiently and flexibly still cannot achieve the right level in both the US and European markets if the dollar/euro rate is out of line. As Devereux and Engel (2009) state: “Between the last day of March 2002 and the last day of December 2004, the price of a barrel of crude oil rose from \$26.31 to \$43.45, a 65.1 percent increase. This represents a 55.1 percent increase relative to the US consumer price index (CPI). Over the same period, the price of a barrel of oil rose from €30.18 to €32.09, a 6.3 percent increase. Relative to the French CPI, this was a 0.7 percent increase, and relative to the German CPI, a 2.5 percent increase. Apparently, the United States experienced a major oil price increase, but Europe did not.”

Of course, the explanation is that the dollar depreciated against the euro by 55 percent during this short time period. This depreciation was almost all in real terms. It is difficult to imagine an economic theory in which markets are efficient and the currency of one major economy can depreciate relative to another in real terms by more than 50 percent within the space of three years – especially when there were no major economic shocks that hit the US but not Europe, or vice versa. Instead, the depreciation must reflect some sort of misalignment. Either the dollar was too strong in March 2002, or too weak in December 2004, or both. But the consequence of this great depreciation was real – the United States suffered an oil price shock, and Europe did not.

3. Determining the target exchange rate in advanced countries and emerging markets

Conceptually, the object of policy is to achieve an exchange rate level such that the competitive positions of firms are not determined by the exchange rate, but instead by underlying resource costs. Measuring this equilibrium exchange rate is potentially difficult even among similar economies, such as the major advanced economies. It is even harder to get a precise estimate of the equilibrium exchange rate between an emerging market and a mature economy.

The problem comes in measuring the resource costs of producing traded goods. It might seem simple enough to gather data on wages, rents, costs of intermediate goods, and other costs for producing traded goods in a pair of countries. But it is not. First, we need to measure the efficiency of firms. Two different firms may use similar inputs, but one may use them more efficiently than another and so will have lower costs. Comparing efficiency of firms internationally may be a very difficult task. Moreover, the comparison of these relative costs may be distorted if the costs themselves are subject to nominal stickiness. If US wages are sticky in dollar terms, the US costs may be relatively low when the dollar is weak. But that cost advantage again does not reflect an efficiency advantage – it is just another manifestation of a misaligned currency.

But we can probably get a rough measure of the equilibrium exchange rate when comparing similar economies by looking at purchasing power parity (PPP) deviations. Deviations from PPP may arise for reasons other than currency misalignments, but between comparable economies these differences might be sufficiently small.

Suppose we have measures of consumer prices of traded goods in the United States and Europe. Those prices may differ because of real cost differences. Perhaps firms are more efficient in Europe than in the United States. If Europeans have a home bias in preferences, so that they prefer to consume more European goods, their overall consumer prices of traded goods should be lower than in the United States. Costs of transportation, distribution, marketing and retailing may differ between Europe and the United States, which may lead to differences in consumer prices based on real costs.

Generally, it is difficult to determine which goods are tradeable and which goods have sufficiently high trade costs that they are non-tradeable. Consumer price levels may differ because of differences in costs of non-traded goods.

But these factors leading to real differences in price levels – that is, leading the efficient level of the real exchange rate to deviate from unity – are minimised when comparing two similar economies. So a rough measure of the equilibrium real exchange rate that policymakers could use is the PPP exchange rate, or perhaps a PPP exchange rate for urban areas. A PPP exchange rate based on urban area prices would account for the differences in underlying costs of consumer goods based on the degree of urbanisation. Generally, urban areas have higher living costs due primarily to higher housing costs.

It is much more difficult to use this sort of back-of-the-envelope calculation to arrive at an equilibrium real exchange rate when comparing an emerging market economy to an advanced economy. It is well known that non-traded goods prices tend to be lower in countries with lower incomes. A number of plausible theories have been advanced to explain this phenomenon, and it is reasonable to assume that such pricing represents an efficient market outcome.

But how then can we measure the efficient level of the real exchange rate? We do not want to use the PPP real exchange rate, because the poorer country ought to have lower prices (a weaker real exchange rate) than the richer country. Nobody should contend that the equilibrium value of the renminbi is the one that achieves purchasing power parity with the dollar.

Instead, we might try to make adjustments based on the relative incomes of countries. But how much weaker should the real value of the currency be in a poor country relative to a richer country? The approach taken by Cheung, Chinn, and Fujii (2007) seems like a reasonable one. They look at a broad cross section of countries. They reason (or, more precisely, they assume) that, on average, real exchange rates relative to the US are at the efficient level. Some may be overvalued and some undervalued, but on average they are just right. We can then look at the average effect of relative income on real exchange rates to gauge the appropriate degree by which we should adjust the PPP real exchange rate to get our measure of the equilibrium rate.

Unfortunately, this approach has a significant difficulty because it requires comparing levels of real income between countries. That exercise in itself requires some comparison of prices, because we need to measure the real value of output in the non-traded sector. This problem is illustrated in the comparison of the calculation of the equilibrium value of the renminbi in Cheung, Chinn, and Fujii (2007) with the calculation in Cheung, Chinn, and Fujii (2009). The earlier paper does find evidence that the renminbi is undervalued, though it emphasises that the measure of the equilibrium exchange rate is imprecise so that they cannot conclude with statistical certainty that there is undervaluation. But the second paper uses new, revised measures of the real income of China. The new measures lowered the assessment of the level of real income in China. But lower income means that the equilibrium value of the

renminbi should be lower. Using the new measures of Chinese income, Cheung, Chinn, and Fujii (2009) conclude that there is no evidence of undervaluation of the renminbi.

4. Fixed exchange rates and credibility

The modern literature on monetary policy has emphasised the gains from credibly committing to a monetary policy rule. The question facing many emerging markets is how does monetary policy establish credibility?

The modern literature does not have a clear-cut answer to that. One important ingredient is central bank independence. If central banks are subject to political pressure, they may be tempted to follow policies that are too activist. But policies that respond too aggressively when there is unemployment or declining output will build in expectations of a bias toward expansionary policy. Those expectations have a cost. When policymakers need to disinflate, they must battle these expectations. They will have to increase real interest rates more and dampen aggregate demand to a greater degree to achieve a given amount of disinflation than they would if they were perceived as being committed to a policy rule. Optimal policy rules need not have inflation alone as their target, but the rules must be verifiable to be credible.

Some economists, and indeed some central bankers, have concluded that fixing the exchange rate is one way to achieve credibility quickly. The exchange rate is a very visible price – very easy to verify. A policy that commits to fixing the exchange rate will be viewed as a clear abandonment of discretionary policy. Clerc, Dellas and Loisel (2008) provide an analysis of this view in the context of the modern Keynesian approach.

A currency board is the cleanest example of a fixed exchange rate. The experience of Hong Kong and Argentina with currency boards also provides some lessons on the benefits and the limitations of a fixed exchange rate policy.

First, as we have already mentioned, if monetary policy is committed to fixing the exchange rate, then policy cannot have separate goals of keeping inflation low or maintaining full employment. To be sure, generally the goals of a stable currency, low inflation and full employment may coincide. To maintain a fixed exchange rate, money growth must be restrained. Argentina, after adopting the currency board, experienced a dramatic drop in inflation. And a stable policy environment imposed in a previously inflationary setting will also tend to increase certainty about economic relationships and will lead to stronger real economic growth. Again, the initial years of the Argentine experience, as well as the entire history of the Hong Kong experience with a currency board, tend to lend support to this view.

But there are possibilities of a trade-off. A country that has a fixed exchange rate can achieve a real appreciation only through inflation. Sometimes economic circumstances require a change in the real exchange rate, and that change can occur only through changes in the nominal price level. So while we have argued that the exchange rate should be an objective of central bank policy, in general there is a trade-off between the exchange rate objective and the inflation and output objectives. The choice of giving up independent influence on inflation and the output gap by adopting a currency board can be supported only if the gains in credibility for policymaking are sufficiently large.

Finally, it perhaps goes without saying that adopting a fixed exchange rate cannot raise the credibility of policy indefinitely if, in fact, policies are being implemented that are ultimately incompatible with the fixed exchange rate. Here, again, the experience of Argentina comes to mind.

5. Sterilised intervention

The analysis of exchange rate policy up until now has been predicated on the idea that the exchange rate is one target of monetary policy. Sterilised intervention offers the possibility of separating exchange rate policy from monetary policy. Here I will offer only some brief observations about sterilised intervention. There is very little analysis of sterilised intervention in the new Keynesian framework. Instead, my comments are primarily based on empirical evidence and observation.

The first point is that sterilised intervention appears to be effective only when the country has capital controls in place or the country's external capital markets are thin. In these cases, the central bank can be a large player in the market for its own currency. It is able to support its currency essentially by drying up the supply of its currency in world markets by selling off its foreign exchange reserves. If capital markets were deep, then the private capital market could "undo" any effect of sterilised intervention. Suppose, for example, that a central bank wants to keep its currency from depreciating. It sells off reserves (for example, of dollar assets) and buys its own currency. But when capital markets are deep, private speculators can reverse the effects of this action. If the market believes that the central bank's target ultimately overvalues the currency, speculators may be willing to sell very large amounts of the currency without changing their assessment of its market value.

The empirical literature on the effects of sterilised intervention faces a significant difficulty of endogeneity. Intervention usually only occurs in response to changes in the value of the currency driven by market forces. For example, the market might perceive that the currency should depreciate, and the central bank responds with intervention to strengthen the currency. The empirical researcher will be confronted with data that show the central bank intervening to support the currency, but the currency is depreciating. It is almost impossible to separate out the effects of the private market from the effects of the central bank action.

Typically, econometric studies deal with simultaneous causality by using instrumental variable techniques. In this case, in order to measure the effects of intervention, researchers would need to find a variable that influences exchange rates but does not influence the amount of intervention. It is difficult even conceptually to come up with such a variable, and there are few if any empirical studies that have successfully used this approach to assess the effects of sterilised intervention. One well known paper by Kearns and Rigobon (2005) uses a technical econometric technique involving restrictions on correlations to identify the effects of intervention on exchange rates. They find that large interventions in exchange markets with deep capital markets have only small effects on the exchange rate: The equivalent of a US\$100 million intervention in the market for Australian dollars moves the exchange rate by about 1.5 percent on the day of the intervention, with the effect receding over time, while in the market for the Japanese yen an equivalent intervention leads to only a 0.2 percent effect on exchange rates.

One tack that a number of research studies have taken recently is to examine very high frequency intra-daily data on interventions and exchange rates. The idea is that if we examine the behaviour of foreign exchange markets at five-minute intervals (for example), we can directly measure the effects of intervention in the five minutes immediately after the central bank enters the market. This type of analysis has two obvious limitations: First, it can only separate out the exogenous effects of intervention over a very short horizon. Second, it still relies on an assumption that the effect of the intervention can be separated out from the effects of market purchases over the short time interval. Even with these assumptions, the studies tend to find little effect of sterilised intervention in currencies with deep capital markets. For example, Fatum and Pedersen (2009) find that intervention by the Danish central bank can influence the value of the krone/euro rate, but only when the intervention policy is consistent with underlying Danish monetary policy. Other studies, such as Dominguez (2006) and Fatum and Hutchison (2006), find that sterilised intervention can have an influence on exchange rates, but only for short periods (less than one month).

On the other hand, some countries such as China are clearly able to influence exchange rates while effectively largely sterilising the effects of intervention on the money supply or monetary conditions. The effectiveness of this intervention is generally believed to be attributable to restrictions on capital flows.

While restricting flows of capital is clearly a case of government intervention in the free operation of markets, there is by now a large literature that supports the case for capital controls in emerging markets. Some of the literature makes a theoretical case. For example, Rodrik (1998, 1999) and Obstfeld (2008) argue that without well functioning economic, social and legal institutions, opening international capital markets may be counterproductive. Empirical studies (such as Klein and Olivei 2008 and Chinn and Ito 2007) support the view that capital market liberalisation does not lead to better economic performance in the absence of internal reforms. In other words, a country in the midst of economic liberalisation should first focus on internal liberalisation before opening capital markets.

Because sterilised intervention can be effective where capital controls are in place, such countries enjoy a sort of policymaking luxury. They can conduct exchange rate policy with some independence from monetary policy. These countries have effectively two policy instruments – sterilised intervention and the monetary policy instrument (money growth or interest rates) – while countries with free, deep and very open capital markets lose the option of using sterilised intervention. Very little research has been conducted on the value of this option.

However, that option comes with a price. One benefit of controlling exchange rates with monetary policy, as has already been argued, is that such a policy may quickly gain credibility for the central bank. Central banks that fix exchange rates clearly are not following discretionary policies with an inflationary bias. It is difficult to imagine how monetary policy alone can fix the exchange rate, except when a currency board is established (or a country joins a currency union). But to the extent that policymakers rely on sterilised intervention to control exchange rates, the exchange rate policy contributes less to the credibility of monetary policy. If exchange rate policy and monetary policy are seen as separate tools, then evidence of the former may tell markets very little about the latter.

Even under sterilised intervention, there surely is some signal about policy commitment when a country maintains a fixed exchange rate. Although I cannot cite empirical evidence to support this, I do believe that international markets increased their confidence in the stability of Chinese economic policy because China maintained a fixed exchange rate during many difficult years including the Asian crisis.

Moreover, it is difficult to maintain a fixed exchange rate with sterilised intervention if there is a big discrepancy between the goals of monetary policy and exchange rate intervention. Suppose there are no underlying reasons for a real appreciation in a country, but it maintains a fixed exchange rate in combination with an inflationary monetary policy. Eventually the overvaluation of the currency will lead to disequilibria in goods and financial markets that are undesirable.

The converse problem also arises – a country can use monetary policy and exchange rate policy separately to gain a competitive advantage through devaluation. The country can devalue its currency in nominal terms, but use monetary policy to control inflation. This type of policy will cut off the channels for real price adjustment. China has, of course, been accused of essentially running such a policy. However, in China's case, there was no devaluation of the currency in nominal terms. Instead, the argument goes, China should have allowed a real appreciation, but by fixing its nominal exchange rate and dampening inflation, it prevented the real appreciation from occurring. Even if this accusation is untrue (recall, Cheung, Chinn, and Fujii 2009 find little evidence that the renminbi is overvalued), it is difficult to refute the charges.

6. Currency reserves

To conduct sterilised intervention, central banks acquire foreign exchange reserves. The management of these reserves is the subject of an intense ongoing debate. I will stay out of that debate, given that it is straying too far from the central topic of this note. I will limit myself to three observations.

First, many commentators and researchers argued – before the crisis – that accumulation of reserves by central banks was wasteful and ill-advised. It was said that central banks accumulated far more reserves than was necessary to fend off an attack on their currencies and that the reserves earned low rates of return compared with other investment opportunities.

Since the crisis, opinions have changed. It turns out that on the whole, countries with a large war chest of reserves weathered the crisis relatively well – better than countries with low levels of reserves.¹² Obstfeld, Shambaugh, and Taylor (2008) reassess the stock of reserves needed to defend a currency. When the central bank is the lender of last resort, it may be required to have a very large war chest of reserves to defend the currency. To prevent a run on banks and subsequent flight to foreign currency, the central bank holds reserves. Its potential liabilities include the bank deposits that could be converted to foreign currency. By maintaining a large stock of foreign exchange reserves, the central bank signals that it will be able to defend the currency, and it can therefore discourage a bank run from occurring in the first place.

Another point to be made is that the return to the portfolios of central banks that held US Treasury bonds has been relatively very strong. It turns out that other assets were risky – probably riskier than the market perceived – and it was the wise investor that held a portfolio heavily weighted toward Treasuries. In the immediate aftermath of the crisis, the dollar appreciated (from \$1.60/€ to \$1.25/€, before weakening again to around \$1.42/€ at the time this note is being written). And the dollar value of Treasury bonds rose while equity markets crashed.

Clearly, now central banks are worried about the value of their dollar assets falling. But they are looking at things from the top of the mountain. The performance of their portfolios has been very strong, and they are worried about underperformance in the future. That is still a much better position to be in than if the reserves had been largely invested in equities or even non-dollar currencies. Then emerging market central banks would be like the rest of us – at the bottom, hoping things improve.

The second point I want to make is that there is, of course, something very different about this crisis from other recent financial crises. In emerging market crises, the crisis countries had accumulated debt denominated in foreign currency (US dollars, mainly). The crises led to steep depreciations of their currencies and an increase in the value of their external debt in units of their own currency.

On the other hand, the recent crisis, which had its epicentre in the US, led to an appreciation of the dollar. But the US had also borrowed primarily in dollar terms, so the appreciation did not reduce the external value of its debt in terms of dollars. The crisis was clearly unusual because the currency of the crisis country appreciated. The emerging markets, which largely did not suffer from the underlying distortions in financial markets that are now evident in large financial centres, nonetheless needed foreign currency reserves to defend their own currency. The simple story for the appreciation of the dollar was that there was hoarding of dollar assets. Banks and other financial institutions, especially, needed to protect their

¹² Obstfeld, Shambaugh, and Taylor (2009) provide the empirical evidence to support this assertion.

balance sheets. Dollar liquidity dried up, creating an excess demand for dollars, driving up their price.

My point here is that, at least in this case, central banks did not need a pot of reserves to protect their own weakened currency. Instead, they needed specifically dollar reserves in order to protect their currencies against this peculiar dollar drought. Other forms of reserves – euros or SDRs – probably would not have been as useful during this crisis.

The third and final point I will make on reserves is that the currency swaps offered by the Federal Reserve during the current crisis have altered the picture. Obstfeld, Shambaugh, and Taylor (2009) demonstrate that in cases where central banks did not hold large dollar reserves, the availability of the swap lines apparently had a significant effect in stabilising exchange rates. On the other hand, many Asian countries already held large and adequate war chests of reserves, so the availability of the swap line was more symbolic.

The role that these swap lines played does demonstrate the importance of having access to a large store of reserves. It may also demonstrate that there is less need to hold reserves if the swap lines are available. However, Obstfeld, Shambaugh, and Taylor (2009) make two observations. First, the scale of the lending to central banks that was necessary in this crisis was so large that it is difficult to imagine any other institution providing such a large supply of dollars save for the institution that can create that currency – the Federal Reserve. These authors note that some central banks such as China's do have very large holdings of reserves, but it would take an extraordinary commitment for these banks to lend their reserves in a crisis. For example, the size of the swap lines envisioned under the Chang Mai initiative may need to be reassessed in light of the experience in the recent crisis. Second, this was an extraordinary event. We have no way of knowing whether the Fed would be willing to create such enormous swap lines in the future.¹³

7. Conclusions

The main conclusion of this note is that there is a case for policy to stabilise exchange rates. Large fluctuations in exchange rates – even if they are not “excessive” fluctuations due to market sentiment or bubbles – can lead to inefficient allocation of resources. Unperturbed free markets in foreign exchange cannot be relied upon to arrive at exchange rate levels that deliver terms of trade and real exchange rates that reflect the underlying economic productivity, efficiency, and competitiveness of economies.

Probably the main case for freely floating exchange rates is a political one: policymakers cannot be relied on to intervene in foreign exchange markets in a benign way. From a selfish standpoint, each country may have an incentive to devalue to gain a competitive edge. The competitive devaluations of the Great Depression loom large in the memories of many economists and policymakers. I conclude that some effort to control exchange rate fluctuations is desirable, but that it is best achieved in the context of cooperation among policymakers.

¹³ See also Obstfeld (2009).

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Targeting inflation in Asia and the Pacific: lessons from the recent past

Andrew Filardo¹ and Hans Genberg²

Introduction

Central banks in Asia and the Pacific have overwhelmingly chosen inflation as the principal objective of monetary policy. Some central banks have declared themselves to be inflation targeters, while others pursue their objective without referring to this particular label. Moreover, whether or not they refer to their strategy as inflation targeting, central banks in the region have chosen diverse approaches to achieving their inflation targets: for example with respect to how explicit the target is, the choice of inflation indicator, and the choice of instrument. All this suggests that the region is a good sample with which to examine the lessons from the experiences of central banks that have adopted formal inflation targeting and those with more eclectic approaches to targeting inflation.

To this end, we examine monetary policy institutional changes in Asia and the Pacific with a view to assessing whether these can be traced to subsequent inflation performance. Section 2 highlights trends in twelve regional economies toward greater central bank focus on inflation control, institutional independence and transparency over the past two decades. Contrasting the experiences of the six formal inflation targeting economies with those of the six others, Section 3 explores the impact of these trends on inflation dynamics and on private sector inflation expectation formation. Section 4 then addresses some policy implications associated with evolving views of inflation targeting in the region, and concludes that our results add to the growing body of evidence that formal inflation targeting is not the only monetary policy framework capable of delivering price stability; in other words, targeting inflation is important but there are many ways to skin that cat.

1. Monetary policy objectives and institutional arrangements in Asia-Pacific

Objectives and strategies

As shown in Table 1, all but one of the twelve central banks in the region have price stability as a target for monetary policy. While for a majority of them the target appears unambiguously to refer to domestic price stability, in the case of three central banks – the People’s Bank of China, Bank Indonesia and Bank Negara Malaysia – the goal is stated as maintaining the stability of the value of the currency which could mean either the internal value in terms of goods and services, ie the price level, or the external value namely the

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exchange rate. Bank Indonesia makes it explicit that the term refers to both aspects. Two central banks – the Reserve Bank of India and the Bank Negara Malaysia – state that an adequate supply of credit to the economy is also an explicit goal of the central bank. Finally, the Hong Kong Monetary Authority puts exclusive emphasis on exchange rate stability (vis-à-vis the US dollar) and pursues this goal by means of a currency board arrangement.

Strategies adopted to achieve the objectives differ. Six central banks are self-proclaimed inflation targeters – the Reserve Bank of Australia, Bank Indonesia, the Bank of Korea, the Reserve Bank of New Zealand, Bangko Sentral ng Pilipinas, and the Bank of Thailand. While the Reserve Banks of Australia and New Zealand are “old hands” at inflation targeting having started in 1993 and 1990 respectively, the other four central banks are relative newcomers with South Korea starting in 1998, Indonesia and Thailand in 2000, and the Philippines in 2002. All inflation targeting central banks use an interest rate as the operating monetary policy target.

The Monetary Authority of Singapore has been described by outside observers as an inflation targeter, albeit following an unorthodox strategy in pursuing price stability by announcing the level as well as the rate of change of the target band for the nominal effective exchange rate of the Singapore dollar.

The People’s Bank of China (PBC) uses growth rates of monetary aggregates as intermediate targets and typically employs several instruments in the implementation of its monetary policy – the exchange rate, the required reserve ratio, interest rates, open market operations. While it is undoubtedly the case that these instruments are not completely independent of each other, controls on the domestic financial system and on international capital flows arguably give the PBC additional degrees of freedom to implement its monetary policy.

Central bank governance and independence

The ability of a central bank to achieve its objective depends in part on the institutional environment in which it operates. A large literature has investigated the link between measures of economic performance – usually inflation – and various indicators of central bank governance and independence (CBGI). A general conclusion of this literature is that central bank independence tends to be associated with better inflation performance, although there is some evidence that this result applies to developed economies only (Cuikerman et al (1992)).

A recent paper in this genre focuses on Asia and the Pacific.³ Ahsan, Skully, and Wickramanayake (2008, ASW) study 36 countries in the region including 11 of the countries in our sample.⁴ The authors construct indices of CBGI using 27 different variables meant to capture different aspects of governance and independence. Apart from an overall index they tabulate indicators of (i) legal independence [“Legal” in the graphs that follow], (ii) political independence [“Political”], (iii) independence to pursue price stability as the main and sole objective [“Price stability”], (iv) independence to pursue exchange rate policy [“Forex policy”], (v) independence in the control of monetary policy instruments and non-obligation to finance government deficits [“Deficit finance”], and (vi) accountability and transparency [“Account. and transp.”]. Using these indicators in regression analysis, the authors find that each of them is negatively associated with the inflation rate of the corresponding economy.

³ Fry (1996) is a forerunner in this respect.

⁴ Singapore is not included. Ahsan et al (2008) also contains an exhaustive survey of the literature relating CBGI and economic performance.

Rather than pursuing the link between CBIG and macroeconomic performance in the region, we will examine the evolution of the ASW indices with a view to detecting any trend over time and to establishing whether there is any appreciable difference between inflation targeting central banks and the others. We will also look at whether the 1997–98 crisis in the region acted as a wake-up call for the authorities in the most affected countries in the sense that they altered the governance structure of their respective central banks after the crisis.

Graph 1 shows the overall value of the CBIG index for two years, 1996 and 2005.⁵ The first year is chosen to represent the situation before the Asian financial crisis and the second is the latest available value in the ASW data set. With the exception of India and New Zealand for which there is no change, all countries show some improvement over time. This is consistent with the notion that policymakers have at least in part accepted the view that greater central bank independence is desirable. The sets of bars on the right hand side of the graph show averages of five groups of jurisdictions: all jurisdictions in the sample, the inflation targeting countries, central banks that are not inflation targeters, the countries most affected by the Asian financial crises (Indonesia, South Korea, Malaysia, Philippines, and Thailand), and finally the “non-crisis” countries. These bars reveal that both inflation targeting and the crisis countries have experienced larger changes in the overall index than their respective counterparts. Graph 2 explores these differences at a more disaggregated level.

The bars in Graph 2 represent the change in the values of the indices from 1996 to 2005 for all countries, inflation targeting and non-inflation targeting countries, and crisis and non-crisis countries. The graph shows that there are improvements in all aspects of CBIG and all groups with the exception of the ability to pursue price stability in the non-inflation-targeting central banks. Particularly large increases are seen in (i) political independence in the crisis countries, (ii) in the ability to pursue price stability in inflation-targeting and crisis countries (note that there is a large overlap in these groups as the inflation-targeting classification is based on the situation in 2005), (iii) in the ability to independently determine exchange rate policy.

The differences across country groupings, not surprisingly, are also illuminating. Compared to their non-inflation targeting counterparts central banks which are inflation targeters have been given more independence to pursue price stability as the sole objective of monetary policy. In general, inflation targeting central banks have become more accountable and transparent relative to their non-inflation targeting colleagues. This latter finding is consistent with the notion that while greater accountability and transparency are desirable for all central banks (see Graph 2), they have been given particular emphasis in the context of inflation targeting monetary policy strategies. With respect to legal independence and the ability to set monetary policy independently from fiscal policy (the ‘deficit finance’ bars), the greatest changes have actually occurred for non-inflation targeting central banks, somewhat contrary to the idea that lack of fiscal dominance is particularly important for inflation targeting strategies.⁶

The difference in the CBGI indices for “old” inflation targeting countries in the region (Australia and New Zealand) and the newcomers were very large before the crises and have fallen substantially thereafter.⁷ This confirms that the introduction of inflation targeting coincided with a more general overhaul of the central banks’ governance structure.

⁵ The overall value is the simple average of the six sub-indices. Corresponding graphs for the sub-indices are presented in an appendix.

⁶ This result is not the consequence of non-inflation targeting central banks catching up. On the contrary, they have a higher index both in 1996 and in 2005.

⁷ The only exception is the legal independence sub-index.

A comparison of the crisis with the non-crisis countries confirms that the Asian financial crisis did seem to lead to particularly significant reforms in the areas of political independence and the ability to set price stability objectives. In the latter case, this was probably due to the overlap between crisis countries and new inflation targeting countries.

Transparency

Dincer and Eichengreen (2007) focus on the determinants and effects of central bank transparency in a large (100) sample of central banks from developed and developing economies including those in our sample. Their empirical analysis implies that greater transparency reduces inflation volatility and persistence. Focusing exclusively on central banks in the Asia-Pacific region, Filardo and Guinigundo (2008) offer a more recent assessment of the transparency and communication strategies based on a survey of the central banks themselves. The responses to the survey give a snapshot of current practices in the region and indicate that central banks use “a fairly sophisticated set of communication strategies...[reflecting]... the greater conscious effort within the policy making circle to clearly communicate policy-relevant information to financial markets, the media and the public at large.” Although it does not contain an explicit comparison with past communication practices, the message of the Filardo-Guinigundo study is consistent with the statistics reported above which show a general increase over time in the transparency and accountability of central banks in Asia and the Pacific.

Finally it is of interest to note the study by Garcia-Herrero and Remolona (2008) which argues that central banks in Asia and the Pacific have learned to conduct policy so as to take advantage of the expectations channel of monetary policy, ie to become more transparent as to their future policy intentions. Their conclusion is based partly on the content of central banks’ policy statements and partly on evidence showing that yield curves reflect expectations of future policy interest rates. Yet they also note that “policy statements still appear to contain a larger element of surprise than do macroeconomic news, suggesting that there is still scope for central banks in the region to communicate more effectively the way they interpret economic data and the strategies that guide their decisions.”

Summary

Inflation control is the main objective of all but one of the central banks in the region but the strategies for achieving this objective varies. Half of the twelve central banks characterise their policy as one of inflation targeting, and use a short-term interest rate as the policy instrument. Other central banks, with the exception of the Hong Kong Monetary Authority, target inflation and use a more eclectic set of policy instruments.

Whether they are inflation targeters or “merely” target inflation, most central banks in the region have gained legal and/or political independence during the past decade. They have also seen improvements in other aspects of governance usually associated with enhanced ability to achieve inflation control.

While there are differences in the evolution of central bank independence and governance between the inflation targeting central banks and the other central banks in our sample, it is an open question whether these differences have resulted in differences in macroeconomic performance, in particular inflation performance, between the corresponding economies. In the next section we present evidence bearing on this question as well as on the more specific issue whether the adoption of inflation targeting as such confers some additional benefits.

2. Assessing the comparative performance of Asia-Pacific inflation targeters

There is no doubt that inflation performance in inflation targeting countries in the region has been remarkable when compared to the pre-inflation targeting days. In this section, we examine various statistical measures of inflation stability to explore whether the adoption of explicit inflation targeting was particularly effective in achieving the goal of inflation control in the Asia-Pacific region. In addition to examining performances before and after the adoption of inflation targeting, we contrast the experiences in controlling inflation between inflation targeting and non-inflation targeting central banks in the region.

Inflation performance amongst Asia-Pacific inflation targeting economies was strong

For the inflation targeting central banks, two performance criteria are central: the achievement of their inflation targets and the reduction of inflation volatility (ie fostering inflation stability). Despite the challenging policy environment of the last several years, inflation targeting central banks have been able to avoid some of the inflation control problems they had experienced in the past.

With regard to hitting inflation targets, inflation performance can be assessed in a variety of ways. The most stringent is whether the numerical target was hit. Graph 3 illustrates that by this metric Asia-Pacific inflation targeters have been far from perfect. Nearly all the inflation targeting central banks breached the announced inflation targeting bands, with some of the deviations being quite large and persistent.

Such deviations from target, however, may be too strict a criterion for assessing performance. Indeed, inflation targeting central banks in the region have not generally defined success as always being at the target or even inside the target bands. Rather, the more conventional approach is to announce a target range over a medium-term horizon. For example, Australia's target range is 2–3% for headline CPI inflation “over the medium term”, and Korea's is 2.5–3.5% in terms of a three-year average annual inflation for headline inflation. Operationally, central banks choose a path for policy rates that puts inflation on a general trajectory towards the middle of the inflation target range.

Using this looser criterion, one could reasonably argue that central banks in the region have achieved their respective goals. Graph 3 shows that inflation rates in the region have consistently gravitated to the centre of the target ranges whenever deviations arose. The success stands in stark contrast to the more volatile inflation behaviour prior to the adoption of inflation targeting.

Notwithstanding this success, it is noteworthy that the deviations from the inflation targets have hardly been symmetrical. While there have been breaches both on the upside and the downside, most have been on the upside. Moreover, the biggest deviations from target have generally been on the upside.

There may be several explanations for this asymmetry. One view is that the period of inflation targeting has been so short that a full range of symmetric shocks, especially large and persistent ones, has yet to be experienced. This view would argue that more symmetry would be observed over time. Another view would suggest that, despite the constraining features of explicit inflation targeting frameworks, central banks are still relatively more concerned about subpar growth and deflation than periodic but modest breaches of the upper end of the target ranges. This would suggest that, on average, inflation would exceed the middle of the inflation target range.

Another performance criterion is inflation volatility. Here the record is far clearer. Inflation volatility generally declined across the region. Indeed, the GDP-weighted average of inflation volatility from 1986 to 1990 is 64% higher than in 2008.

Yet the decline in inflation volatility was hardly uniform across the region during the period. For example, the Philippines and New Zealand certainly achieved much better inflation performance with respect to this measure of volatility; however, Indonesia exhibited higher volatility after the adoption of inflation targeting than in the early 1990s, although part of the earlier stability may have been somewhat illusory because of the extensive use of administered prices for important staples

Comparative performance with non-inflation targeters

The experience of the non-inflation targeters over the same period is equally noteworthy. Inflation volatility for the non-inflation targeting central banks was either low or falling across the region. While this behaviour underscores the favourable inflation environment in the region as a whole, it does raise questions about the marginal contribution of explicit inflation targeting regimes in achieving this outcome. In other words, it is not clear that the adoption of inflation targeting per se has yielded inflation performance which is qualitatively different – at least with respect to the inflation volatility criterion – to that of the non-inflation targeting countries.

In terms of inflation levels, non-inflation targeting central banks have shown roughly the same success as inflation targeting central banks in achieving low inflation (Graph 4). For the non-inflation targeters, inflation rates were generally lower in the past 10 years than in the previous decade. Two notable exceptions to this trend toward greater success at controlling inflation are evident for inflation targeting and non-inflation targeting central banks alike: the Asian financial crisis in the late 1990s led to a spike in inflation, especially in Indonesia, Thailand and Korea; more recently, the boom and bust in commodity prices led to a transitory rise in inflation.

Another similarity between the inflation targeting and non-inflation targeting central banks is that short-term policy interest rates have become lower and smoother for those central banks using this rate as their primary policy tool. In the 2000s, most policy interest rate cycles exhibited lower frequency swings than in the 1980s and early 1990s. This central bank behaviour was seen well beyond the region and was consistent with greater central bank transparency as documented in the previous section. The greater clarity about the goals and policy frameworks of central banks has been seen as elevating the role of private sector expectations in influencing economic decisions (Woodford, 2003). The similarity in behaviour across inflation targeting and non-inflation targeting central banks is consistent with the findings of Eijffinger and Geraats (2006) that remarkable enhancements of public communication during the period of 1998–2002 in central banks from advanced industrial economies were achieved without significant changes in formal disclosure policies in central bank legislation.

Delving deeper into the inflation record

Given the close comparative performance of the inflation targeters and the other central banks, we now delve more deeply into the characteristics of each country's inflation process to see if more subtle differences between inflation targeters and non-inflation targeters emerge. We first look at various measures of inflation persistence and examine how inflation persistence has evolved over time, focusing on the permanent and transitory components of the inflation process. Then we explore the implications of the choice of inflation targeting on private sector expectations, using panel regression methods. Theory would suggest that a significant change in monetary policy regimes, such as adopting explicit inflation targeting, should influence the time-series behaviour of inflation and the expectations of the private sector.

AR(1) persistence measures. One conventional measure of persistence is the AR(1) parameter of an autoregressive representation of the inflation process, $\pi_t = C + \beta\pi_{t-1} + \zeta_t$. By this measure, persistence of the inflation process for inflation targeting appears to show a more systematic decline during the mid-1980s to mid-1990s period, relative to the 2000s (Graph 5). The average decline across the region for the inflation targeters from 0.4 to 0.1 understates the much more dramatic declines for Australia, Korea and New Zealand. These countries stand out in two respects. First, they are well developed, economically and financially, especially when compared to the rest of the Asia-Pacific region. Second, they adopted strong inflation targeting regimes. The Philippines, by way of contrast, is a small, open economy that has experienced much greater inflation variability. In Graph 5 (right side panel), the non-inflation targeting central banks have experienced very little change in the estimated AR(1) persistence across the two subperiods.

One interpretation of this result is that inflation expectations were more firmly anchored in some inflation targeting central banks. The firmer the anchor, the smaller the low-frequency drift in inflation expectations. Some conventional theories suggest that inflation represents a mixture of three stochastic processes:

$$\pi_t = E(\pi_{t+1}) + \gamma y_t + \varepsilon_t$$

For credible inflation targeters, expected inflation might be considered nearly a constant and y , the output gap, would be trendless (ie, an I(0) variable); the error term would be transitory white noise. In this case, actual inflation persistence would largely reflect the inherent persistence of the output gap. If, however, central banks were not so credible, then inflation expectations might move gradually up and down with the level of inflation. In this situation, the AR persistence would be higher than that implied by the output gap alone. From this vantage point, the decline in the AR persistence of the inflation targeting central banks could be seen as a sign of relative success in achieving inflation-fighting credibility. However, this cannot be the whole story because some economies characterised by a low AR persistence estimate, such as Indonesia and India, have relatively chequered records of inflation control.

To investigate the role of the persistent component in inflation expectations (ie the permanent stochastic component) and a transitory component (ie I(0) variables), we turn to an alternative measure of persistence along the lines of Stock and Watson (2007). While the full implementation of Stock and Watson's trend-cycle model proved to be unstable for many of the Asia-Pacific economies, a simplified integrated moving average IMA(1,1) representation fared much better.

In this implied IMA(1,1) representation, changes in inflation from period to period are decomposed into two statistical components, one that arises from a shift in the permanent stochastic trend component of inflation and another one that arises from purely serially-uncorrelated transitory fluctuations:

$$\Delta\pi_t = a_t + \theta a_{t-1} = \Delta\tau_t + \Delta\eta_t$$

Underlying this representation is a model of the level of inflation, $\pi_t = \tau_t + \eta_t$. The permanent component, τ_t , is envisioned as evolving as a random walk, $\tau_t = \tau_{t-1} + \varepsilon_t$, with ε_t and η_t being serially, uncorrelated error terms. Under these assumptions, the statistical model of interest can be estimated as an IMA(1,1).

Some inferences about the relative role of the permanent and transitory components can be inferred from the MA estimate of θ . If θ is close to zero, the permanent component plays a relatively large role in driving the inflation variance. The greater $|\theta|$, the greater the proportion of the inflation variance accounted for by the transitory component; intuitively, this would correspond to inflation fluctuating around its mean.

Graph 6 plots the MA parameter estimates for the inflation targeting and non-inflation targeting economies. Various noteworthy features of the two panels stand out. First, the MA estimates are fairly large and the averages are between -0.5 and -1.0 for inflation targeting and non-targeting central banks alike. This suggests the role of permanent and transitory shocks is not particularly unique to whether a central bank chooses to explicitly adopt inflation targeting or not.

Second, for Australia, New Zealand and Korea, the absolute value of the MA estimate increases as might be expected with a successful inflation targeting regime. A time-varying measure of the MA parameter (not shown) confirms a nearly uniform change for each country since the end of the 1990s.

Third, a notable exception to the pattern observed for the inflation targeting economies is the Philippines. This appears to reflect the more challenging inflation conditions for this small, open economy. During the past decade, inflation rate swings have been pronounced and persistent, more often undershooting or overshooting the inflation target bands than remaining inside them. Moreover, the inflation target bands have been moved downwards during the decade, which could induce a bias towards a more prominent permanent component.

Fourth, for Indonesia and Thailand, the estimate of θ is nearly -1 and reflects the fairly favourable inflation behaviour before and after that tumultuous period (nb the regression samples exclude the Asian financial crisis period in the late 1990s). Somewhat surprisingly, the MA estimate for Indonesia does not appear to have fallen even though inflation target bands have been both increased and then decreased over the past decade. This indicates that transitory shocks, often related to large relative price adjustments, have been a very important part of their inflation record.

Finally, Hong Kong and Singapore also stand out as having relatively low estimates of θ . This might not be so surprising given their exchange rate regimes. Hong Kong adopted a currency board that has kept the bilateral exchange rate with the US dollar within a narrow corridor. Singapore, in contrast, controls its exchange rate against a trade-weighted basket of currencies of major trading partners; the Monetary Authority of Singapore uses this exchange rate as its policy tool to promote price stability and sustainable economic growth.

The technical nature of the discussion in this section should not obscure the basic point. The time-series econometric findings indicate that inflation performance has improved in the Asia-Pacific region, and that improvements in regional price stability do not appear to correspond closely to the decision of some central banks to adopt formal inflation targeting.

Exploring the cross-sectional dimension of inflation expectations

While instructive, the time-series measures of inflation performance above are ex post realisations that may obscure some of the ex ante benefits of explicit inflation targeting. Indeed, one of the putative advantages of transparency associated with inflation targeting regimes is the self-reinforcing impact on private sector inflation expectations. Theory suggests that greater clarity about the intentions of a central bank should lead to reduced dispersion of private sector expectations, which in turn should promote the firmer anchoring of inflation expectations and hence greater inflation control. We explore this role of explicit inflation targeting in the Asia-Pacific region by comparing the impact of inflation targeting on the cross-sectional inflation expectations of the private sector using the survey by Consensus Economics.

Does inflation targeting account for the narrowing of the forecast distributions?

One natural question is whether shifts in the cross-sectional distribution of inflation forecasts are correlated in some way with the adoption of formal inflation targeting in the region.

Graph 7 illustrates the shifts in the location as well as the shapes of the distributions.⁸ The estimated distributions represent the range of views that private sector forecasters held for inflation for the years 1996, 2001, 2006 and 2008 (the forecasters were surveyed in January of each preceding year).

Other things being equal, the adoption of inflation targeting should lead to a shift to the left, indicating a move to lower inflation, and a sharpening of the distribution, indicating less dispersion amongst the private sector forecasters. Indeed, this general tendency can be seen in the behaviour of the estimated cross-sectional distributions for the region. A few caveats are important to note.

First, we have data only from mid-1990 onwards owing to the data limitations of the Consensus Economics surveys. At the date that our data begin, both New Zealand and Australia had adopted explicit inflation targeting several years previously. For New Zealand, which adopted inflation targeting at an early stage, the cross-sectional distribution shifts somewhat to the right from 1996, reflecting the raising of the upper inflation range bound from 2% to 3% in the mid-1990s and the raising of the lower bound in the early 2000s from 0% to 1%. Notwithstanding the shift in the modes of the estimated distributions, the dispersion of inflation expectations has noticeably sharpened over time. For Australia, even though the inflation target bands did not change, the cross-sectional dispersion of inflation expectations sharpened too.

For Indonesia, Korea and Thailand which adopted inflation targeting in the 2000s, the shift in the mode of the cross-sectional distributions is much more dramatic. Also, there is less evidence of a uniform sharpening of the distributions.

Turning to the non-inflation targeting countries, the shifts and shape changes are much more diverse. For low-inflation economies such as Japan, Malaysia and Singapore, the cross-sectional evidence does not appear to be out of line with the experiences of the inflation targeting countries. In general, there were fairly sharp distributions of inflation expectation with some shifting of their modes. For China, Hong Kong and India, there was a pronounced shift to the left after the mid-1990s. The dispersion for China and India remained fairly wide in the 2000s while Hong Kong has experienced periods of sharpness and periods of diffuse expectations. These results are also consistent with the findings of Mishkin and Schmidt-Hebbel (2006) that inflation targeting economies do not necessarily exhibit better monetary policy performance than highly successful non-inflation targeters.

Overall, the evolution of the private sector forecast distributions is consistent with the view that there has been a greater focus on inflation control in the region. To delve further into the links between these shapes of the forecast distributions and the monetary policy regime, it is important to distinguish the role of the regime from the size of the nominal shocks hitting the economy in each year. To achieve this, we now turn to panel regression methods.

Econometric exploration of the dispersion of beliefs of private forecasters of inflation

An immediate difficulty in assessing the statistical significance of the changing inflation forecast distributions lies in the conversion of the graphical shapes into a useful statistical metric. We use the Kullback-Liebler (KL) divergence metric.⁹ A higher KL statistic indicates a reduction in the dispersion of private sector views about the likely inflation outcomes, ie a sharper shape of the forecast distribution.

⁸ The distributions are estimated with kernel density estimators.

⁹ For more information about the methodology behind the KL statistic, see Filardo and Guinigundo (2008).

Armed with these KL divergence statistics, we use panel regression analysis to examine the relationship between information in the KL divergence and the timing of the adoption of explicit inflation targeting regimes in the region. The estimated equation is

$$KLn_t^i = C^i + \beta_j KLC_t^i + \gamma_{IT} I_t^i + \gamma_{AIT} \sum_{n=1}^{11} I_t^n + e_t^i,$$

where $KLn_{t,m}^i$ is the KL divergence statistic that applies to the subsequent year's inflation forecast distribution for each country i reported in the month of m , $KLC_{t,m}^i$ is a similar statistic for the current year's inflation forecast distribution, I_t^i is a dummy variable that indicates whether a country i adopted a formal inflation targeting regime at time t , and $\sum_{n=1}^{11} I_t^n$ is an aggregator of the inflation targeting dummy variables. In the reported results, we also allow for interactions between these dummy variables and the constant (C) and slope parameters (β_j). We use panel regressions with fixed effects and report the coefficient estimates along with t -statistics calculated with robust standard errors.

In Table 2, the results for the January Consensus Economics surveys are consistent with the view that the adoption of explicit inflation targeting was correlated with less dispersion of private sector forecasts of inflation. The coefficient estimates for KL levels have the intuitively plausible signs, and standard statistical diagnostics indicate a good fit.

The positive and statistically significant sign on KLC (β) reflects the fact that uncertainty about the inflation environment is seen to be fairly persistent from year to year. The estimate is robust to alternative specifications 2–5 in Table 2.

The inflation targeting dummy coefficient (γ_I) is statistically significant. The positive sign of the parameter in column (2) indicates that if a country is an inflation targeter, one-year-ahead inflation expectations are, on average, distributed with less dispersion, owing to the higher predicted KLn (of 0.21).

Inclusion of the inflation targeting aggregator dummy yields intriguing results. The aggregator dummy variable is a common regional dummy for all countries in the panel regression, which contrasts with the country-specific inflation targeting dummy I_t^i . The coefficient on the common aggregator dummy (γ_{AIT}) in specifications 3–5 in Table 2 is positive and statistically significant. The sign is intuitively plausible. As an indicator of the region's focus on inflation control, there was a general sharpening of private sector inflation forecast distributions. The coefficient may look rather small compared to the coefficient on the inflation targeting dummy variable but in the 2000s the value of the aggregator dummy is 5 (it is not 6 owing to the paucity of data for the Philippines); to get a sense of the quantitative importance in the 2000s, multiplying γ_{AIT} by 5 is a useful benchmark.

In addition, the inclusion of the aggregator dummy variable in the panel regression leads to a reduction in the size and statistical significance of γ_I . The smaller size and lower statistical significance in specifications 4–5 of γ_I indicate that the aggregator dummy variable dominates the country-specific inflation targeting dummies.

These findings support the view that a common regional trend toward greater inflation control, as might be reflected in the aggregator dummy, could account for many of the similarities in inflation performance across the region. Such a view would downplay the importance of adopting explicit inflation targeting regimes as a necessary condition for

improved inflation outcomes.¹⁰ This can be seen as being consistent with the basic conclusions of Ball and Sheridan (2003). They find evidence in OECD countries in favour of the hypothesis that greater emphasis on price stability, but not the adoption of inflation targeting per se, is important.

Specifications 6–7 include interactions between the country-specific and regional inflation targeting dummies with the slope estimates on ΔKLC_t^i (namely, β_{IT} and β_{AIT}):

$$\Delta KLn_t^i = C + \beta \Delta KLC_t^i + \gamma_{IT} I_t^i + \gamma_{AIT} \sum_{n=1}^{11} I_t^n + \beta_{IT} (I_t^i \times \Delta KLC_t^i) + \beta_{AIT} \left(\sum_{n=1}^{11} I_t^n \times \Delta KLC_t^i \right) + e_t^i.$$

This first-difference specification is useful for examining the robustness of our conclusions from the panel regressions in levels. Intuitively, if central banks can more firmly anchor inflation expectations, inflation expectations at longer horizons should be less sensitive to transitory inflation shocks. In other words, the dispersion of inflation expectations for future years should be less variable to short-term inflation variability. In terms of the KL metric, this translates into a prediction that changes in KLn should become less sensitive to variations in KLC as central banks become more transparent and more interested in inflation stability. This prediction is borne out in Table 2 with β_{AIT} being negative and statistically significant. This indicates that the slope of the relationship between $\Delta KLn_{t,m}^i$ and $\Delta KLC_{t,m}^i$ became flatter ($\beta + \beta_{AIT}$) as the region as a whole became more focused on inflation control.

Taken as a whole, the panel results appear sufficiently strong to underscore the basic point that central banks in the region have been effective in getting out their message about price stability and, in the process, have had an important impact on private sector expectations. In turn, private sector expectations arguably have been supportive of the central bank price stability goals.¹¹ Further research is needed to establish more subtle and possibly intricate inter-linkages among changing central bank practices and communication strategies, private sector expectations and macroeconomic stability.

Overall, the results confirm that greater emphasis on targeting inflation – though not explicit inflation targeting – has been important in the Asia-Pacific region. Central bank inflation fighting credibility appears to have generally risen, reflecting the intellectual, social and economic consensus that central banks control the inflation destiny of a country and that low, stable inflation promotes sustainable growth. But the initial motivation for this study remains an open empirical question: what is the marginal contribution of explicit versus implicit inflation targeting? The panel evidence in this section suggests that the contributions are not so obvious but subtle differences might be linked to the particular features of explicit inflation targeting regimes.

¹⁰ The basic thrust of the results using the aggregated IT dummies is obtained using the aggregated price stability and the monetary policy independence dummies described earlier in the paper, but with somewhat less statistical support. The results using the full sample of months from the Consensus Economics also is consistent with the results from the January sample.

¹¹ The general narrowing of the forecast distributions could also correspond with biases amongst professional forecasters toward the benefits of formal inflation targeting, and hence the surveys could yield overly conservative dispersions of inflation forecasts. While possible, we also find some evidence in our sample that the reduction in dispersion is accompanied with an increased precision of forecasting accuracy, after correcting of the size of nominal shocks.

Conclusions from the empirical evidence

The empirical evidence confirms that inflation performance in Asia and the Pacific has been admirable. The greater focus on inflation control has translated into a lower and more stable inflation environment.

However, it is difficult to document big differences in inflation performance over the past decade between explicit inflation targeters and non-inflation targeters. This is not to say there were no differences, but that the differences appear to be rather subtle.

Additional research and experience with inflation targeting will help to clarify the reasons for these performance patterns. In the interim, two competing, though not mutually exclusive, views are supportable. One view is that inflation dynamics in the region have been dominated by common nominal shocks. The swings in import prices during the mid-2000s and then the boom-bust cycle in global commodity prices toward the end of the 2000s surely left their imprint on the inflation record.

Another view emphasises the role of central bank mindsets. Over the past decades, central banks in the region and elsewhere saw a broad intellectual, social and economic consensus emerge about the importance of inflation control. Not only was low, stable inflation seen as a key policy goal but it was also felt that central banks had the means to achieve the goal.

In addition, supportive changes in central bank governance (as documented in Section 2) and in the general policy environment have taken place. Of particular importance in the past decade, Asia-Pacific policymakers strengthened medium-term policy frameworks, not least those associated with fiscal probity and financial stability. With respect to the fiscal side, the region has adopted sound fiscal practices that have strengthened sustainability and lowered debt levels. With respect to financial stability, the soundness of the region's banking system has been improved through prudent capital provisioning and the reduction in non-performing loans. These developments have not only strengthened the ability of central banks to achieve their primary goal of inflation control but have also helped to boost the public's confidence in the underlying competence of the region's policymakers.

Hence, the evidence from Asia-Pacific indicates there are many different ways to ensure price stability. In other words, there is more than one way to skin a cat.

3. Policy implications and conclusions

While the past decade has witnessed greater interest and determination in controlling inflation, thinking about the responsibilities of central banks continues to evolve. Exchange-rate misalignments associated with periods of sustained capital inflows have long been of concern because of their impact on inflation and economic growth, and because of fears that the inflows may suddenly stop or reverse, leading to stress in local banking systems.¹² The international financial crisis has naturally led even greater focus on the nexus of monetary stability and financial stability, not least owing to some views that the crisis could be attributed in part to lax monetary policy conditions during periods when inflation appeared to be consistent with medium-term trends. This section considers some challenges facing Asia-Pacific central banks as they seek to maintain a primary focus on inflation in a context where concerns about financial system stability, the potential volatility of international capital flows and the variability of economic growth are taking on greater importance in the pursuit of central bank policy objectives.

¹² See Committee on the Global Financial System (2009).

Some would argue that pursuing multiple independent goals with monetary policy, ie with one policy interest rate, is futile or at least inadvisable. The classic assignment problem in macroeconomics emphasises the need for one independent policy tool for each independent policy goal. Moreover, others might argue that such competing goals would naturally lead to central banks to lose sight of their primary goal of price stability.

There are two basic counterarguments to this view. First, even though the logic of the assignment problem is impeccable, the theoretical assumptions are rather stark when compared to the practical trade-offs facing central banks. Goals related to financial, foreign exchange and capital flow volatility are not truly independent of the goal of price stability. Achieving price stability is a much more difficult task if stresses associated with these other factors are present in the economy. For example, if a strict focus on inflation control over a certain time horizon is associated with the buildup of imbalances in the economy that leads to inflation (or deflation) pressures further out in the future, then it may be argued that monetary policy faces a trade-off between near-term and longer-term inflation stability. Second, some central banks in the Asia-Pacific region have been able to achieve strong inflation performance while at the same time placing emphasis on exchange rate volatility, capital flows and financial stability concerns (eg India, Indonesia and China). This success should not be ignored. Indeed, with respect to exchange rate stability and inflation control Singapore and, of course, Hong Kong stand out.

This is not to say that central banks have an absolute or in most cases a comparative advantage in taking on these particular goals. But the experience in the region points out that one need not abandon inflation control when taking some actions to address these alternative, albeit subordinate, goals.

A key question is how best to incorporate these experiences from the region, and elsewhere, into our evolving understanding of the conduct of monetary policy. Is it necessary to construct monetary policy frameworks that focus exclusively on inflation control (as in strict inflation targeting regimes) or is it possible to construct monetary policy frameworks that reflect the wide range of trade-offs that central banks face? If so, what would these frameworks look like?

The answer to the questions depends on how central banks perceive their responsibilities outside strict inflation control. A few stylised approaches help to illuminate the key issues.

At one extreme is the view that central banks need to compartmentalise their policy priorities. A lexicographical approach provides a succinct way to summarise this perspective (Fischer, 2008). Under this view, central banks would target inflation, and only when inflation was under control would they take countercyclical actions intended to smooth output. Likewise, only when inflation and output stability was achieved would central banks entertain issues associated with exchange rates, capital flows and financial stability. While such priorities may have a theoretical appeal in certain stylised models of the economy, it is less clear that they are practicable in a context where the evolution of inflation, output and measures of financial stability depend on each other in a complex fashion. And, such a set of priorities appears to stand at odds with the actions taken by central banks during the international financial crisis.

An alternative approach is to smoothly trade-off output and inflation stabilisation, while emphasising key risks associated with auxiliary goals for a range of relevant policy horizons. As noted above, exchange rates, capital flows and financial stability issues have implications for inflation and output at some horizon. The policy conundrum is how best to weigh medium- to long-term concerns against those, say, at the 1–2 year horizon. One could interpret the fact that most central banks in the Asia-Pacific region have adopted price stability targets over the medium term as consistent with the view that strict inflation control at all horizons is not paramount, but rather that there are a range of concerns that need to be addressed. Finally, from technical point of view, such preferences may be best thought of as being state-dependent (Svensson (2003), Disyatat (2005)).

We would argue that the monetary policy responses in the region and elsewhere to the international financial crisis have been consistent with state-dependent preferences, but from a somewhat different motivation. Consider central banks that may find themselves in somewhat awkward positions at times when government authorities may not have adequately addressed regulatory or external issues, which then result in a crisis (Filardo, 2009). At that point, central banks may have a comparative advantage (in the short run) to address such concerns with monetary policy tools. Of course, central banks would prefer not to be in such a situation and certainly moral hazard issues arise. But, as the international financial crisis has shown, sometimes a central bank is called on to address such extreme situations.¹³

Practically, what might these state-dependent priorities mean for central banks, especially those with that have adopted strict inflation targeting in the past? One implication is that inflation targeting regimes need to be flexible. Overly strict, non-state-dependent criteria are not realistic.

Another implication is that conventional inflation targeting regimes and state-dependent priorities may be odd bedfellows. While it is possible to argue that flexible inflation targeting regimes can take into account economic and financial undershooting and overshooting, it is not so clear that stretching the reach of such policy regimes contributes in the best way to transparent and hence credible policymaking. Rather, monetary frameworks that explicitly reflect a full range of relevant policy risks would seem appropriate, especially given the different horizons that apply to short-term inflation and output fluctuations on the one hand and the longer-term boom-bust dynamics on the other. Frameworks such as those adopted by the Bank of Japan (two perspective approach) and the European Central Bank (two pillar approach) would appear more consistent with these types of concerns. In these regimes, there is a clear distinction between the inflation and output dynamics that economists have a reasonable handle on, and those phenomena that defy easy characterisation with conventional forecasting tools. In the case of the latter, the nature of the low probability-high impact risks are qualitatively different to the standard macro risks related to short-term inflation and output.

However, the suggestion that multi-pillar/perspective monetary policy frameworks should arguably dominate strict inflation targeting frameworks does not imply that one size fits all. Quite the contrary, a broader implication from the wide range of policy experiences in Asia-Pacific is that monetary policy strategies may have to be tailored to each central bank depending on the nature of the economic environment. For example, instrument rules would naturally look different in different economies, depending on a diverse set of factors, not least being: whether the country is a commodity producer or not; the degree of exposure to food price shocks; the exposure to volatile international capital flows which in turn depends on the sophistication of the domestic financial system to deal with such shocks; openness and the role of the exchange rate in the inflation and growth process. These factors are furthermore likely to change over time, which means that monetary policy strategies cannot be static, even if the main objective of policy remains price stability.

¹³ In some respects, this motivation is one justification for central banks taking on the responsibility of lender of last resort. But recent central bank behaviour raises the practical question of whether the central bank should be lender of first resort, or somewhere in between.

Table 1
Central bank policy objectives

Central bank	Policy objective	... as stated on the central bank's official website	IT?
Reserve Bank of Australia	Price stability	...to focus on price (currency) stability while taking account of the implications of monetary policy for activity and, therefore, employment in the short term	Yes, 1993
The People's Bank of China	Value of the currency	The objective of the monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.	No
Hong Kong Monetary Authority	Exchange rate stability	The primary monetary policy objective of the Hong Kong Monetary Authority (HKMA) is to maintain exchange rate stability	No
Reserve Bank of India	Price stability and adequate credit supply	...maintaining price stability and ensuring adequate flow of credit to productive sectors	No
Bank Indonesia	Price stability and exchange rate stability	... Bank Indonesia has one single objective of achieving and maintaining stability of the Rupiah value. The stability of the value of the Rupiah comprises two aspects, one is stability of Rupiah value against goods and services and the other is the stability of the exchange rate of the Rupiah against other currencies.	Yes, 2000
Bank of Japan	Price stability	The Bank of Japan Law states that the Bank's monetary policy should be "aimed at, through the pursuit of price stability, contributing to the sound development of the national economy."	No
The Bank of Korea	Price stability	Like other central banks, the Bank of Korea takes price stability as the most important objective of its monetary policy. The Bank of Korea Act, which came into effect in April 1998 following its revision at the end of 1997, stipulates price stability as the purpose of the Bank of Korea.	Yes, 1999
Bank Negara Malaysia	Price stability and exchange rate stability	To issue currency and keep reserves safeguarding the value of the currency; To promote monetary stability and a sound financial structure; To influence the credit situation to the advantage of the country.	No
Reserve Bank of New Zealand	Price stability	The Reserve Bank of New Zealand Act 1989 specifies that the primary function of the Reserve Bank shall be to deliver "stability in the general level of prices."	Yes, 1990
Bangko Sentral Ng Pilipinas	Price stability	The primary objective of BSP's monetary policy is to promote a low and stable inflation conducive to a balanced and sustainable economic growth.	Yes, 2002
Monetary Authority of Singapore	Price stability	The primary objective of monetary policy in Singapore is to promote price stability as a sound basis for sustainable economic growth.	No
Bank of Thailand	Price stability	Setting the monetary policy direction which is consistent with the nation's economic conditions, with the ultimate objective of maintaining price stability and sustainable economic growth	Yes, 2000

Source: Adapted from Genberg and He (2009).

Table 2

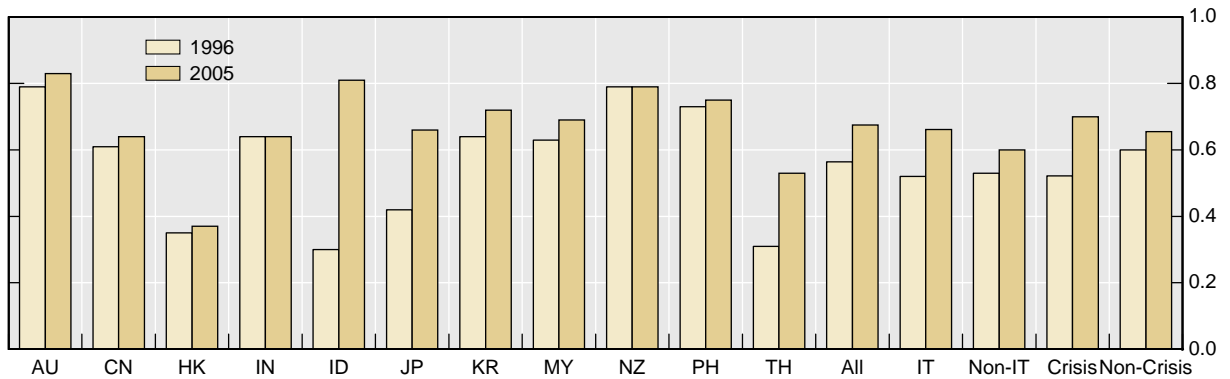
**The impact of the adoption of inflation targeting
on the cross-sectional distribution of
inflation forecasts in Asia-Pacific**

$$KLn_t^i = C^i + \beta KLC_t^i + \gamma_{IT} I_t^i + \gamma_{AIT} \sum_{n=1}^{11} I_t^n + \beta_{IT} (I_t^i \times KLC_t^i) + \beta_{AIT} \left(\sum_{n=1}^{11} I_t^n \times KLC_t^i \right) + e_t^i$$

	Using January sample						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	KL in levels					ΔKL	
β	.62 (6.8)	.61 (6.8)	.57 (6.1)	.57 (6.1)	.58 (4.7)	.87 (4.6)	.86 (4.6)
γ_{IT}		.21 (4.2)		.06 (0.9)	.01 (0.6)		.17 (2.2)
γ_{AIT}			.05 (2.8)	.05 (2.1)	.05 (2.1)		-0 (-0.5)
β_{IT}					-04 (-0.3)	-13 (-0.8)	-13 (-0.8)
β_{AIT}						-08 (-1.9)	-08 (-1.9)
Nobs	163	163	163	163	163	149	149
R^2	.66	.66	.66	.67	.67	.34	.34

Notes: t-statistics in parentheses based on robust standard errors.

Graph 1
Index of central bank independence and governance¹

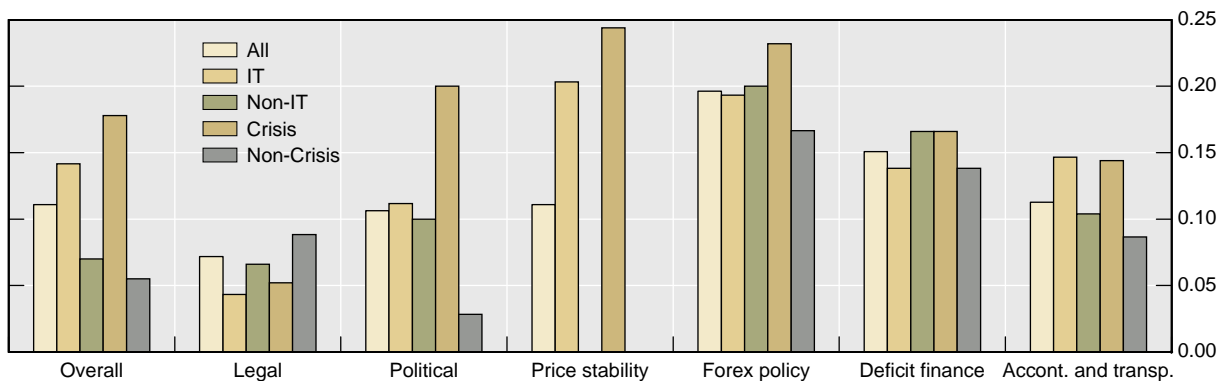


AU = Australia; CN = China; HK = Hong Kong; ID = Indonesia; IN = India; JP = Japan; KR = Korea; MY = Malaysia; NZ = New Zealand; PH = Philippines; TH = Thailand; All = Average for all countries; IT = Average for inflation targeting countries; Non-IT = Average for non inflation targeting countries; Crisis = Average for Indonesia, South Korea, Malaysia, Philippines, and Thailand; Non-Crisis = Average for Australia, China, Hong Kong, India, Japan and New Zealand.

¹ There were no data available for Singapore.

Source: Ashan et al (2008)

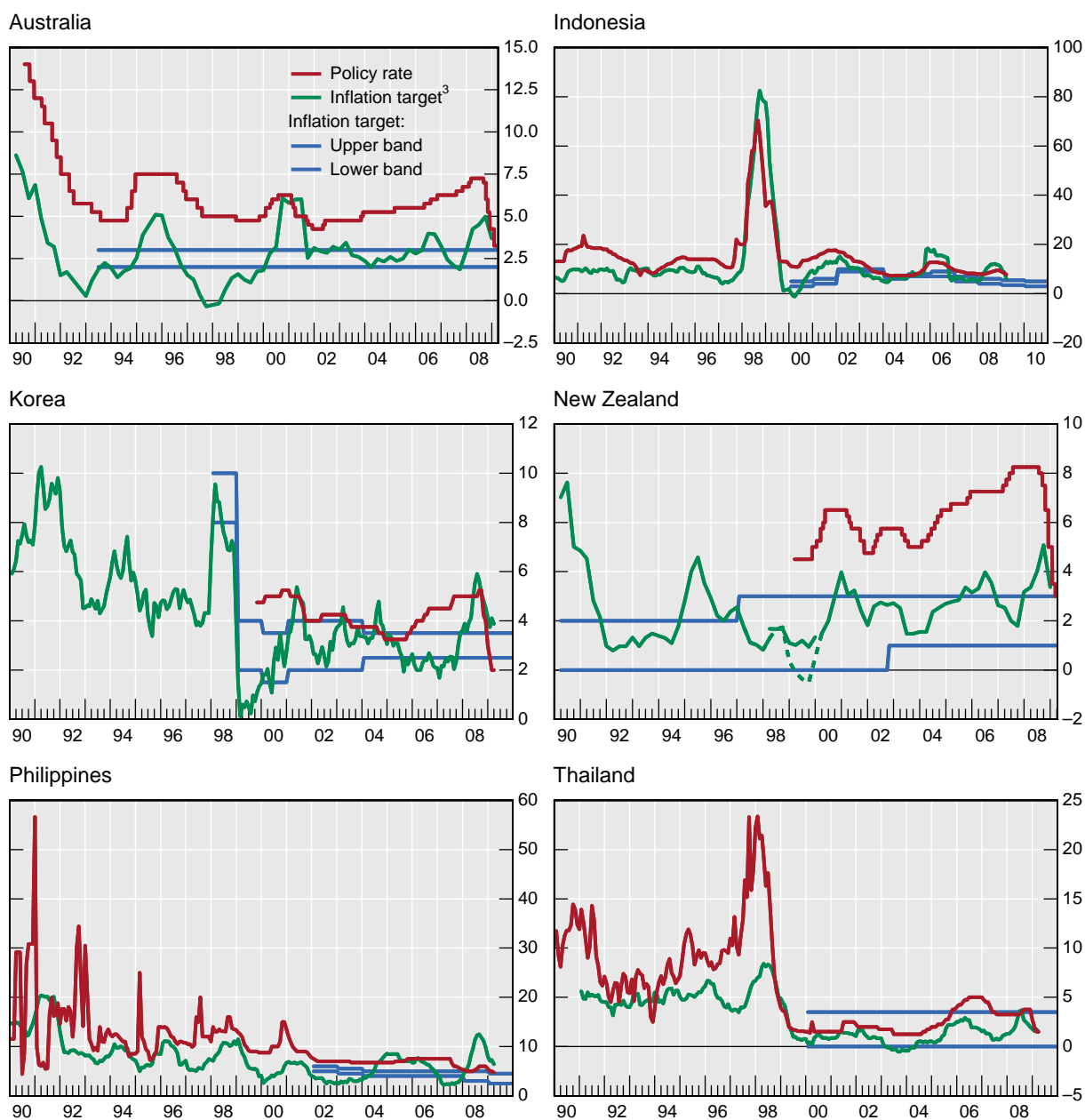
Graph 2
Differences in the overall index between 2005 and 1996



Source: Ashan et al (2008)

Graph 3

Inflation¹, inflation targets and policy rates²

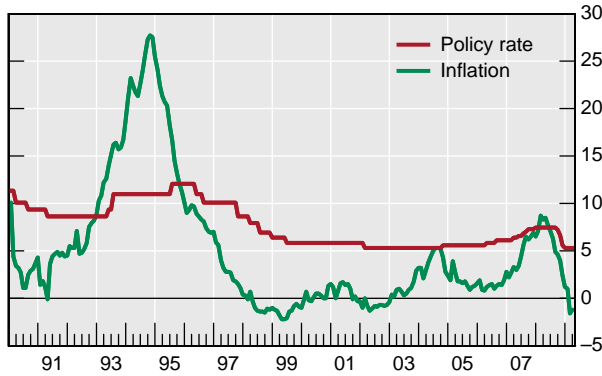


¹ Twelve-month changes in consumer prices. ² Per cent per annum. ³ In terms of headline consumer prices index, except in the case of Thailand, where it refers to core inflation. Between 1998 and 1999 New Zealand was monitoring the consumer prices index excluding credit services.

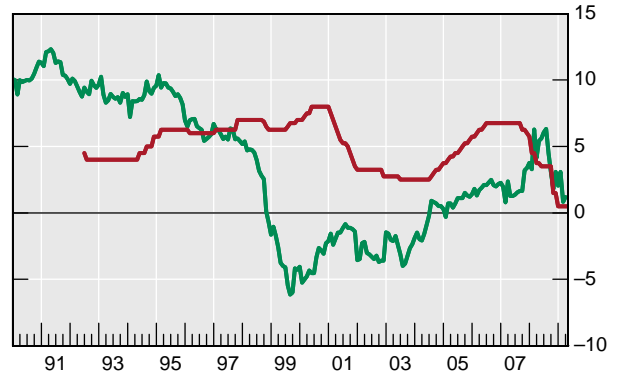
Sources: CEIC; national data.

Graph 4
Inflation¹ and benchmark rates²

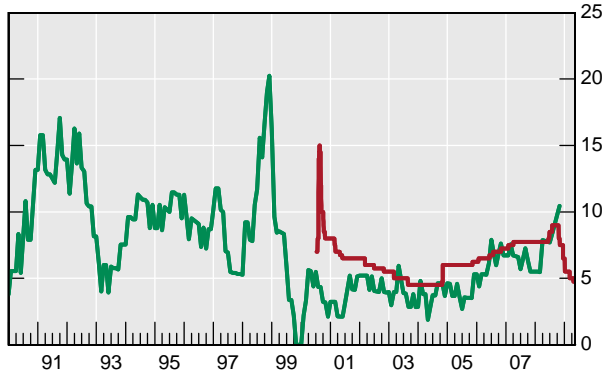
China



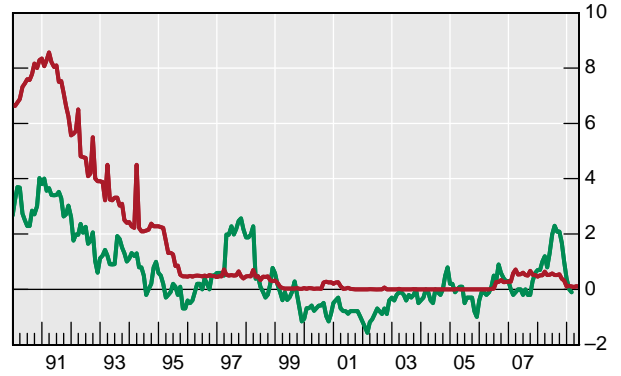
Hong Kong SAR



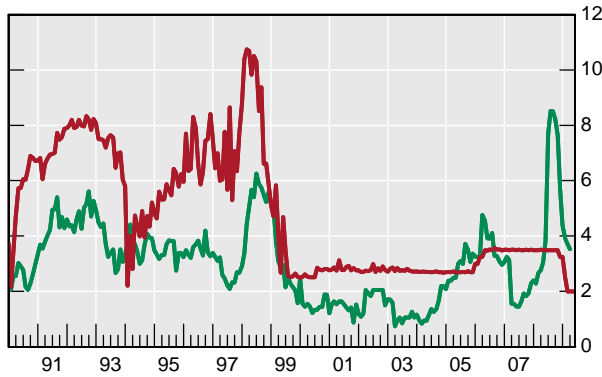
India



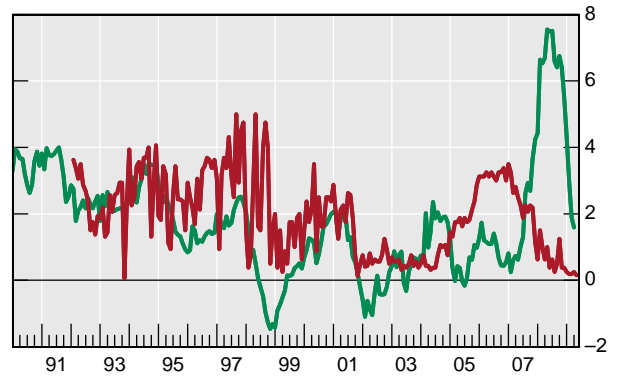
Japan



Malaysia



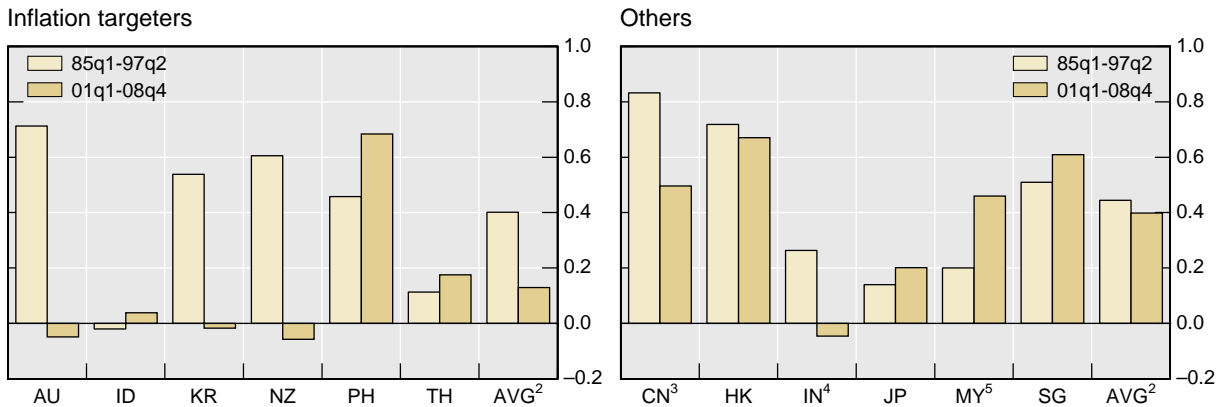
Singapore



¹ Twelve-month percentage changes in consumer prices. ² Per cent per annum. China: one-year working capital; Hong Kong SAR: discount window base rate; Japan: uncollateralized overnight rate; India: repo rate; Malaysia: overnight interbank rate; Singapore: overnight rate,

Sources: Datastream; national data.

Graph 5
Changing AR(1) inflation persistence¹

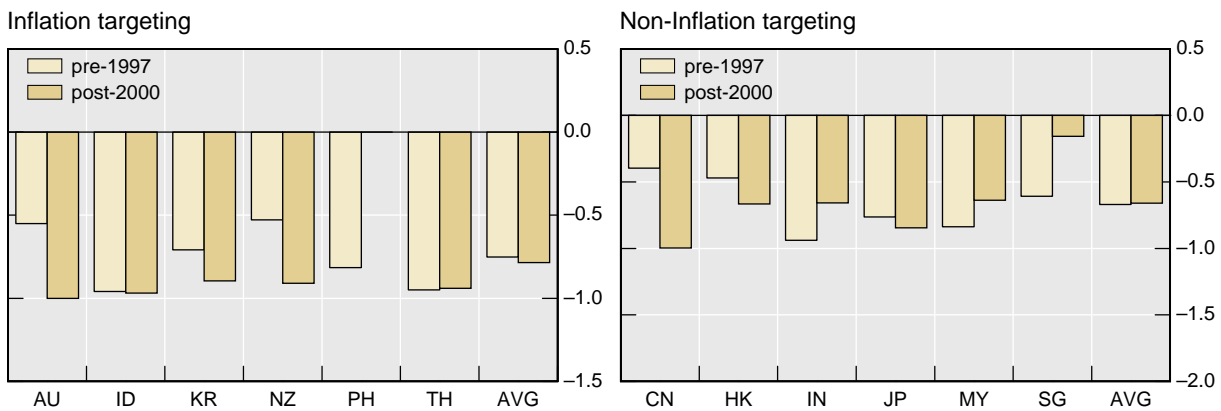


AU = Australia; CN = China; HK = Hong Kong; ID = Indonesia; IN = India; JP = Japan; KR = Korea; MY = Malaysia; NZ = New Zealand; PH = Philippines; SG = Singapore; TH = Thailand.

¹ Estimated autoregressive coefficient for annualized quarter-on-quarter CPI inflation. ² Cross-country average coefficient. ³ 93q2-97q2. ⁴ 89q2-97q2. ⁵ 85q2-97q2.

Source: BIS calculations, national data.

Graph 6
Changing IMA(1) inflation persistence^{1,2}



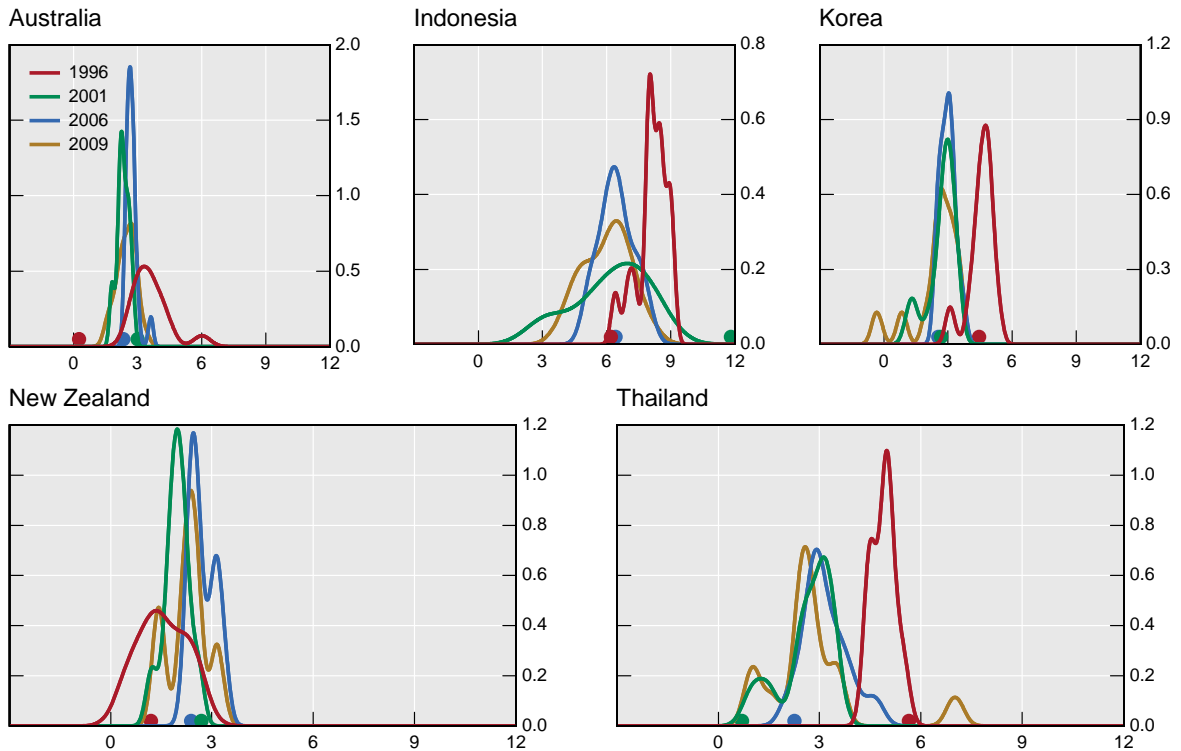
AU = Australia; CN = China; HK = Hong Kong; ID = Indonesia; IN = India; JP = Japan; KR = Korea; MY = Malaysia; NZ = New Zealand; PH = Philippines; SG = Singapore; TH = Thailand.

¹ Estimated IMA(1,1) coefficient through unobserved components decomposition on the basis of 10 year sample subject to data availability. ² AVG stands for cross-country parameter mean.

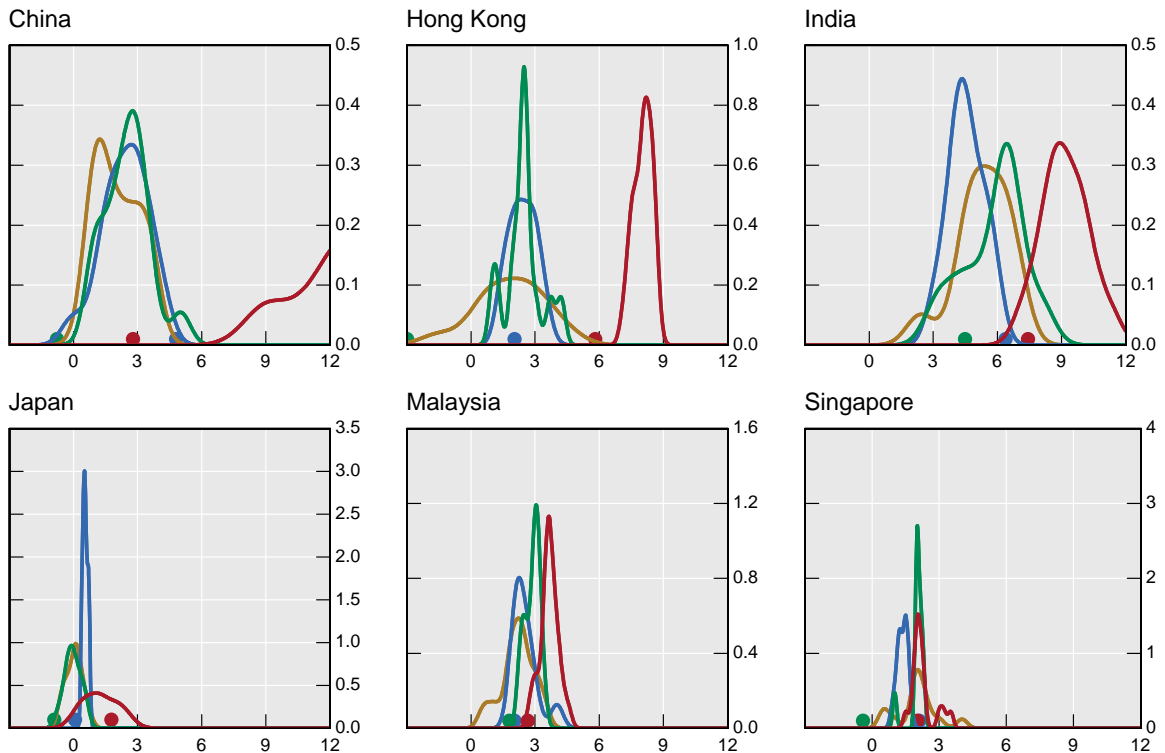
Source: BIS calculations, national data.

Graph 7

Cross-sectional distribution of next year's inflation expectations^{1,2}
Inflation targeting countries



Non-inflation targeting countries



¹ Estimated distribution of individual forecasts from Consensus Economics for January. ² Dots represent the actual inflation corresponding to the forecast.

Source: Consensus Economics, BIS calculations, national data.

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Financial deleveraging and the international transmission of shocks

Michael B Devereux¹ and James Yetman²

1. Introduction

The current international financial crisis has highlighted the critical role of financial markets in the propagation of business cycle shocks, both in transmitting shocks from one country to another and in magnifying the effects of shocks. A relatively minor (on a global scale) deterioration in the US subprime mortgage market led to a much larger collapse in the asset values of major US investment banks, which in turn quickly precipitated a major crisis affecting financial institutions across the globe.

It is widely agreed that high financial leverage – high ratios of assets to underlying capital – was a critical factor in the magnifying effects of the crisis. As asset values declined, highly leveraged financial institutions found their net worth sharply eroded, and were forced to shed assets to avoid unacceptable risks of insolvency. This process of “deleveraging” drove asset values down further, impairing the balance sheets of other institutions. While the financial dynamics of balance sheet deleveraging have been widely discussed elsewhere, it is less well understood how this process affects macroeconomic outcomes or that financial deleveraging alone may generate an immediate and powerful international transmission of shocks.

A clear prerequisite for deleveraging to have powerful macroeconomic effects is the presence of some type of financial friction or distortion in credit markets. After all, in a frictionless, undistorted world, leverage is irrelevant. Thus, in order to capture the dynamics of the financial meltdown, financial frictions will be of critical importance.

Many existing models do a poor job of explaining international spillovers during the recent crisis. Most models of business cycle transmission still rely on the international linkage of countries through trade flows. While global trade has been growing at remarkable rates over the past two decades, it is still the case that the major world regions – the United States, Asia and Europe – are to a large extent “closed” economies, with the export share from one region to another representing only a small proportion of overall GDP. This perspective led many to believe in the prospects for a ‘de-coupling’ of the rest of the world from a US recession. But the rapid deterioration in economic activity in almost all regions of the world during the current crisis appears to be much larger than would have been anticipated based on trade linkages alone. Krugman (2008) suggests that traditional multi-country business cycle models lack a critical “international finance multiplier” by which financial shocks in one country affect investment both in the original country and in other countries through financial or balance sheet linkages.

¹ University of British Columbia, NBER, CEPR. Devereux thanks the Bank for International Settlements, Bank of Canada, SSHRC and the Royal Bank of Canada for financial support. The views expressed here are those of the authors and do not necessarily reflect those of the Bank for International Settlements or of the Bank of Canada. We thank, without implication, Philip Wooldridge for advice on data. This paper was written while the first author was visiting the Reserve Bank of Australia and the Bank for International Settlements. He is grateful for the warm hospitality and resources provided by both institutions.

² Senior Economist, Bank for International Settlements

This paper discusses a theoretical model of a balance sheet channel for the international transmission of shocks. The model emphasises how a process of financial deleveraging, generated by a downturn in one country, is spread around the globe through interconnected portfolios. In the presence of leverage constraints, we show that this gives rise to a separate financial transmission mechanism of business cycle shocks that is completely independent of trade linkages. In fact, we work with a highly stripped down “one world good” model in which, in steady state, there are no trade linkages across countries at all.

The paper’s main contribution is to compare how macro shocks are transmitted under two financial market structures. The model contains two countries in which investors borrow from savers in each country, and invest in fixed assets. Investors also diversify their portfolios across countries, and hold equity positions in the assets of the other country as well as their own. Investors cannot commit to repay savers, however, and in order to enforce payment, may face limits on the maximum amount of leverage on their balance sheets. In an environment where leverage limits do not bind, the Modigliani-Miller theorem applies, and the international transmission of shocks is quite limited. Specifically, there is no international transmission due to deleveraging. A negative productivity shock which leads to a fall in the value of assets in one country will cause financial institutions to sell some assets and reduce their debt exposure, but this does not affect other countries. In fact, in other countries, investors increase their borrowing. More broadly, business cycle fluctuations across countries are essentially uncorrelated in the absence of limits on leverage.

When leverage constraints are binding, however, there is a powerful transmission of shocks across countries. A fall in asset values in one country forces an immediate process of deleveraging in that country’s financial institutions. But the deterioration in asset values leads to a worsening of leverage constraints in other countries as well, causing a sell-off in assets and a forced reduction in borrowing around the globe. This, in turn, drives a further sell-off in the first country, establishing a feedback loop. The end result is a large magnification of the initial shock, a big fall in investment, and highly correlated business cycles across countries during the resulting downturn.

The model draws heavily on a number of separate literatures. First, and most importantly, we follow Kiyotaki and Moore (1997) in imposing leverage limits on investors. Second, we emphasise the linkages among countries through the presence of inter-connected portfolios. Portfolio linkages, in a somewhat different context, have for some time been seen as important in the contagion effects of financial shocks (see Rigobon 2003 and Pavlova and Rigobon 2008, for example). Finally, we introduce endogenous portfolio interdependence through the recently developed techniques of Devereux and Sutherland (2009).

The paper is organised as follows. The next section provides some evidence of the importance of financial deleveraging in the recent business cycle downturn. We then discuss the key components of the basic two-country model in which investors and savers interact, but investors may be limited by leverage constraints. In Section 4 we explore the effects of a negative productivity shock in one country, and demonstrate the role of deleveraging in the propagation of business cycle shocks across countries. We then conclude.

2. Empirical evidence

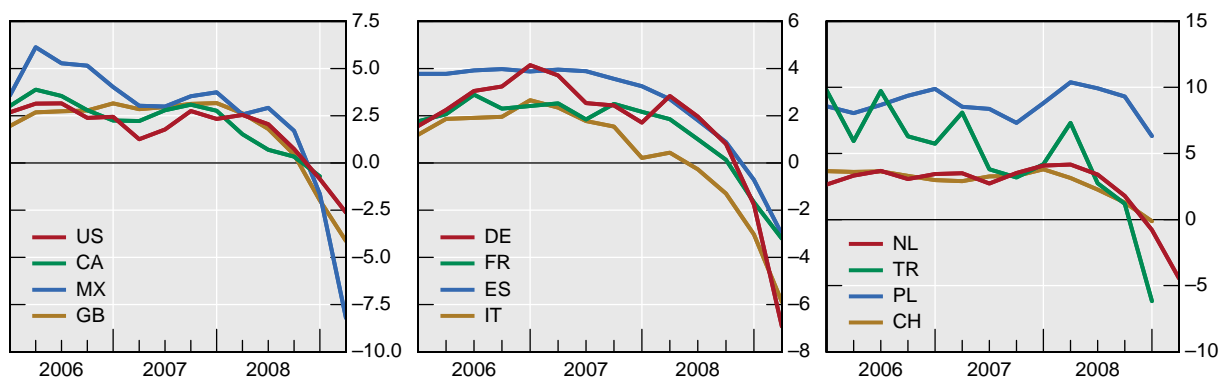
We present some empirical evidence that supports our contention that global deleveraging may have been an important propagation mechanism for the crisis. First, Figure 1 documents the global nature of the economic crisis. Figure 1a, for OECD countries, and Figure 1b, for economies in the Asia-Pacific, both show a remarkably synchronous collapse in economic growth rates. It is unlikely that trade linkages alone could account for the simultaneous downturns in all regions. If we take the US economy as the ultimate source of the financial crisis then it would be easy to explain the scale of the downturn in Mexico, for instance. But

Figure 1a illustrates dramatic reductions in economic growth in many European economies, only marginally linked to the US through trade flows. A similar picture emerges from the Asian economies in Figure 1b.

Figure 1a

Real GDP growth¹

In percent



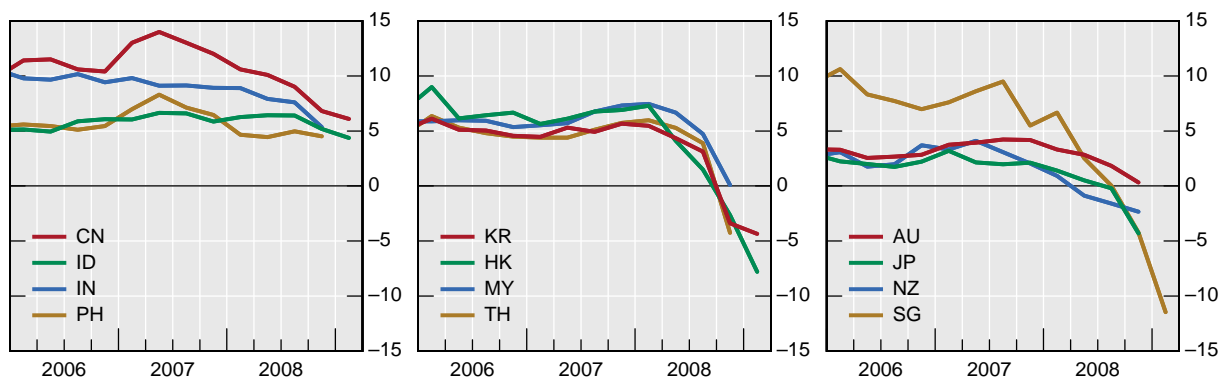
¹ Year-over-year changes in real GDP. US = United States, CA = Canada, MX = Mexico, GB = United Kingdom, DE = Germany, FR = France, ES = Spain, IT = Italy, NL = Netherlands, TR = Turkey, PL = Poland, CH = Switzerland.

Source: national data.

Figure 1b

Real GDP growth¹

In percent



¹ Year-over-year changes in real GDP. AU = Australia, CN = China, HK = Hong Kong, IN = India, ID = Indonesia, JP = Japan, KR = South Korea, MY = Malaysia, NZ = New Zealand, PH = Philippines, SG = Singapore, TH = Thailand.

Source: national data.

In addition there is clear evidence that deleveraging by banks has reduced the supply of credit in Asia. Table 1a contains the stock of short-term exposures of US banks to major Asian economies. This is the total stock among US reporting banks of all loans to the destination economy with less than one year remaining until maturity. Under normal circumstances, in each quarter new claims are issued and many maturing existing claims are rolled over. A rapid decline in less than one year (for example, to Chinese Taipei between 2008Q2 and 2008Q4), then, implies little new issuance, and few loans being rolled over. Indeed, the average decline between 2008Q3 and 2008Q4 represents a 26% fall in total

claims on Asia, demonstrating that US banks have substantially deleveraged their balance sheets with respect to Asia since the beginning of the crisis.

Table 1a
Short-term claims of US banks on Asian economies

\$US millions

Destination of funds	2007Q4	2008Q1	2008Q2	2008Q3	2008Q4
Hong Kong	10,079	10,066	12,900	11,366	8,837
Singapore	17,007	16,966	15,196	11,778	10,188
China	13,192	11,635	14,795	12,693	6,498
Chinese Taipei	7,845	9,689	8,929	7,155	3,795
India	25,722	20,779	16,582	17,093	13,801
Indonesia	6,007	5,902	5,286	6,782	5,313
Malaysia	3,345	3,431	4,054	2,201	1,997
Philippines	1,370	2,060	1,923	1,579	1,547
South Korea	26,254	27,435	28,027	29,873	21,518
Thailand	794	860	534	692	869

Source: BIS International Banking Statistics

Further evidence for deleveraging by US banks is presented in Table 1b, for all OECD countries for which data is available. While the evidence here is more mixed, there is a clear pattern overall that the largest OECD economies (by size of claims) have experienced a substantial fall in US bank claims during 2008. In particular, France, Germany Ireland, Italy, Korea and Luxembourg, the largest recipients of US bank claims, all experienced major withdrawals over 2008. Further, total claims across all countries declined by more than 20%, with half of that decline occurring in the final quarter.

Aside from bank balance sheets, we can also find clear evidence consistent with deleveraging in other instruments. Equities in particular were believed by many policymakers to be a vector of contagion, as the following remark by Rakesh Mohan, Deputy Governor of the Reserve Bank of India, indicates:

“Our problems are mainly due to the sell-off by foreign institutional investors in the domestic equity markets leading to a sharp reduction in net capital inflows and the sharp slowdown in global economic activity and external demand.”
(Mohan 2009)

This view is consistent with the data on international capital flows captured by the Treasury International Capital System (Figure 2). The crisis has seen a fall in both inflows and outflows of capital from the US, at the aggregate level. The scale of the fall in flows in early 2009 is unprecedented over the full sample of aggregate TIC data going back to 1980. In the model we will see that this type of deleveraging, when combined with binding leverage constraints among financial institutions, can impart an independent international transmission of shocks.

Table 1b
Short-term claims of US banks on OECD economies

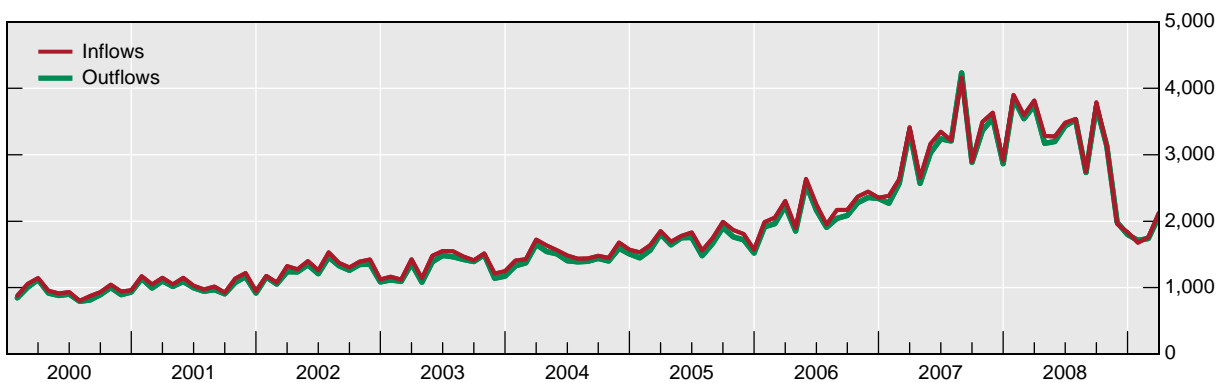
\$US millions

Destination of funds	2007Q4	2008Q1	2008Q2	2008Q3	2008Q4
Austria	4,179	4,207	4,841	3,574	2,256
Belgium	8,742	13,911	17,453	15,762	15,567
Czech Republic	527	716	798	894	518
Finland	3,191	2,837	2,386	3,024	2,928
France	57,952	69,098	41,790	44,355	55,287
Germany	56,910	65,933	48,407	41,295	39,266
Greece	3,947	4,857	3,005	2,310	2,428
Hungary	894	1,003	900	1,113	491
Ireland	28,317	27,471	28,082	27,767	23,550
Italy	25,180	25,521	26,215	18,617	17,243
Korea	26,254	27,435	28,027	29,873	21,518
Luxembourg	26,050	24,730	22,826	21,650	11,943
Mexico	6,492	7,752	7,497	6,784	7,734
Netherlands	43,132	46,995	52,071	47,617	37,230
Poland	2,356	2,254	2,279	2,308	2,521
Portugal	2,861	2,331	2,054	1,740	1,226
Spain	28,267	28,367	25,370	18,719	18,420
Turkey	7,320	6,916	7,014	6,010	5,107

Source: BIS International Banking Statistics

Figure 2
US capital inflows and outflows

In billions of US dollars



Source: US Department of Treasury.

Financial linkages versus trade linkages

The effect of global deleveraging should be expected to vary by country. Some economies are more dependent on capital inflows than others, and countries with low credit ratings may suffer more from a sudden reduction in flows than higher rated countries, for example. Evidence of the effects of deleveraging should account for the difference in vulnerabilities across countries.

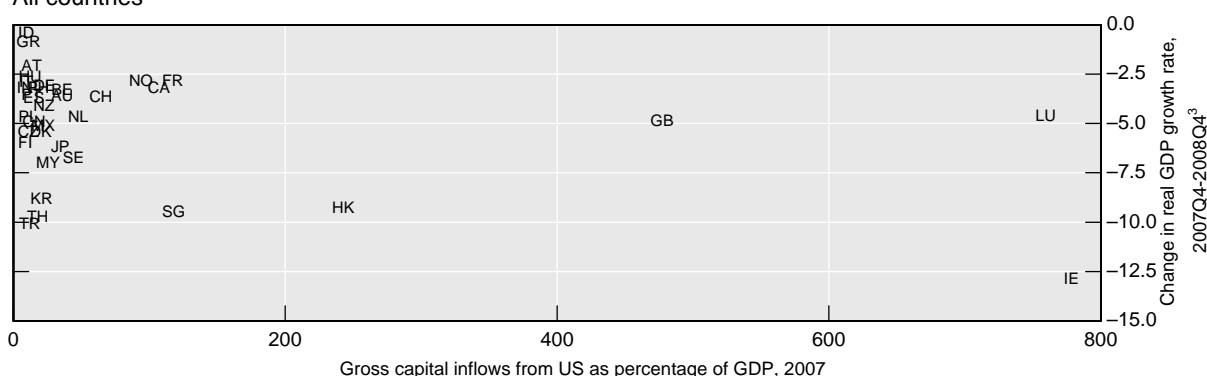
We demonstrate the importance of deleveraging as a propagation mechanism for the crisis using a simple graphical approach. As a rough measure of the international effect of the crisis, we use the change in the GDP growth rate between the year ended December 2007 and December 2008. The vulnerability of countries to a sudden outflow of capital is calculated as total gross sales by foreigners to US residents of long-term securities during 2007, as a percent of 2007 GDP, using US Treasury International Capital (TIC) data. Our sample includes all members of the OECD for which TIC data is available, as well as some additional Asian economies (China, Hong Kong, India, Indonesia, Malaysia, Philippines, Singapore and Thailand).

The results in the top panel of Figure 3 suggest no clear relationship between the slowdown and international capital flows. However, this does not account for difference in credit ratings across economies. It also does not separate international financial centres, which are likely to be affected differently by the crisis than other economies, and Ireland, which is an extreme outlier.

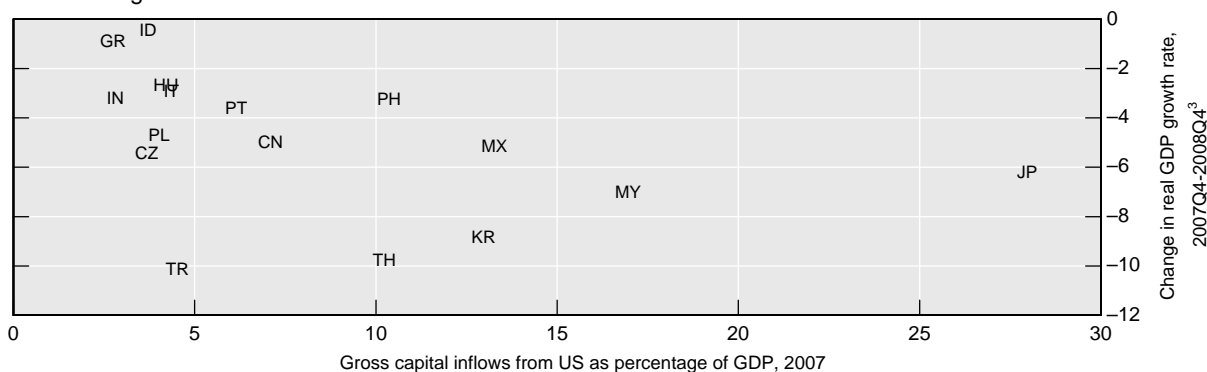
Figure 3

Decline in GDP as a function of capital inflows from US¹

All countries



Credit rating < AA²



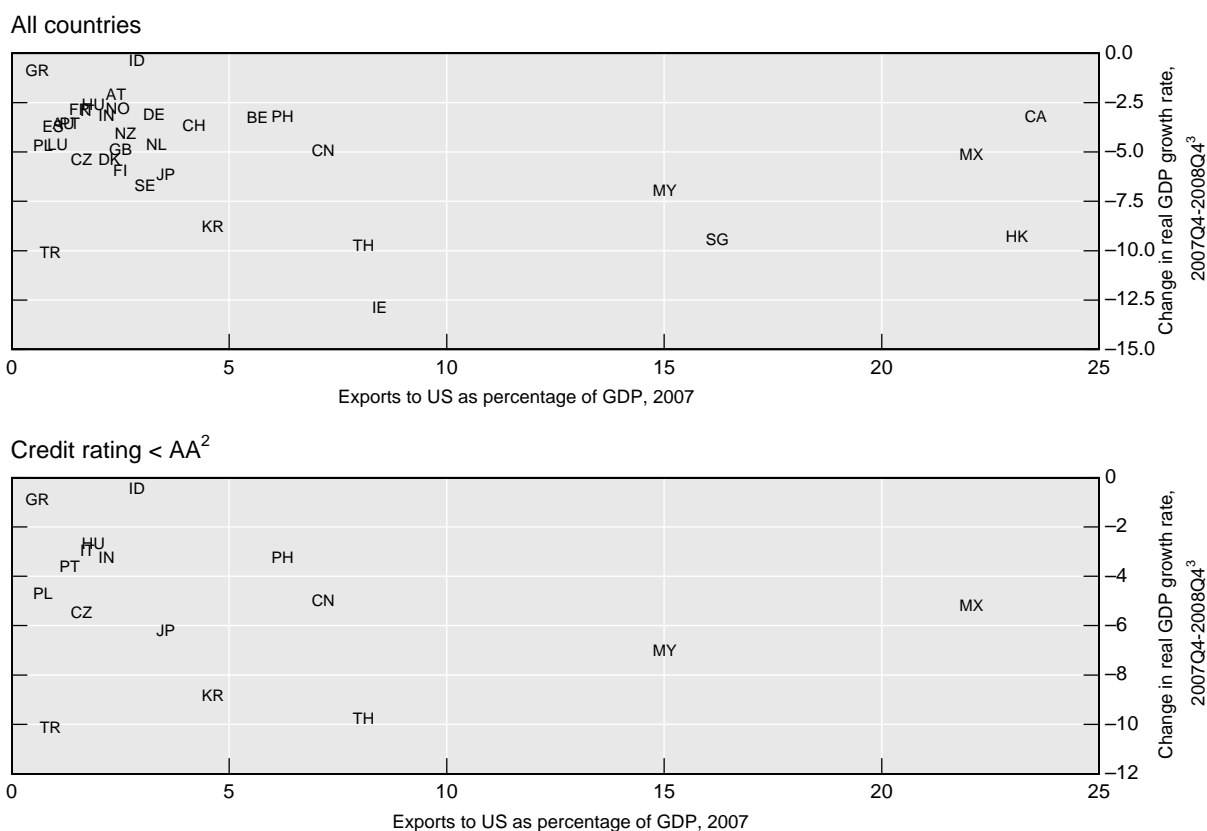
¹ Labels are 2-digit ISO country codes. ² Sovereign foreign currency credit rating, S&P, 2007. ³ Real GDP growth rate in year to December 2008 less growth rate in year to December 2007.

Source: Treasury International Capital System; International Financial Statistics; national data.

The lower panel repeats the analysis, including only those countries with a sovereign foreign currency rating lower than AA by S&P in 2007. Now there is a clearer negative relationship. Lower-rated economies that had previously enjoyed large capital inflows from the United States saw particularly severe declines in GDP.

The evidence for trade as a propagation mechanism for the crisis, using similar methods, is a little more mixed. Figure 4 repeats the analysis for the same samples of countries, substituting exports to the United States in 2007 as a percent of GDP from the IMF's Direction of Trade statistics in place of capital flows. There may be a negative relationship between trade and the downturn, but Mexico and Canada stand out as outliers with relatively minor declines in output, despite exports to the United States that exceed 20% of GDP.

Figure 4
Decline in GDP as a function of exports to US¹



¹ Labels are 2-digit ISO country codes. ² Sovereign foreign currency credit rating, S&P, 2007. ³ Real GDP growth rate in year to December 2008 less growth rate in year to December 2007.

Source: Treasury International Capital System; International Financial Statistics; national data.

In summary, this evidence suggests the possibility that a financial channel may be important for the international propagation of shocks, in addition to the normal trade-related channels. Moreover, it is difficult to explain the scale and synchronicity of the global downturn based on trade alone.

3. The model

In this section we describe a basic two-country model with leveraged borrowers and lenders in each country. The model contains many standard elements, which are only outlined briefly.³ Within each country, there are investors and savers. Both have infinite horizons, supply labor inelastically to production firms and purchase the same fixed asset. Investors rent the fixed asset to competitive production firms, receiving a risky return in exchange, while savers use it in home production. Investors are more impatient than savers, so they will borrow from savers in order to invest in the fixed asset. Savers therefore choose a portfolio in which they hold the debt of investors and the fixed asset. By assumption, savers do not hold domestic or foreign equity.

Investors in either country trade claims with investors in the other country so as to diversify their portfolio of equity holdings. Thus they hold leveraged investments, but also have equity portfolios that are interconnected across countries.

Focusing on the key assumptions of the model, we define the discount factor as:

$$\theta_{t+1}^i = \beta^i (\bar{C}_t^i) \theta_t^i, \quad \beta^i \nu(\bar{C}_t^i) \leq 0, \quad (1)$$

Where \bar{C}_t^i is the economy-wide average consumption of agents of type i , and $i \in \{I, S\}$ indicates savers or investors. The specific functional form we assume is $\beta(C) = \zeta C^{-\eta}$.

Investors face a constraint on total leverage due to an inability to commit to repayment, as in Kiyotaki and Moore (1997). Total debt is assumed to be restricted to be no greater than κ times the market value of equity assets, where $\kappa < 1$. Thus home investors' choices are constrained by:

$$B_t^I \leq \kappa (q_{1t} k_{1t}^I + q_{2t} k_{2t}^I), \quad (2)$$

where q_{1t} and q_{2t} represent the price of the fixed asset (or equity) in the home and foreign country respectively, k_{1t}^I and k_{2t}^I are the portfolio holdings of the fixed assets in each country held by the home investor and B_t^I is the debt issued to domestic savers. Leverage constraints in the form of (2) have been used quite widely in the literature on asset prices (Aiyagari and Gertler 1999), emerging market crises (Mendoza and Smith 2006), borrowing in a small open economy (Uribe 2006) and monetary policy with credit frictions (Iacoviello, 2005).

Investors in the home country choose investment in the home equity and the foreign equity, as well as borrowing, to maximise their expected utility subject to their budget constraint and leverage constraint, giving the standard portfolio selection condition:

$$E_t U'(C_{t+1}^I) \left(\frac{(q_{1t+1} + R_{1Kt+1})}{q_{1t}} - \frac{(q_{2t+1} + R_{2Kt+1})}{q_{2t}} \right) = 0. \quad (3)$$

Given that the portfolio choice may be written in the form (3), we can use the recent methods described in Devereux and Sutherland (2009) to derive the optimal equity portfolio of each country's investors.

We also follow Tille and Van Wincoop (2007) in also extending (3) to allow for transactions costs of international financial trade that effectively limit international portfolio diversification

³ For full model details, see Devereux and Yetman (2010).

to generate home equity bias in equilibrium. In particular, we assume that an “iceberg” cost factor given by $\exp(-\tau) \leq 1$ reduces the returns that home investors receive from foreign investment so that condition (3) becomes:

$$E_t U'(C_{t+1}^I) \left(\frac{(q_{1t+1} + R_{1Kt+1})}{q_{1t}} - \frac{(q_{2t+1} + R_{2Kt+1})}{q_{2t}} \exp(-\tau) \right) = 0. \quad (4)$$

As we will show, when leverage constraints are not binding, the dynamic paths of asset allocations are independent across countries. This holds despite the fact that, up to a first order, expected returns on all assets are equalised both within and across countries. However, when leverage constraints bind, asset allocation in the each country will depend on the level of productivity in both countries, because productivity shocks to one country will affect the tightness of leverage constraints across all financial markets.

Because the model is such a stripped down representation of a full-scale DSGE framework lacking capital accumulation and dynamics in the labour supply and containing only a single world good, there are many dimensions in which the model's predictions will depart from reality. The aim of the exercise is rather to explore the way in which financial leverage constraints affect the cross-country dynamics of asset prices, asset allocations and leveraged investments, and to investigate the international transmission of deleveraging. To do this, however, we need to choose parameter values for preferences, production technologies and the leverage constraint itself. Table 2 gives the set of parameter values used in the baseline model.

Table 2
Calibration

Parameter	Value	Parameter	Value
n	0.5	ε	0.5
η	0.01	ω	0.36
ζ	Discount factors 0.96 and 0.94	σ	5
κ	0.8	ρ	0.9

We focus on shocks to the productivity of final goods in each country. The stochastic process for final goods productivity is modeled as:

$$\log(A_t) = \rho \log(A_{t-1}) + v_t, \quad (5)$$

where $\rho = 0.9$, $E_{t-1} v_t = 0$ and $\sigma_v^2 = 0.02^2$. We assume that foreign productivity is driven by the same process, and foreign and domestic productivity shocks are uncorrelated.

4. Deleveraging effects of productivity shocks

No leverage constraints

We first examine the impact of a 1% negative productivity shock in the home country, in the environment without leverage constraints. Figures 5 and 6 describe the impact of the shock on consumption of investors, asset prices, lending by savers, asset allocation, the internal lending rate and the consumption of savers. Figure 5 represents the case where portfolio diversification is restricted by second order transactions costs as described in (4), while

Figure 6 describes the case of unrestricted portfolios, as in (3). In the unrestricted case, home investors have a bias against home equities. Investors are exposed to non-diversifiable risk from wage income, which is positively correlated with the return on home equity. With an unrestricted portfolio, they will hedge this risk by taking a larger position in foreign equity than home equity, as discussed in Baxter and Jehrmann (1997). Given the calibration of the model, in an unrestricted equilibrium $k_1^I = .2\hat{k}_1^I$. That is, home investors would hold only 20% of total home equity (i.e. 20% of the fixed assets which are invested in the home final goods technology), with foreign investors holding the remaining 80%.

Figure 5

No leverage constraints, partial diversification

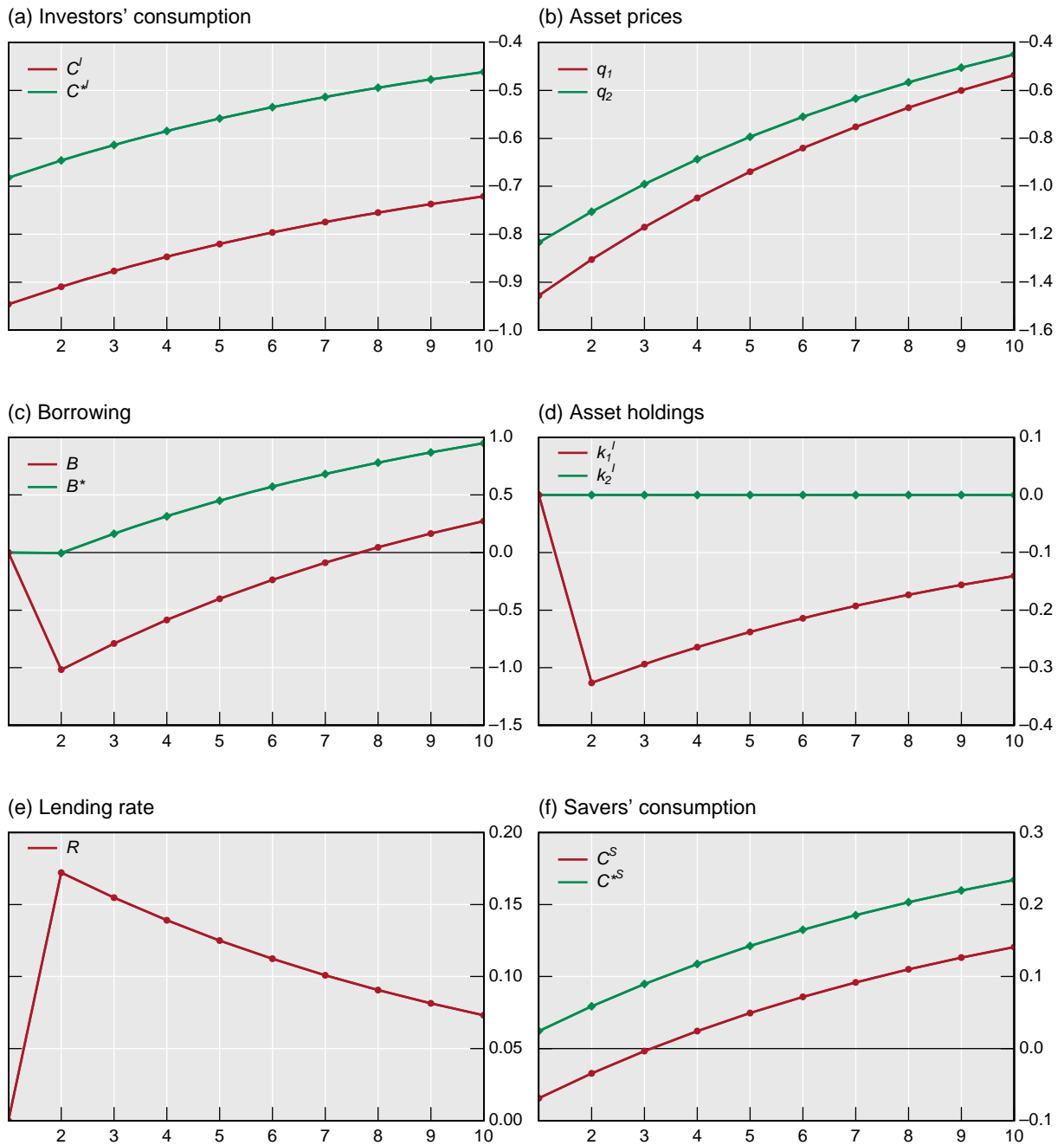
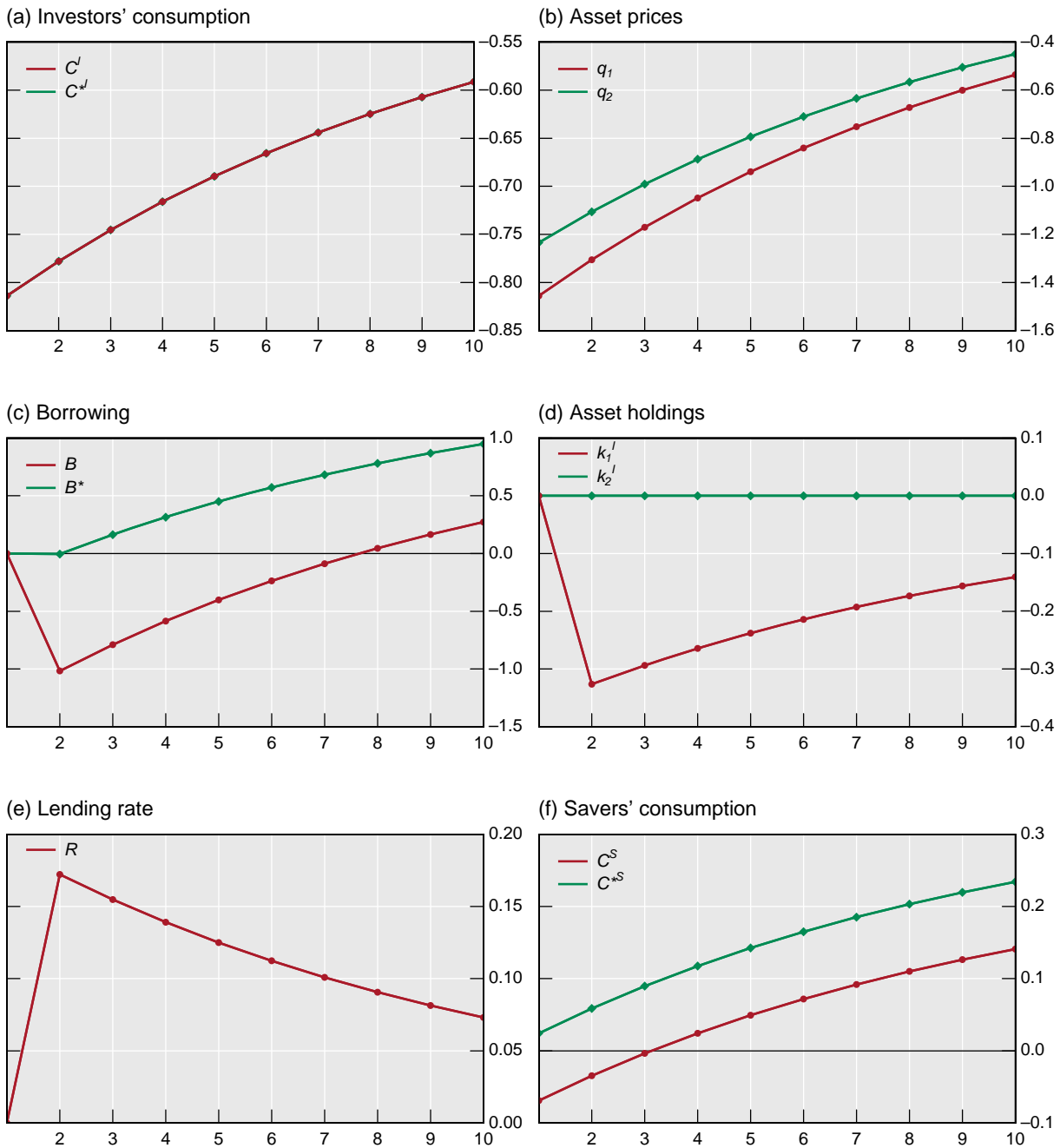


Figure 6

No leverage constraints, full diversification



Since this is clearly counterfactual, we use the iceberg cost variable τ as a crude mechanism to match the optimal portfolios more closely with observed home bias in equity holdings. In Figure 5 τ has been chosen so that $k_1^I = .75\hat{k}_1^I$, implying that home investors hold 75% of home equity.

The response to a productivity shock is quite similar in each of the figures. Without leverage constraints, the impact of a fall in home country productivity is to reduce consumption of investors globally, by identical amounts in the case of unrestricted diversification. The shock represents a temporary fall in the consumption of investors in both countries. But since consumption is expected to increase in the future, real interest rates must rise. The

combination of a persistently lower return on the home asset and rising real interest rates means that the home asset price must immediately fall.

Without leverage constraints, all returns are equalised, at least up to a first order approximation, for investors to be willing to hold all assets in their portfolios. Thus the price of foreign assets must also fall. That is, arbitrage implies that the rate of return to lenders rises by the same amount in both countries, even though lenders do not directly engage in international borrowing or lending. But the pattern of lending moves in completely different directions in the two countries, as do lenders' portfolios. In the home country, there is a fall in investment in the fixed asset in the final goods sector simply because this sector has suffered a persistent negative technology shock. This leads to an increase in the holdings of the fixed asset by lenders. They shift the composition of their portfolios from debt towards increased holdings of the fixed asset. Thus lending falls in the home country. In the foreign country, by contrast, there is no change at all in the allocation of the fixed asset. But lending in the foreign country actually rises, as investors borrow more from lenders in order to cushion against the temporary fall in their investment income.

A different way to see this is that in the foreign country, lenders are offered a higher rate of return on their lending, and are willing to purchase more debt from foreign investors. Either way we look at it, lending rises in the foreign country, while it falls in the home country. In this sense, there is no international transmission of deleveraging.

The impact of the shock on lenders' consumption in the two countries also moves in opposite directions. Lenders in the home country lose, since they suffer a direct fall in their wage income. Lenders in the foreign country gain, since they lend more at higher interest rates, and their wage income and holdings of the fixed asset are unaffected. Clearly lenders cannot achieve full consumption risk-sharing, since they cannot directly hold a claim on the equity of the other country.

In the economy without leverage constraints, then, the international transmission of shocks is limited, and clearly counterfactual, relative to the discussion of the empirical evidence of financial spillovers in Section 2. A negative productivity shock in the home country leads to domestic deleveraging, as investors reduce both their borrowing and holdings of fixed assets. But there is no foreign deleveraging. Investment in fixed assets is completely unaffected in the foreign country, and foreign investors actually increase their borrowing. More critically, there is no international transmission of the shock to GDP at all. Since the foreign asset allocation is unaffected by the domestic shock, foreign output is unchanged. Thus, in the absence of credit market imperfections, the possibility for the international transmission of shocks through balance sheet deleveraging is limited.

Leverage constraints and international transmission

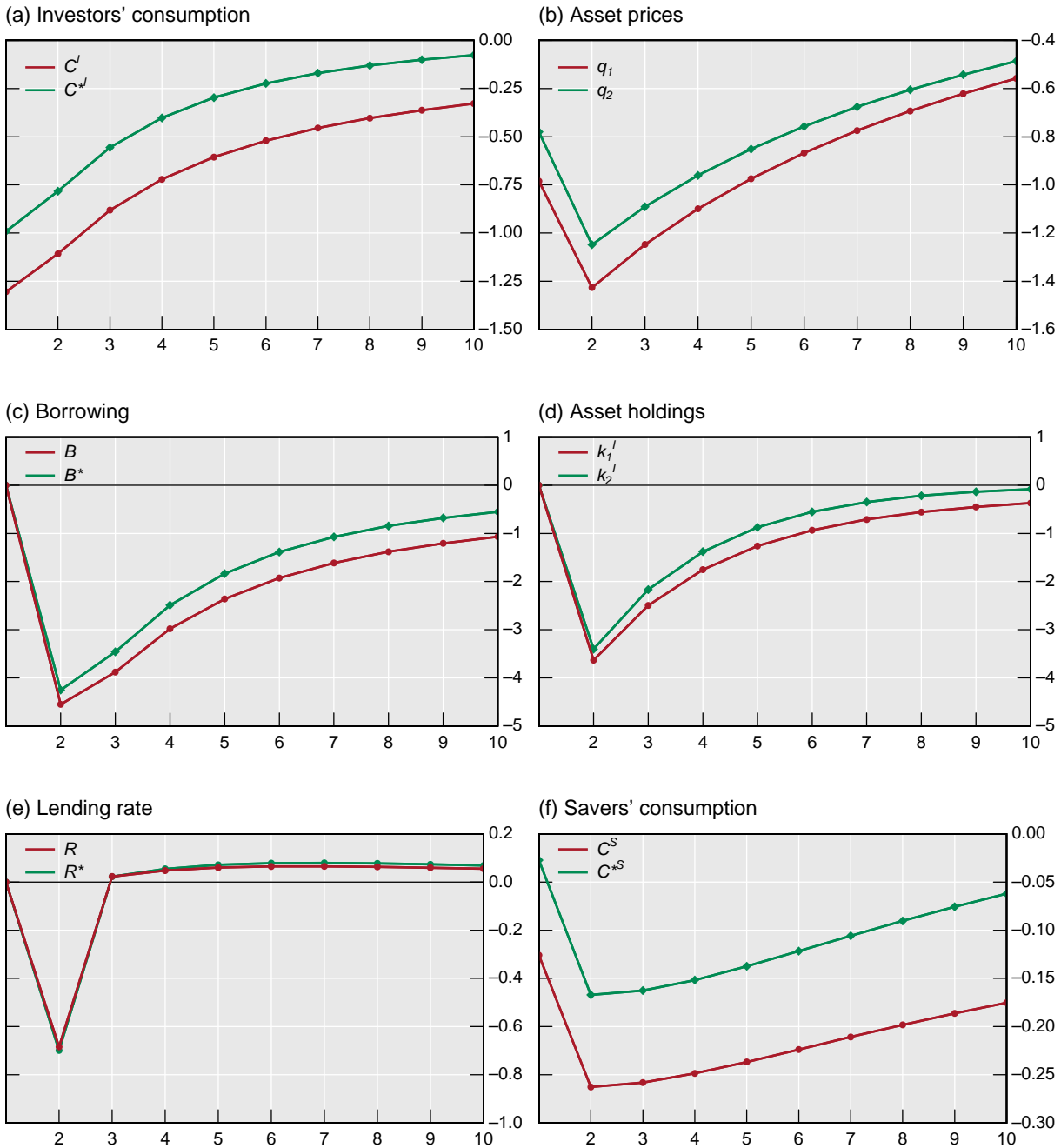
Figure 7 shows the impact of a negative productivity shock in the home country in the model when leverage constraints bind in both countries, when investors' portfolios are only partly diversified due to the presence of transactions costs.⁴

We saw before that without leverage constraints, a fall in home country productivity leads to a fall in asset prices in both countries, and a fall in investors' consumption. With leverage constraints, the fall in asset prices leads to a tightening of the constraint, in both countries. The result is a reduction in borrowing by investors, and a consequent reduction in investment in fixed assets. Note that, for the foreign country, there is no direct fall in the productivity of the domestic final goods sector.

⁴ Results are qualitatively similar with lower levels of leverage or with full diversification.

Figure 7

Binding leverage constraints, partial diversification



In addition, the price of foreign equity falls. But in spite of there being no direct shock to foreign equity returns, and a fall in the price of the asset, there is still a fall in demand for the asset by investors in both countries. This is the essence of the “inverted demand curve” for assets that characterises episodes of deleveraging, as emphasised by Aiyagari and Gertler (1999). Here it is taking place as a spillover from one levered investor to another, as emphasised by Krugman (2008). That is, a fall in the price of the asset held by one investor leads to a tightening of leverage constraints and a fall in demand for both the original asset and other assets held in the portfolio.

Even in the case where portfolios are only partly diversified, there is a very high correlation across countries in borrowing and investment. The decline in leverage is so great that the internal lending rate in each country immediately falls. Again, note that this is in response to

a temporary shock so that future consumption of investors is expected to increase. But because investors are subject to leverage constraints, the path of their consumption is de-linked from the path of interest rates.

The fall in asset prices is of a similar order of magnitude in the leverage-constrained economy as in the unconstrained economy. Asset prices display a V-shaped response, however, falling by less immediately than in the second period. This is due to the fall in lending rates. Since lenders are unconstrained, the fall in returns on lending must be accompanied by a fall in the expected returns on the lenders holding fixed assets for home production. Hence, immediately following the shock, asset prices are expected to fall further.

Note that there is a distinct difference between the constrained and unconstrained economy, not just in the direction of international transmission of shocks, but also in the scale. In the unconstrained economy, a one percent decline in final goods' sector productivity leads to an approximately one percent fall in borrowing from lenders, but only a 0.3% reduction in fixed asset investment. Not only is there an absence of transmission via international deleveraging, but the domestic impact of the shock is also relatively mild. By contrast, the response of the constrained economy is larger by orders of magnitude. Borrowing falls by almost 5% in the home economy, and investment in fixed assets by almost 4%. Even in the foreign economy the deleveraging multiplier is very large – investment falls by more than 3% and borrowing falls by 4%. In both countries, the response to the shock is proportionally much larger than the shock itself, due to the interaction of asset price declines and binding leverage constraints.

Consumption of home and foreign investors also falls by more in the constrained economy than in the unconstrained economy, although the decline is less persistent with leverage constraints. Also, in contrast to the economy without constraints, consumption falls for both for investors and lenders, in both countries.

Unconditional moments

Table 3 reports the unconditional moments of the model under the assumption that productivity shocks in both countries follow identical but uncorrelated distributions, given by (5).

Table 3
Unconditional moments

Leverage constraints	None	None	Binding	Binding
Diversification	Partial	Full	Partial	Full
SDEV(C^I)	2.9	3.0	3.9	4.0
SDEV(C^S)	0.4	0.5	0.8	0.9
SDEV(q)	4.7	5.2	4.7	4.9
SDEV(R)	0.6	0.7	2.0	2.0
SDEV(\hat{k}^I)	0.8	0.9	11.0	11.3
CORR(q_1, q_2)	0.98	0.99	0.99	0.99
CORR(\hat{k}_1^I, \hat{k}_2^I)	0.02	0.04	0.99	0.98
CORR(R, R^*)	–	–	0.99	0.99

As is evident from the figures, the model with binding leverage constraints displays substantially more overall volatility than the model where leverage constraints are absent. Consumption of investors is 50% more volatile, and consumption of savers is twice as volatile. Asset price volatility is relatively unchanged with and without leverage constraints but investment volatility is vastly higher, as is clear from a comparison of Figures 5 and 7. Investment correlation across countries is essentially zero in the economy without leverage constraints, but almost perfect in the economy with leverage constraints. Table 3 therefore underscores the main message of the paper. In the presence of credit market imperfections, balance sheet linkages across financial institutions can generate a very powerful mechanism for the international transmission of business cycle shocks.

5. Conclusions

This paper has provided empirical evidence on the importance of financial deleveraging in propagating business cycle shocks across countries. Financial interdependence, combined with binding leverage constraints, can open a channel for the transmission of shocks that may be as important as standard trade linkages. We have used this evidence to construct a simple two-country model in which highly leveraged financial institutions hold inter-connected portfolios, and may be limited in their investment activity by capital constraints. The combination of portfolio interdependence and capital constraints leads a negative shock in one country to precipitate an episode of global deleveraging and disinvestment. In this sense, our model may be seen as a formal general equilibrium representation of Krugman (2008), who suggests that interconnections in financial markets may give rise to an “international finance multiplier”. In our model, we find that with high initial levels of leverage, the global effects of the shock may be substantially magnified.

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Discussant remarks: monetary policy and exchange rate issues in Asia and the Pacific

Kyungsoo Kim¹

First of all, let me thank the People's Bank of China and the Bank for International Settlements for inviting me to this wonderful event. My discussion has three parts: a discussion of the two papers presented in this session, a general discussion of BIS research on monetary policy and exchange rates, and some specific comments on the background paper prepared by the BIS Asian office.

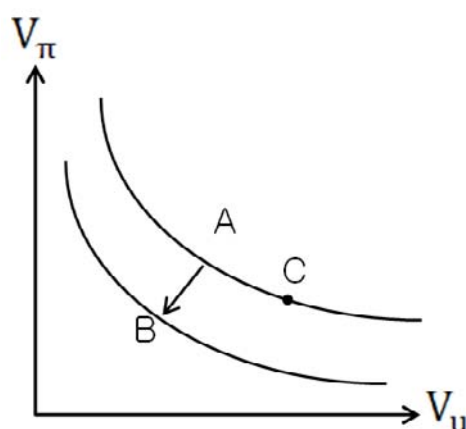
Discussion of “Targeting inflation in Asia and the Pacific: lessons from the recent past” by Andrew Filardo and Hans Genberg

In this paper the authors observe that since the Asian financial crisis, 12 Asia Pacific central banks have performed remarkably well in terms of both the level and the volatility of the inflation rate.

This phenomenon, the so-called Great Moderation, is best illustrated by the Taylor curve (Graph 1). The horizontal axis measures the variance of the unemployment rate, and the vertical axis the variance of inflation rate. The Taylor curve says that there is a trade-off between the volatility of the unemployment rate and that of the inflation rate. When there is an aggregate supply shock, monetary policy makers can stabilise inflation only at the expense of unemployment stability, or vice versa. Central bankers therefore choose one goal or the other, or some combination of both depending upon their preferences.

The Taylor curve shifts toward the origin when monetary policy becomes more efficient. That is, the state of the economy as represented by the variances of the rates of inflation and unemployment moves from point A to point B. The authors argue that the increased

Graph 1
Taylor curve



¹ Deputy Governor of the Bank of Korea.

efficiency in monetary policy, if there is any, is due to central banks' legal and/or political independence and a general increase in transparency and accountability.

In theory, an inflation-targeting (IT) central bank would prefer the lower variance of inflation rate more than a non-IT central bank would. So, other things being equal, the IT central bank would prefer point C to point A along the Taylor curve. In reality, however, it is not clear that the adoption of IT by itself has led to a qualitative difference in the performance IT central bank compared to that of non-IT central banks.

The author's findings may be explained in the following ways. First, they may be due to the difficulty in identifying points on the Taylor curve. For example, a non-IT country could be at point B while an IT country is at point C. Second, the shape of the Taylor curve may not be the same for all the countries. Third, as countries move towards close financial integration, they lose monetary independence (vis-à-vis a base country, say the United States) even if exchange rates have been allowed to vary further. (Aizenman et al. (2008)).

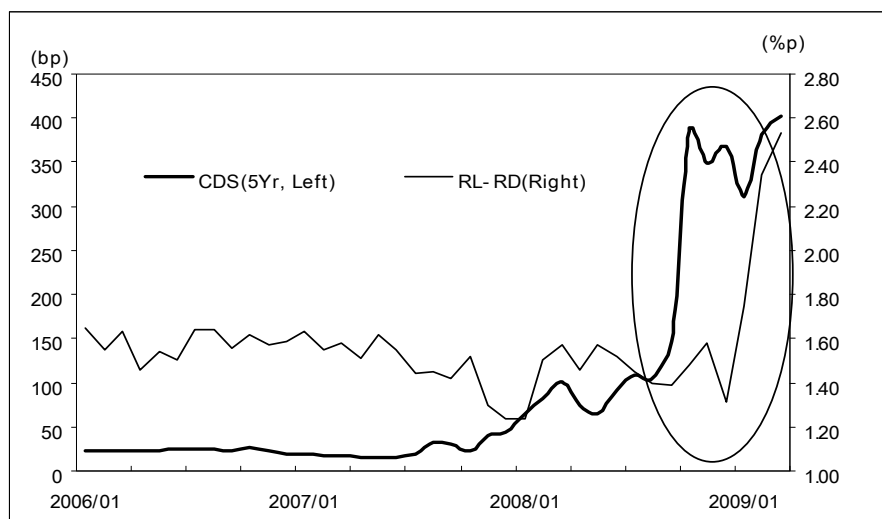
The authors' conclusion, that an emphasis on price stability may be more important than adopting an IT regime in improving outcomes, can be interpreted as suggesting that an emphasis on price stability may help to enhance the efficiency of monetary policy.

I think the paper nicely documents the performance of monetary policy in the Asia Pacific region after the Asian Financial Crises and gives an excellent evaluation of the IT and non-IT regimes. It also provides important policy implications for the conduct of future monetary policy.

Discussion of “Financial deleveraging and the international transmission of shocks” by Michael B. Devereux and James Yetman

The authors have built a 'double drain' model in which international financial shocks easily cause domestic credit crunches. After the collapse of Lehman Brothers double drains emerged not only in developed countries but in emerging market countries as well. In Korea, as seen here, when the CDS premium sky-rocketed in October 2008, the difference between lending and deposit rates in the banking sector also rose sharply, with a three-month lag (Graph 2). In fact, the liquidity of the inter-bank market dried up immediately after the Lehman collapse.

Graph 2
Double drain: Korea



The core assumption of the paper is the investor's borrowing constraint: $B_t^l = \kappa q_t k_t^l$ where $\frac{1}{1-\kappa}$ is the leverage ratio and $q_t k_t^l$ is the product of a vector of domestic and foreign asset prices and a vector of the amount of domestic and foreign asset invested, respectively.

This borrowing constraint has important implications. It results in a very high correlation across countries in borrowing and investment. The increased diversification leads to a greater sensitivity of home leverage constraint to foreign asset prices. Naturally, greater diversification magnifies the propagation mechanism by which shocks are transmitted internationally. Hence, the greater the leverage ratio, the larger is the deleveraging multiplier.

Negative productivity shocks in the home country result in a reduction in investors' borrowing both at home and abroad. A consequential reduction in investment and a fall in the prices of assets held by foreign investors lead to a tightening of the leverage constraint. The novel feature of the paper is that, even though the leverage ratio does not change, the response to the shock is proportionally much larger than the shock itself. This is explained by the interaction between asset price declines and the binding leverage constraints.

The paper has important implications for the central bank's monetary policy. The central bank should lean against the wind and an aggressive monetary policy response to deleveraging may be optimal. I think the result of the paper is robust. Kim (2009) has investigated the similar issue using a small open economy model and derived the same policy implication.

General discussion on BIS research on monetary policy and exchange rate

The BIS research has offered us valuable resources to deal with the current crisis, when both academia and the central banks community failed to see it through. Especially, I would like to point out some noteworthy research findings.

Price stability and financial stability

The BIS has emphasised that the pursuit of consumer price stability is not sufficient to guarantee macroeconomic stability, based on the fact that major economic and financial crises have occurred without being preceded by inflationary pressures. The BIS has also stressed the importance of liquidity and credit. The main reason is that, due to financial liberalisation, the adoption of anti-inflation monetary policy regimes, and globalisation, real interest rates have been so low and liquidity has expanded so much without putting pressure on inflation. Here liquidity and credit play a key role in asset price fluctuations, so that unusually rapid credit growth and large increases in asset prices are indicators of financial imbalances. Furthermore, the BIS has pointed out that the issue of household indebtedness needs to be addressed before it becomes excessive, since a high level of household debt increases the sensitivity of a household's financial condition to changes in interest rates. In summary, the BIS has consistently insisted that financial imbalances should not be ignored.

Policy responses

The BIS has urged implementation of countercyclical monetary policy. Specifically, it has suggested that it is more appropriate for central banks to respond to asset price bubbles, given that tightening monetary policy when asset prices are inflating and easing when they collapse may increase social welfare under certain circumstances. In addition to monetary policy strategy, the BIS has suggested that macroprudential policy needs to support

monetary policy in ensuring price stability and financial stability. This is because, to effectively restrain the build-up of financial imbalances during a low-inflation era, a macroprudential policy is needed. It is also essential that macroprudential policy tools be devised to alleviate procyclicality. In this regard, forward-looking measures are desirable since the usual prudential policy tools, such as loan provisions and minimum capital requirements, etc, are procyclical.

Exchange rates

The BIS has stressed that, to emerging market economies (EME), exchange rates matter not only with regard to macro variables such as inflation and foreign trade, but also for financial stability. Real exchange rate misalignments and currency mismatches have particularly important implications for financial stability. EMEs have used various policy tools to cope with volatile capital flows and volatile exchange rates. Monetary policy, market intervention, and regulations have been used, for example, and all have their pros and cons.

To cope with global imbalances, institutional changes are needed to strengthen the international adjustment process. For example, more formal currency blocs could be established, in which exchange rates are relatively freely floated against each other. Other more informal cooperative solutions can also be discussed, with a view to avoiding circumstances that may lead to systemic disruptions.

Discussion on the background paper prepared by BIS Asian office

In the morning session, the BIS Asian office raised and discussed important research issues. They included the new monetary policy framework, the exit strategy, financial instability, and foreign reserves and international cooperation among others. These cover a substantial portion of what many of us are concerned about, although there are some remaining issues that need to be elaborated on and thought out further.

New monetary policy framework

The BIS has emphasised the extended role of central banks. As we have seen through the global financial crisis, central banks are called on to deal with crises. But this gives rise to new concerns and questions: is there a risk that the independence of central banks will be weakened by their enhanced role in crisis management weakening? How can we deal with private sector moral hazard problems? What would be the best institutional arrangement between the central bank, the government and the regulatory authorities? These concerns and questions need to be appropriately addressed.

Regarding the inflation targeting regime, I think it should not be abandoned altogether. Abandoning IT would have a negative impact on inflation expectations and ultimately on central bank credibility. What we need is a better communications strategy, to help the public understand that our pursuit of other goals in the short run does not mean that we are ignoring price stability in the long run. Equipped with this better communications strategy, we can pursue multiple objectives.

Central banks may also need new monetary policy instruments, given that it may not be sufficient simply to manipulate short-term interest rates in order to prevent and/or deal with credit expansions and asset price boom-bust cycles. Here as well questions naturally arise. What are the alternatives? Can the central bank's bill be used as a new liquidity control measure? Should interest be paid on reserves? Or should the reserve requirement be asset-based? Furthermore, before employing any new instruments, we need to know how to

implement these alternative measures. We should also consider whether they are at odds with the conventional monetary policy tool, ie adjustment of short-term interest rates.

Exit strategy

How and when we signal our exit may be crucial because this influences the way that agents form expectations. The exit sequence – interest rates first or liquidity reduction first – also matters. It is also necessary to assess how the reversal of the monetary policy stance will affect the financial strength of households and financial firms, given that their balance sheets are still weak. The balance sheets of central banks are also at risk, mainly due to the huge size of our rescue programs. After taking all these factors into account, the speed of exit also has to be calibrated.

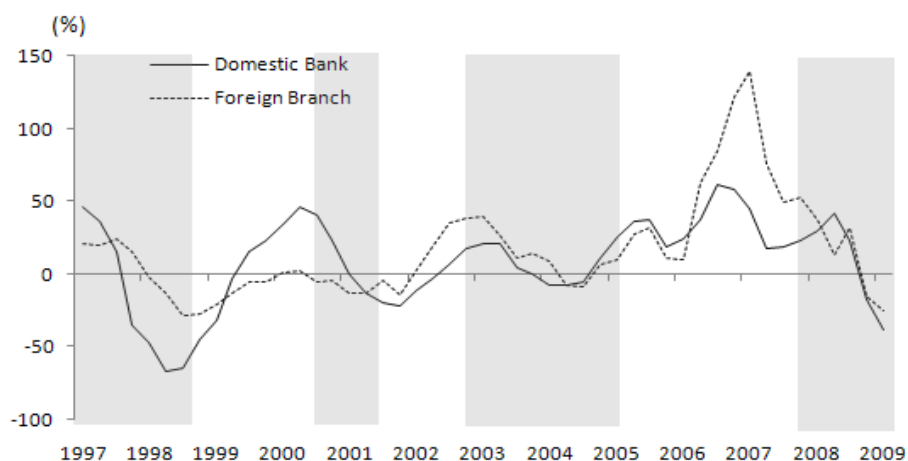
Financial instability and foreign reserves

Since the Asian financial crisis, EMEs have amassed great volumes of foreign exchange (FX) reserves. It is well appreciated that FX reserves serve as a self-insurance against the adverse side effects of deeper financial integration of EMEs (Aizenman and Lee (2005), Rodrik (2006)). However, the maintenance of excessive FX reserves has its own costs. In order to reduce the incentives for increased accumulation of FX reserves, enhancement of international cooperation alone may be insufficient. Other measures such as the strengthening of prudential regulations and the promotion of currency internationalisation are also necessary.

In EMEs, macro-prudential regulation should be extended to external sectors because they tend to generate procyclicality (Kaminsky et al (2005)). In Korea, short-term debt accumulation by the banking sector has shown strong procyclicality (Graph 3).

Graph 3

Growth of short-term external debt in Korea's banking sector



Note: Compared with the same period of the previous year

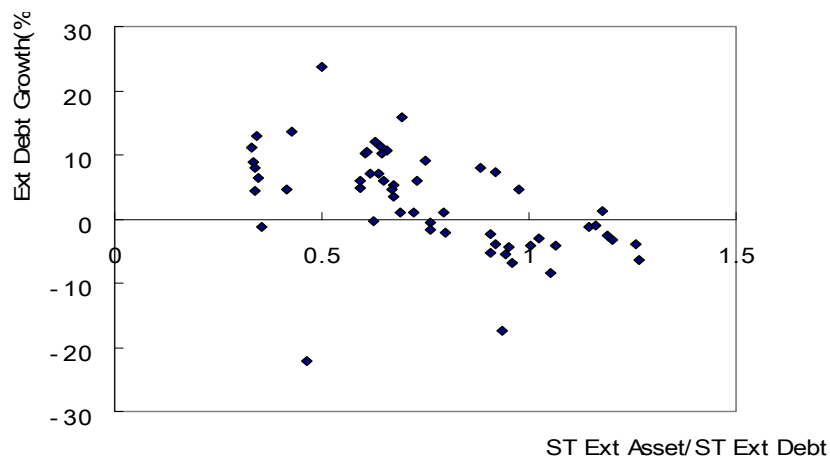
Source: BOK ECOS

Furthermore, the negative association between external debt growth and the ratio of short-term external debt to short-term external assets in the banking sector suggests that the risks of currency and maturity mismatch are positively correlated and should be considered as key vulnerabilities in Korea (Graph 4). This is the so-called 'capital inflow problem' (Kaminsky et

al (2005)). As strengthened microprudential regulation cannot prevent the capital inflow problem, macroprudential regulation in this area has to be introduced.

Graph 4

Banking sector's external debt growth and maturity mismatch



Note: Compared with the same period of the previous year

Source: BOK ECOS

Finally, I would like to add several possible issues for future consideration: how to suppress excessive external borrowing without dampening financial deepening; how to prevent exchange rates from acting as a financial accelerator; and, finally, how to minimise regulatory arbitrage among countries for cross-border capital flows.

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High-level policy panel on monetary policy and exchange rate issues: some thoughts on the future of inflation targeting

Amando Tetangco, Jr¹

1. Introduction

Our recent experience with global financial instability and its spillover effects into real sector activity has prompted a rethinking of some principal tenets not only on the global financial architecture but also on monetary policy.

As our economies stabilise, this may be a good time to think about the future of monetary policy under inflation targeting, which over the years has gained much currency with central banks and has become associated with good monetary policymaking.

Overall, my sense is that the practice of inflation targeting, particularly in emerging-economy central banks, has been quite flexible, largely out of necessity, and this has allowed monetary authorities sufficient room for manifold considerations while remaining mindful of the primacy of the inflation goal.

That flexibility, in my view, may point to the way forward.

I would like to organise my remarks this afternoon in the following manner: First, I will speak briefly on the experience of inflation targeting. Then, I will share our own experience with IT. Finally, I will lay out some implications of the ongoing crisis and policy options for IT countries in general.

2. The inflation targeting experience

Let me begin by presenting some observations about inflation targeting.

IT experience has been generally positive

Carl Walsh's (2009) recent assessment of the overall cross-country experience with inflation targeting suggests that the experience has been generally positive.

First, inflation targeting has proven to be durable because, despite many missed targets, no central bank has abandoned inflation targeting. Indeed, the ranks of inflation-targeting central banks appear to have increased since New Zealand first began using inflation targets two decades ago. Since 1990, IT has been adopted by 24 countries, of which 16 are emerging markets.

Second, IT has been associated with good inflation and macro performance. Interestingly, the spread of IT occurred during the period of the Great Moderation. And therefore, its popularity as a monetary framework coincided with better macroeconomic performance and generally lower and less volatile inflation.

¹ Governor of Bangko Sentral ng Pilipinas.

Third, IT has enabled greater transparency in central banks. As a framework, IT emphasises transparency. Therefore, the move towards greater central bank independence, occasioned by changes in their governing charters and the consequent need for greater accountability, became conducive to the spread of the IT framework.

As central bankers around the world became more transparent about their goals and operations, they also began to place much greater emphasis on their communication strategies. In addition, it has become increasingly clear that managing expectations is a key objective of monetary policy. Communication policy, which is central in the IT framework, has therefore risen in stature within the central banker's toolkit.

Fourth, IT provided flexibility in the conduct of monetary policy. One trend that has been suggested by research is that inflation targeters have not been “inflation nuts” (ie they have not been fixated on the inflation target). IT central banks have pursued their inflation targets in a flexible manner. They have broadly also paid due attention to the short-term consequences for variability in output growth. As observed by Roger and Stone (2005), IT central banks have willingly accepted some variability in inflation from targets to dampen excessive volatility in growth or unemployment, while also ensuring that inflation is brought back on track over the medium term.

A purist may say, this is a classic example of the problem of “time inconsistency of policy” that Kydland wrote about years ago. I would disagree (but) with a qualification. A “flexible” IT framework, as I just described it, is time-consistent if policymakers uphold the primacy of price stability. What becomes critical and the linchpin to make the framework workable is clear communication of policy intent. The centrality of transparency in IT makes it best suited to be the commitment mechanism, as Kydland would refer to it. Clearly, time inconsistency in a monetary policy framework – whether IT or otherwise – would be avoided if the policymakers are committed to the objective, and are seen to be credible.

IT practice confronted with issues

Apart from credibility and commitment, there are other “sticky” (difficult) issues that need to be considered in an inflation targeting framework, particularly for emerging market economies.

First, a perennial issue in any open economy is the role of the exchange rate.

This has been a particularly difficult issue for inflation targeters who had previously relied on the exchange rate as the nominal anchor for policy (examples include Brazil, Chile, Israel, Poland and South Africa). In some cases, the transition has not been easy, in part because it has been difficult to convince the public and the financial markets that the central bank has subordinated exchange rate and competitiveness concerns to the inflation objective.

Second, IT countries are not immune to disruptive shifts in investor sentiment.

Capital flows tend to follow a cycle, rushing in when the economy is strong and rushing back out again during times of decline. Prior to the recent crisis, emerging-economy inflation targeters in Eastern Europe, Latin America, and Asia experienced strong capital inflows, putting upward pressure on exchange rates and leading to ballooning current account imbalances and foreign exchange reserves. Given the varied reasons for these flows, determining the appropriate policy mix is oftentimes highly challenging.²

² Several central banks have felt compelled to respond with intervention in money and foreign exchange markets, administrative measures or restrictions to slow the pace of short-term capital inflows through regulations on foreign borrowing, foreign exchange transactions and operations of the banking system. The appropriate policy mix depends on various factors, such as the causes of capital inflows and outflows

3. The Philippine IT experience

Let me now move on to the Philippine experience.

The BSP formally adopted the inflation targeting framework in 2002. Our experience shows that inflation generally trended downwards from 1991 to the first two quarters of 2009. Output performance has also been generally steady during the period.³ However, economic activity has been affected by the downturn in external demand, especially during the latter part of 2008 in the aftermath of the global financial crisis, even though the Philippine financial system was only moderately affected by the turmoil.

In our case, the key benefits of IT were to enhance the policymaking process, increase policy discipline, improve focus on the price stability objective, and strengthen the credibility of the central bank. It has also greatly improved transparency.

Allow me to cite some empirical work to support these conclusions.

- Dincer and Eichengreen (2009) observed that among Southeast Asian countries, the Philippines has been the most transparent since 2002 insofar as monetary policy is concerned.⁴
- Research at the BSP indicates that inflation expectations have become a potent channel of monetary transmission under inflation targeting, and that the BSP policy rate is an important factor in shaping inflation expectations (Bayangos, Basilio, Floro and Glindro 2009).⁵
- McNelis (2009) shows that persistence in price-setting in the Philippines has fallen during the IT regime. McNelis, using a dynamic stochastic general equilibrium

(permanent or temporary), availability and flexibility of instruments and the condition of the domestic financial market.

³ The simple linear trend line from 1991 to 2009 shows that Philippine inflation has decelerated while real Philippine GDP growth has increased (with attached chart at the end of the presentation). A closer look at pre-IT and IT periods shows the following average for inflation and real GDP growth:

	Inflation (%)	Real GDP growth (%)
Pre-IT Period (Q1 1991-Q4 2001)	8.27	2.96
IT period (Q1 2002-Q2 2009)	5.46	5.01

⁴ Dincer and Eichengreen's transparency index is based on Eijffinger and Geraats' (2006) definition, which includes political transparency (that is, openness about policy objectives), economic transparency (openness about data, models and forecasts), procedural transparency (openness about the way decisions are taken, achieved mainly through the release of minutes and votes), policy transparency (openness about the policy implications, achieved through prompt announcement and explanation of decisions), and operational transparency (openness about the implementation of those decisions), with three subcategories within each of these five dimensions. Their overall index is the sum (equally weighted average) of the sub-indices for these five dimensions. The values are found at the end of the presentation.

⁵ In particular, a sustained one percentage point rise in the real BSP policy rate was simulated over a period of two years beginning January 2005. Simulations show that a sustained one percentage point rise in the real BSP policy rate reduces the expected inflation rate by 0.6 percentage point in the first 12 months and by an average of 1.1 percentage points over the entire 24 months.

(DSGE) model for a small open economy, estimated the effects of the monetary regime shift in the Philippines to inflation targeting. He finds strong evidence of structural changes in the Philippine economy following the shift in the monetary regime. In particular, the implementation of inflation targeting has reduced persistence in the pricing of home goods by more than 60 percent.

Looking more closely at our inflation performance under IT, however, it can be shown that there have been quite a few breaches of our inflation targets on both the upside and the downside. These breaches have stemmed from a confluence of global and supply-side factors beyond the control of the BSP, such as the surge in the international prices of oil and food commodities in 2008, resulting in higher domestic fuel and rice prices. Supply shocks, which continued over a longer period, contributed to second-round effects, affecting the wage and price-setting behaviour of businesses and households. These external and supply-side factors are listed under the BSP's explanation clauses.

In addition, in the course of implementing IT, the BSP has had to contend with certain operational and institutional hurdles that were not specific to IT itself. These issues include the BSP's ability to issue its own debt securities for monetary operations; the impact of off-balance sheet activities of banks on liquidity; and statistical gaps which include non-bank transactions. Such concerns, although fairly important, have not, however, gravely limited the BSP's effectiveness in liquidity management. The BSP Charter has empowered the BSP with sufficient flexibility to employ other creative monetary tools, allowing the BSP to carry out the necessary real-time assessment that underpins monetary decision-making.

Despite these supply-side shocks, external factors and institutional issues, the Philippines still saw a reduction in the volatility of headline inflation during the IT period. From a level of 3.47 from first quarter 1996 to first quarter 2001, the standard deviation of monthly inflation fell to 2.08 from the first quarter 2001 to the second quarter 2007. In a similar manner, average inflation fell from 5.84 percent to 5.04 percent during the same period.⁶

In sum, while the BSP's overall experience has been positive, we are aware that inflation targeting does not offer a magic formula for insulating a country from external financial disturbances or other influences on the real exchange rate and external competitiveness. In that respect, IT is no different from alternative policy regimes. However, for the Philippines at least, the formal adoption of IT clearly defined the specific objectives and parameters under which monetary policy decisions should operate. The IT framework continues to provide a focus in the implementation of monetary policy, and provides an anchor for accountability and transparency. These have made communication of policy actions much more efficient and effective.

4. Implications of the global crisis to IT and monetary policy settings

Let me now just quickly speak about some implications of this current crisis for IT and monetary policy setting.

The experience of the ongoing global crisis has sparked debates on whether central banks can afford to care only about inflation, even though the primary goal of monetary policy is still price stability. A key question going forward is how to maintain a primary focus on inflation in a context where concerns about financial stability, the potential volatility of international capital flows and asset prices, and the variability of economic growth are also seen as important policy objectives.

⁶ See Siregar (2008), "Inflation Rates of Emerging Market IT Economies," IMF, July.

Recently, the idea that central banks should also care, in particular, about asset prices has gained some support. A view that has gained greater currency is that policymakers should care about asset price and credit booms, especially because build-ups in systemic risks often precede economic downturns. Equally important, asset price movements have important implications for the real sector and for spending behavior via the wealth effect.

As the debates develop, we shall see that the concern about asset prices in fact relates to the broader issue of the nexus between monetary and financial stability.

Indeed, the evolving nature of our economic operating environment, as evidenced by the roots of this crisis and the rapidity with which it spread, begs a second look at how we conduct policy. Going forward, there may be a need to combine monetary and regulatory policies into a macro financial stability framework. This necessarily calls for closer cooperation between monetary authorities and financial regulators in assessing the build-up of systemic risks and in deciding how to mitigate them. Central banks should further enhance the understanding of financial linkages in the transmission of shocks and monetary policy. This need has been made more evident in this crisis by the fact that aggressive and non-conventional monetary policy action had to be undertaken to rein in the impact of shadow banking. Shadow banking, as we now all realise, was created largely by the unregulated financial engineering that took place in the guise of risk mitigation. Finally, as financial markets become more integrated, central banks will have to also pay closer attention to vulnerabilities posed by the financial systems of other countries, as well as to the impact of other jurisdictions' monetary policies on our own domestic markets.

There have also been proposals for a more countercyclical conduct of both monetary and regulatory policies. For instance, both monetary and regulatory instruments could be used to lean in a systematic way against credit excesses in the upswing of the cycle.

Although there is merit in these suggestions, there must also be the realisation that such a framework would imply a different mindset. Such may require, for example, that, from time to time, interest rates would be raised even when near-term inflation seems to be well under control. In addition, such efforts to mesh together monetary and supervisory policy would need to be done on a broad, all-encompassing scale, since attempts to reduce risk in one segment of the financial system (for example, the banking system) may only shift risk-taking activity away to other segments or markets.

As we move forward, we will again see that, as in all that is dear to central bankers, a tight balancing act is required.

5. Conclusion

Allow me to conclude with these thoughts:

- It is clear that inflation targeting has made a significant mark on the practice of monetary policymaking, and the overall experience with inflation targeting appears to have been positive. Inflation targeting is thus likely to remain a good choice of many central banks for the foreseeable future.
- The experience also suggests that, far from being a strictly rules-based activity, the practice of monetary policy under an inflation targeting regime has ample room for the judgment and discretion of policymakers. More importantly, inflation targeters do not care solely about inflation, as they also give due consideration to output conditions.
- Finally, perhaps the relevant question going forward is whether inflation targeters will begin to broaden their objectives, to allow for important considerations such as financial stability, for example. Judging from the relative flexibility in the

implementation of inflation targeting that we have seen thus far, particularly in emerging economies, my thinking is that this may be the case in the future. A broader reaction function may be viewed by some as a dilution of – or at least a shift away from – the original idea of inflation targeting. To my mind, however, it would represent an evolution of the framework and a way forward for IT central banks.

The work of the Asian Research Program has been a great support to the BSP in our own research and as we have tried to fine-tune our own monetary policy implementation. Let me therefore take this opportunity to commend the BIS and all those who participated in the ARP. As we continue to try to find answers to the questions I have raised today on the way forward for monetary policy, in general, and inflation targeting, in particular, I am certain efforts such as the ARP will continue to be useful and I hope will be sustained.

Thank you for your attention.

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High-level policy panel on monetary policy and exchange rate issues: the RBA'S monetary policy challenges during the international financial crisis

Ric Battellino¹

1. Introduction

The past year has been a very challenging period in Australia as it has been elsewhere. So far, however, the Australian economy has weathered the global financial crisis relatively well.

There are a number of factors that may have contributed to this, which I will touch on in my comments. But let me start by briefly describing the economic and financial background in Australia prior to the onset of the crisis. I will then outline the challenges we faced over the past couple of years, as well as the measures we took in response, and provide an assessment of how effective they have been.

2. Some background

The economy

In the years leading up to the onset of the crisis, the main challenge the RBA was facing was the risk of overheating in the Australian economy.

This was mainly due to the sharp rise in the terms of trade, which in 2008 reached their highest level since the wool boom of the 1950s. They were about 70 per cent above their long-term average.

The boom in income from the terms of trade led to very strong spending; the labour market became very tight, with unemployment at generational lows; and inflation rose above the target range of 2–3 per cent to a peak of around 5 per cent.

The financial system

Like many other developed economies, Australia had experienced a very large increase in house prices since the mid-1990s.

But the ratio of house prices to income peaked much earlier in Australia than in most other countries – in 2003 – and this ratio had adjusted down substantially by the time the global financial crisis hit. High interest rates, jawboning by the RBA about the dangers of a housing bubble, and supervisory pressure by APRA on banks to maintain lending standards were all used to help restrain house prices.

The other feature of the Australian housing market that differed from some other countries was that lending standards did not deteriorate to any significant extent during the boom. Sub-prime loans were less than 1% of the market. Arrears rates on housing loans have remained low, at around 0.5%.

¹ Deputy Governor of Reserve Bank of Australia.

Finally, and related partly to the previous two points, the Australian banking sector has remained in a very healthy position over the past couple of years. Profits have remained high and banks continue to be well capitalised; domestic loan defaults have been low; and Australian banks' international exposure to US sub-prime loans has been negligible.

3. RBA responses to the crisis

Mid-2007 to mid-2008

When the crisis first emerged in mid-2007, the RBA saw the challenge as being mainly to ensure that Australian banks and other market participants had adequate access to liquidity.

That was not too difficult because the RBA has always had flexible liquidity management arrangements:

- we deal in a wide range of securities;
- we deal with any counterparty who has eligible collateral; and
- we are flexible in the terms to maturity of our repos.

The challenges faced during that first year of the crisis – from mid-2007 to mid-2008 – were readily dealt with by existing liquidity management arrangements. There were no significant changes to operating procedures, although the RBA provided a greater than usual volume of reserves to the banks, and it somewhat lengthened the term of its repos.

There was no adjustment to monetary policy at that stage on account of the crisis because, as noted, the crisis up until then was centred largely on a shortage of liquidity and was readily dealt with through market operations. Monetary policy continued to be tightened through to early 2008 due to rising inflationary pressures.

September 2008 onwards

After the collapse of Lehman Bros in late 2008, the economic and financial situation in Australia changed abruptly, as it did in all other countries.

In response, monetary policy was eased quickly; six years of tightening were unwound in the space of six months, though official interest rates in Australia did not fall to the low levels seen in a number of other countries.

The reduction in official interest rates in Australia was passed through to interest rates on loans to borrowers to a greater extent than in other countries. That is, borrowers in Australia benefited from larger reductions in interest rates than those in other countries, which made the monetary easing more effective. This reflected the fact that:

- the banking sector in Australia was healthy and therefore operating effectively; and
- Australia has a predominance of floating rate loans so the interest rate cuts passed through to borrowers very quickly.

The RBA through this period did not give any promises or guarantees about the future path of official interest rates. We are pleased we did not do so, as this has preserved flexibility in exiting from the “emergency” setting of interest rates that was put in place during the crisis.

As well as easing monetary policy sharply, the RBA undertook a number of “balance sheet” measures to reduce stress in the financial system:

- the supply of bank reserves was increased substantially further after September last year;

- the range of collateral accepted in repos was also widened further, though the requirement for collateral to be AAA rating was retained;
- the term of repos was lengthened considerably;
- a term deposit facility at the central bank was introduced to allow banks to park excess liquidity; and
- the RBA joined the list of central banks with which the US Fed undertook foreign exchange swaps. (Australian banks did not need US dollars, but Australian pension funds did, in order to roll over hedges on US investments. The bulk of the US dollars supplied by the Fed, however, were in fact recycled, through Australian banks, back to banks in the northern hemisphere.)

These measures continued to give the RBA a high degree of control over money market interest rates, and the overnight interest rate in the market rarely departed from the target rate.

These measures proved very effective and have now been fully reversed. The RBA's balance sheet is back to the level it was before the crisis; and the provision of bank reserves has been scaled back to relatively normal levels. Our experience through this period reinforced the importance of central banks having flexible procedures for market operations, so that they can respond quickly, and without adding to the sense of crisis, to evolving market circumstances.

Another important development was that the exchange rate fell sharply – by more than 30% in the space of three months. This helped insulate the Australian economy from the collapse of global demand. The RBA did not stand in the way of this initially, but undertook some intervention towards the lower end of the exchange rate range, to help stabilise conditions. A flexible exchange rate remains one of the key factors behind the resilience of the Australian economy, due to the consistent tendency of the exchange rate to move countercyclically.

4. Government measures

As well as the monetary and balance sheet measures taken by the RBA, the Australian government also undertook a range of measures to support the financial system and economic activity. These included bank guarantees, credit easing policies and fiscal easing.

Bank guarantees

When the crisis hit, most countries with deposit insurance arrangements responded to the loss of depositor confidence by increasing the size of deposits that were insured. Australia did not have a deposit insurance scheme at that time and the Australian Government responded to the crisis initially by guaranteeing all deposits of all authorised deposit taking institutions, for free.

This was subsequently amended to put a cap of \$1 million on deposits that were automatically guaranteed for free. Larger deposits are only guaranteed on application, for a fee.

The guarantees on bank deposits were certainly effective in calming community fears. An important policy challenge will be how and when to reverse them.

A guarantee on wholesale funding was also introduced, as it was in many other countries. This was very effective in allowing banks to sustain access to wholesale markets and, in the event, Australian banks for a time were among the heaviest users of wholesale funding

guarantees. Their use of the guarantees has diminished sharply as market conditions have improved.

Credit easing policies

The RBA did not engage in any credit easing policies. The credit exposure on its balance sheet today is no higher than it was a year ago.

The Australian Government did, however, undertake two initiatives that can be thought of as “credit easing” policies:

- it set up a small fund to provide financing to car dealerships after some vehicle financing companies withdrew from the market; and
- it bought, through its debt management agency, a small amount of mortgage-backed securities to help maintain the flow of new securitisations.

Fiscal policy

The Australian Government also engaged in a very large fiscal expansion. It had ample scope to do so because Australia had run budget surpluses for much of the previous decade, and had paid off all government debt.

The strong starting position on fiscal policy, plus the fact that the Government was able to publish a credible path for return to fiscal surplus, are likely to have contributed to the effectiveness of the fiscal easing.

Banks and public sector authorities: the international financial crisis and policy challenges in Asia-Pacific

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I. Introduction

The aim of this paper is to view the current financial crisis through the prism of conceptual models of the basic relationships between the commercial banking sector on the one hand and the public sector authorities, comprising the government, especially the ministry of finance, central bank and specialist regulatory/supervisory authorities, on the other. In Section II, I set out my interpretation of the Anglo-Saxon model of this relationship, as it stood in June 1997 before the crisis, and contrast this with a less clearly defined Asian model; the European (Rhineland) model being an uncomfortable mixture of the two.

In Section III, I describe how the original Anglo-Saxon model imploded under the pressure of events (2007–09), and how it is being gradually refashioned, visiting various dead-end turnings along the way. In some respects, this has brought the two models, the Anglo-Saxon and the Asian, closer together. I conclude, in Section IV, by asking whether the remaining differences may disappear, so that the world moves closer to a unified model.

II. The Anglo-Saxon model and its Asian counterpart

A. The macroeconomic structure

The main focus of monetary policy, in the Anglo-Saxon model, has been for the central bank to set (short-term) interest rates so as to hit an inflation target, whether implicit (USA) or explicit, over some future forecast horizon.² With some admixture of luck, such inflation targeting did lead to some fifteen years (1992–2007) of growth and stability, the “great moderation”, a golden age, at least in the Anglo-Saxon developed countries. There were some weaknesses, eg the notorious ‘imbalances’, low savings rates in the Anglo-Saxon countries, enhanced inequality etc, but so long as the good times continued, these issues were put on one side to be addressed later.

The implicit assumption was that, as long as the macroeconomy held stable, so too would its financial infrastructure. Or to put the same point another way, if the financial system autonomously misbehaved, this might be expected to show up quickly enough in forecasts for the output gap and inflation to allow successful remedial action through the standard official interest rate tool. The success of Greenspan’s Fed in doing just that on several occasions reinforced the credibility of this hypothesis.

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² The standard Taylor reaction function is faulty because it relates decisions to **current** inflation and output gap rather than to **forecast** values of these variables, but it explains policy quite well ex post, because current and past values of those variables are the main factors driving the forecasts of their future values.

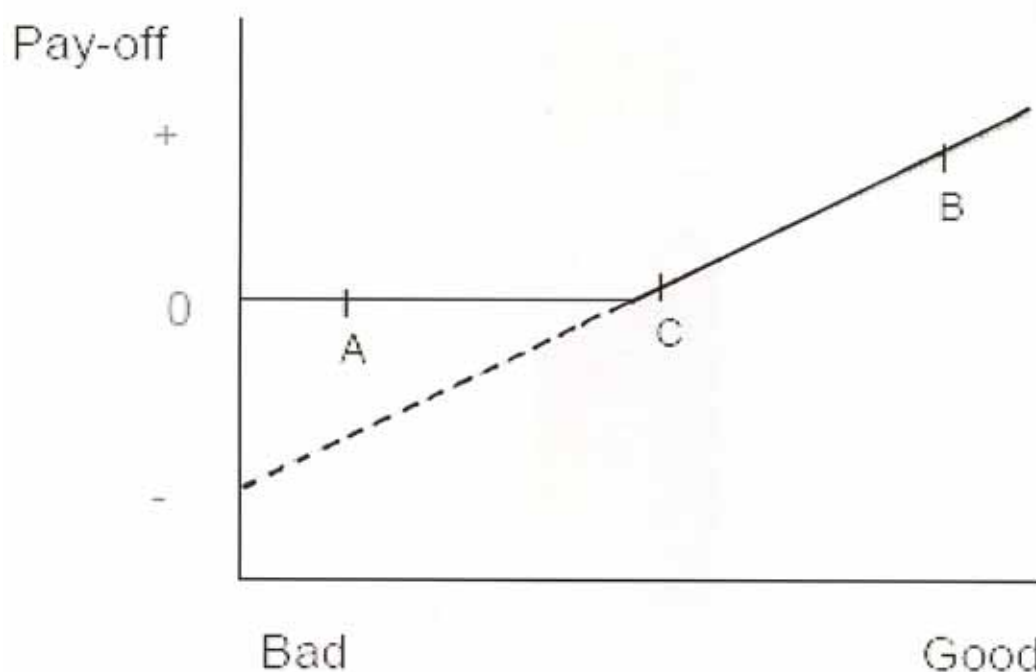
B. The incentive structure for bank executives

Within the Anglo-Saxon model, key decisions are taken by a firm's or a bank's top executives. While the board, key stake-holders, the government and public opinion all have some influence, at least on some occasions, and decisions are always taken within a context, nonetheless such decisions are generally taken independently by top management.

The main theme of governance theory and of practical remuneration policy had been, over previous decades, to aim to align managerial interests with those of shareholders. This was done, with a vengeance, by rewarding top managers, mainly via bonuses, for success in achieving steady earnings growth and rising share prices. Given the difficulty of distinguishing between prudent risk aversion and plain bad management during booms, and the relatively short expected shelf-life of a top manager, this would usually lead to short-termism.

Perhaps more importantly, the limited liability of shareholders meant that they and a fortiori their top managers would prefer a risky option (with the same expected mean outcome) to a safe policy. This is shown in Diagram 1, where a 50/50 chance of A or B will always be preferred to C. One answer to this had been to organise some (particularly risky) financial institutions into partnerships rather than limited liability companies (eg the large US investment houses), but this practice had eroded over time, partly because of the advantages companies enjoy in raising new capital and partly from the desire of existing partners to cash in their chips while they could.

Diagram 1



A more realistic constraint on such risk-seeking was meant to come from minimum capital requirements, and from tying executive bonuses and wealth to the value of the company. If the (required) capital position of a company (bank) is raised from C to B in Diagram 1, then the advantage of the risky option, with the same dispersion as before, over the safe option disappears. Moreover, the requirement that banks hold minimum capital provides a buffer to absorb losses, and protects the taxpayer and the public sector from having to pick up the pieces.

C. Regulation and supervision

Consequently the focus of regulation and supervision in the Anglo-Saxon system was to ensure the provision of a sufficient minimum capital buffer. Moreover, as long as the buffer was sufficient to ensure solvency, it was held that liquidity could always be attained by accessing the broad and efficient wholesale money markets. Given the availability of such funding liquidity, regulators/supervisors allowed banks throughout the Anglo-Saxon world to cut back their asset liquidity to a tiny fraction of what had been in place, say, in the 1960s.

The general belief, eg of Alan Greenspan, was that, with sufficient capital and personal wealth tied up in their own companies, top bank executives would never allow their own banks to come under serious risk of collapse.

Hence regulation could be light-touch and based on general principles rather than intrusive intervention. Indeed, the original *raison d'être* of the Paulson Report in March 2008 was to try to lighten capital market regulation in the United States to cope with competition from London; the abrupt mid-draft change of direction in that Report is rather obvious.

A serious problem with the precept of leaving risk management primarily to bank executives is that the probability of really severe tail events, such as a major systemic crisis, cannot be easily established, if at all. (Early warning exercises have a poor track-record.) Moreover, private sector bank executives would often regard it as being the public sector authorities' responsibility to cope with a crisis. So the risk management models used by banks, such as Value at Risk, tended to focus on sensible procedures for handling normal conditions, represented by normal distributions, rather than on extreme tail events.

But their models were, at least initially, technically much more sophisticated than those of the regulators/supervisors, so the latter tended to get cognitively captured, in that they used the models developed to assess and to control risk conditions in individual banks under 'normal' conditions, rather than to examine the effects of major shocks on the financial system as a whole. This syndrome reached its apex with the adoption of Basel II, which, combined with the simultaneous application of mark to market, fair value accounting, had the unintended effect of making the official regulatory system much more procyclical and unstable than previously.

D. The Asian model

Whereas the basic (USSR) communist model of finance was clearly distinct from the Anglo-Saxon model, it is harder to identify a clearly Asian model. Nevertheless I would suggest, though others will know better, that there are some distinct features of the Asian approach, by which I primarily mean the banking systems of China, India, Indonesia and Japan.

Amongst these are:

- (i) A much greater willingness to have a sizeable proportion of the domestic banking system under public sector ownership and/or control. Where there are private sector banks, these are more likely to be family-owned and/or related to industrial groupings than the limited liability companies with widely dispersed shareholders of the Anglo-Saxon model. Thus there are likely to be more external constraints on the authority and power of bank executives in the Asian model.
- (ii) Much greater direct influence from the public sector, especially from the ministry of finance/central bank in providing guidance on the amount of bank lending to the private (and public) sectors, and even guidance on the sectoral distribution of such lending, eg towards agriculture, construction, infrastructure etc.

Anglo-Saxon free marketeers claim that the greater direct intervention of the public sector with the banking sector leads to allocative inefficiency, a higher incidence of non-performing-loans

and, ultimately, more corruption. But it also greatly reduces the pressure for short-term profit maximisation.

By the same token, the wish of the authorities to encourage growth, together with the comparative power of large industrial borrowers vis-à-vis Asian banks, has helped to make banks rather than the (relatively) undeveloped capital markets the primary source of external finance.

Again, the closer and more continuous involvement of the public sector with the banks has also meant that the external control mechanisms of the Anglo-Saxon system, eg transparent accounting and external supervision, are less well developed in the Asian system.

In part because shareholders are less important in this system than the public sector and/or dominating family/industrial influences, the appointment mechanism and incentive structure of top managers differs from that of the Anglo-Saxon world. Top managers are less likely to be promoted from within each bank and more likely to be parachuted in from outside (perhaps from public sector bureaucracy or industry). Once again, short-term profit maximisation, though not unimportant, will often be less crucial for preferment than an aptitude for carrying out the wishes of those ultimately in charge. Rewards and incentives come less in the form of pecuniary rewards (eg bonuses) and more in the guise of ascendancy to a higher rung in the ruling hierarchy.

Under these conditions, regulation and supervision is simpler and more basic, partly because external control is exerted more directly. With less regulation, there is less incentive for regulatory arbitrage. For all these reasons, there has been less financial innovation in the Asian model, which now seems much closer to traditional banking than the Anglo-Saxon system with its penchant for derivatives, off-balance sheet shadow banking, securitisation etc.

III. The implosion of the Anglo-Saxon model

A. The macroeconomic context and the sad history of the crisis

The macroeconomic context continued to appear benign through 2006 and up to August 2007, as can be verified from forecasts issued up to that date. To be sure, official US interest rates in 2003–05 were held perhaps 1% or even 1.5% too low, or so it appears with the benefit of hindsight. This contributed to the housing boom both in the USA and abroad, and also fomented the search for yield and the expansion of financial leverage. But, pace John Taylor in “Getting Off Track” (2009), I find it hard to believe that a relatively minor error in setting interest rates could really destabilise the bulk of the Anglo-Saxon financial system, (and if it did, it would suggest that the system was remarkably precarious).

Instead my belief is that the crash proceeded from the scenario outlined by Hyman Minsky (1977 and 1982), whereby stability carries within itself the seeds of future instability. A combination of the ‘great moderation’ with low interest rates caused all financial institutions, especially banks, to expand leverage. This was particularly so in Europe, where there was no required leverage ratio, so that European banks leveraged themselves up, often at a ratio of 50:1, by buying highly rated tranches of mortgage-backed securities. It was also the case among investment houses in the United States, where leverage constraints had recently been relaxed. It was no accident that the epicentre of the crisis was to be found in these two sectors.

The adoption of the procyclical combination of Basel II and mark to market accounting served to hide the fragility of the overextended financial and banking positions both from the regulators and from the regulated. Northern Rock had a leverage ratio of more than 50:1, was highly reliant on wholesale funding and was making mortgage loans with no equity buffer

in the overheated UK housing market. Yet a couple of months before its effective demise in September 2007, the Financial Services Authority judged that its compliance with Basel II was so good that it could even increase its dividend! Similarly the profitability and balance sheet positions of banks in the USA and elsewhere appeared so comparatively strong in mid-2007, (partly because the shadow banking system was only dimly perceived by the regulators), that it appeared improbable then that the relatively minor losses in asset values following from the downturn in the US housing market and the demise of subprime could not be quite easily absorbed by these profitable and well capitalised banks.

The initial losses were indeed quite small. But the banks (and other parts of the financial system) were overleveraged and overextended. Meanwhile, both the high profits and excess capital buffers were, to a considerable extent, figments of inflated asset values and credit ratings. In reality the margins were much thinner. Banks and professional investors came fairly quickly to recognise this fact, with the corollary that the solvency of some parts of the shadow banking system and, by extension, of some banks was no longer absolutely assured. That led to the withdrawal of asset-backed commercial paper, to the closure of wholesale markets and to severe liquidity problems that interacted with solvency concerns.

All this led to massive deleveraging, several self-amplifying destructive value-reducing spirals (see the Geneva Report, Brunnermeier et al, 2009), until the whole process came to a cataclysmic halt in September 2008 with the bankruptcy of Lehman Brothers and the rescue of AIG. During the intervening period, central banks had been struggling to meet the steadily increasing demands for liquidity by lending to an ever-widening set of financial institutions on an ever-widening range of collateral assets at ever longer maturities.

But central banks cannot provide capital. As market prices and credit ratings went into reverse, more capital was required and, as the financial system weakened, the market began to demand ever higher capital buffers. Not surprisingly the capital market became closed, most of the time, to new equity issues by banks. Sovereign wealth funds that made investments during the few windows of opportunity generally came to regret them. During this period the authorities failed to prevent continuing dividend payments and massive compensation packages; indeed they had no legal powers to do so. Nor could banks cut back unilaterally on such out-payments without adverse signalling implications. Thus the banks and many associated financial intermediaries, such as monoline insurers, became massively under-capitalised.

Eventually the state had to step in, using taxpayer funds on a gargantuan scale. The alternative was complete financial collapse, as the Lehman bankruptcy presaged. Partly to limit the fiscal burden, the authorities also sought to encourage and perhaps even put pressure on the bigger and better capitalised banks to absorb their failing brethren, often by waiving anti-trust and cartel regulations, as in the case of Lloyds and Halifax/Bank of Scotland in the UK. The result has been the concentration of banking systems in the Anglo-Saxon countries into a small number of vast and widespread enterprises that are probably too large to control efficiently (Citigroup and Bank of America) and certainly too large to close.

B. Whither the Anglo-Saxon model?

The old basis of the relationship between the public sector authorities and the financial system in the Anglo-Saxon model, whereby the public sector sets the broader macro-economic and regulatory context and the private financial system decides autonomously on its own behaviour within that framework, has been upset, if not blown away entirely. It is not just that the public sector has come to own all the banks in Iceland and Ireland, and large swathes of the financial sector in the United States (Fannie Mae, AIG etc), in the UK (Lloyds, RBS), and in Europe (Fortis, Dexia, HRE, Landesbanken) but, probably more importantly, the public sector has now effectively guaranteed virtually all non-equity liabilities, including various kinds of subordinated debt, everywhere. The public sector has become the guarantor

not just of bank liquidity but, except for equity shareholders, effectively of the solvency of all systemic financial institutions. Moreover, in a crisis, a widening range of institutions, even quite small ones such as the Dunfermline Building Society in Scotland, may be regarded as systemic.

State ownership of private sector financial institutions has been assumed reluctantly in the Anglo-Saxon countries, as an unfortunate concomitant of the necessary recapitalisation. Steps have been taken, wherever possible, to design the recapitalisation (eg by the issue of preference shares rather than by diluting equity) so that business decisions can be left with private sector managers. Even when a controlling equity stake is taken, the role that the public sector adopted has generally, at least in public, been one of an arms-length shareholder with no direct say in decisions.

The model that the Anglo-Saxons are following is the one applied during the Scandinavian banking crisis of the early 1990s. In this case, the authorities took into public ownership the banks most in need of recapitalisation, injected new capital, tidied up the balance sheet, and were then able to sell the banks back to the private sector, at a profit, within a few years. But this rapid recovery was, in some large part, due to sharp depreciations of their currencies and a rapid rise in net exports, at a time when the rest of the world was (after 1992) growing quite fast (see Jonung, 2007). Such favourable macroeconomic conditions will not now be available to the developed world as a whole. Consequently any early sale of ownership stakes in such banks could probably only be done at a loss. To avoid having to absorb such a loss, governments may find themselves in a controlling position for much longer than they now hope.

Although governments have avoided the phrase 'nationalisation' largely for presentational and political reasons, there is a growing tension between the reality of control and the desire to avoid interference in what is seen as private sector decision-making. Much of the blame for the continuing recession is placed on the 'credit crunch'. But if the state actually owns some banks, why can it not just order them to expand lending? The rapid recovery of China, apparently fuelled by massive state-ordered expansion of bank lending in the first half of 2009, has not gone unnoticed. So we have the curious spectacle of the UK's Chancellor of the Exchequer, Alistair Darling, and his German counterpart threatening banks in general with (unspecified) sanctions if they do not increase lending to the private sector, and yet taking no apparent steps to enforce that policy where they have the power to do so (except in the case of Northern Rock, where a planned policy of running down the book was reversed by official decree).

Another political hot-spot of the recent crisis was the continuation of huge pay-outs to the executives of failing banks. Should a publicly owned bank really go on paying seven-figure salaries to top executives? The reported negotiation of a potential pay-out of more than £9 million to Stephen Hester, the new RBS chief executive, was unpopular.

If the public sector owns banks and other financial intermediaries, can or should it refrain from using its controlling position to achieve social or political objectives? For the time being, such questions are being sidelined on the grounds that such a controlling position is temporary, having been unwillingly and accidentally entered. If, however, the recovery is so anaemic that such stakes cannot be easily resold for many years, such issues may come to have greater prominence.

Banking decisions are already clearly influenced by the likelihood that public sector recapitalisation will bring with it constraints on private sector freedom of action in such delicate areas as remuneration and dividend policies, and perhaps on asset market decisions. If the banks can take action to reduce the need for public sector support, they will tend to do so. In some cases this may take the form of aggressive deleveraging, running down the balance sheet in order to preserve capital and hence avoid the need for public sector assistance. But such a response would only worsen the macroeconomic conjuncture.

Of course, banks claim that sluggish bank lending is due to a fall in demand but they are or have been tightening the terms on which borrowers can access funds.

But the questions about the implications for public/private roles in this field of public ownership of banks are, perhaps, minor compared with the questions posed by the state's role as the ultimate guarantor of the solvency of (non-equity) bank liabilities. In effect, the state has not only insured bank liquidity, via the central bank, but also the solvency of bank creditors. The implications for moral hazard are obvious.

This is not a comfortable outcome, to say the least. But what can be done about it? There are two natural responses. The first is to try to reset the structure so that we can return to the status quo ante, in which the state would no longer play a role as general guarantor. In this case, bankruptcy and the fear of private sector loss would provide some (enough?) discipline against excessive risk-taking. The second response is to accept that the financial system is central to any market economy, so that the state will always provide de facto ultimate insurance in a crisis. In this case, policy must be adjusted to reflect that reality.

There are several versions of the first proposal, most of which have a slightly quaint flavour of seeking to revert to an unspoilt Arcadian age before the wiles and innovations of investment bankers fouled the nest. One variant is the call to break up big banks, so they can be more easily shut. "If banks are too big to fail, they are too big," Mervyn King, Governor of the Bank of England, has said, and he has the support of Paul Volcker. Whereas it is true that some banks are now too big to fail on their own, even with zero contagion, the key systemic problem is contagion. Contagion depends on the interconnections and (perceived) similarities between the failing bank and its peers. Northern Rock was not large, but if Northern Rock had been allowed to fail, a run on Bradford & Bingley and Cheltenham & Gloucester would have occurred the day after, and on HBOS the day after that.³ If a large bank were to be broken up into segments that were just smaller-scale replicas of the original, then the contagion/systemic problem would remain almost as bad.⁴ As several economists have noted (see for example Acharya 2009, and Wagner, 2007/2008), contagion is a positive function of similarities between banks. The microprudential supervisor wants diversification within each individual bank; the macroprudential supervisor should want diversification between banks. A danger of microprudential regulation is that it forces all the regulated institutions into the same mould.

So, apart from the legal issues of whether the government should override private property contracts by forcing a break-up, it is doubtful whether having many smaller banks would help to ease contagion crises. Recall that it was the myriad of small banks that failed in the United States in 1929–33, whereas the more oligopolistic systems in some other countries, eg Canada and the UK, were more resistant. A more realistic approach is to assess how far the larger banks involve greater systemic risk, and then impose additional offsetting charges, (as discussed further below).

A second approach is to try to limit the range of institutions or functions to which the safety net applies. This theme goes under several headings, such as narrow banking or bring back Glass-Steagall. It is associated with the populist phrase that current banking combines 'a casino with a utility'. The latter idea has obtained surprising traction, even in the august

³ The sceptic will note that all these banks *did* eventually fail and have to be taken over, but crisis resolution is, in some large part, about playing for time, and seeking to avert panic. If such time is not well used, one may then just get a slower moving collapse. The difficulty in 2007–08 was that the basic concern was ultimately about solvency/capital adequacy, and this was not really addressed until after the Lehman failure.

⁴ But this approach might at least allow the first small bank to run into difficulties to go bankrupt, pour encourager les autres, even if runs on similar banks are then vigorously countered. When Barings was allowed to fail in 1995, the Bank of England prepared measures to support the other British merchant banks.

pages of the Financial Times. Perhaps the worst error of the crisis was to allow Lehman Bros to fail, but the firm had no retail deposits. In the populist jargon, it, together with AIG and Bear Stearns, were casinos rather than utilities. For reasons set out in my paper on “The Boundary Problem in Financial Regulation” (Appendix to the Geneva Report, 2009, and National Institute Economic Review, October 2008), regulatory constraints on a protected, narrow sector will drive business to the unregulated sector during normal times but provoke a flight back to safety during crises, thereby worsening the crisis.

Banking is about risk-taking, eg through the mismatching of maturities. Securitisation and derivatives are used to lessen and to hedge such risks. A narrow bank which has to hold all its assets (unhedged) to maturity can be very risky; is a 15-year fixed rate mortgage loan a suitable asset for a bank or a specialised building society (S&L) to hold? What exactly do the proponents of narrow banking suggest in the case of relationships with industry? Relationship banking, as practised in Asia and in continental Europe, exposes banks far more to the changing fortunes of their major clients than the more arms-length and capital market-integrated Anglo-Saxon model would do. It is arguable that the Asian/Rhineland model can only exist because the state is perceived as the ultimate guarantor. Presumably, without such a guarantee, the Anglo-Saxon model had to be safer, but it has now been shown not to be safe enough.

A third strand in this genre, which overlaps with the second response of adapting to the new reality, is to try to shift the burden of guaranteeing the banks back to the private sector. In this instance, the burden would be transferred to the debt holders, by forcibly requiring subordinated debt to be transformed into equity at the behest of the authorities in the event of a crisis. There is a question of the legality of this measure in the case of existing debt instruments, but some or all future debt issues could be required to include such a feature. But even with the present structure of debt, the debt holders of failing institutions, such as Fannie Mae, could have been penalised, as they were in the case of Lehman Bros. In the latter case, the effect was to transfer the losses to other debt holders, such as money market mutual funds, and thereby to widen the crisis. The US authorities, when they rescued a financial institution, generally did not impose losses on debt holders, mainly out of concerns for the reputation of their financial system, and for the cost of and access to funding in the future. When push came to shove, the US authorities were, therefore, not prepared to impose large losses on debt holders. Would they act differently in future if they did have the right to enforce the transformation of debt into equity? Perhaps but, if so, what would be the cost to the banks of being required to hold a second-tier tranche of transmutable debt?

There is a need to reconsider the role of (transmutable) debt as an element in banks' capital base, but, beyond that, most of the proposals for enabling the public sector to withdraw from its role as ultimate guarantor of the financial system would be ineffective, or damaging to efficiency, or both. So we need to turn to the second set of responses, which concern themselves with adapting to the new reality.

This new reality is that the public sector is the ultimate guarantor of both the liquidity and the solvency of all the systemic parts of the financial sector. In other words, the public insures the systemic components of finance. If we now view the state as providing such insurance, it gives guidance on what needs to be done to prevent the task becoming an excessive burden on the taxpayer, (who risks getting stuck with the cost of any pay-outs). Further, the state needs to ensure that systemic banks and other key financial institutions do not take advantage of their insured status to extract rents (moral hazard).

The answer must lie in, first, seeking to measure the extent to which the behaviour of the insured institutions places the state's insurance function at risk, and, second, in imposing sanctions, which could take various forms, on such behaviour. Both steps in this procedure are difficult. In the case of measurement, problems are made worse, inter alia, by externalities, whereby an act undertaken by an individual component will not be fully internalised but react, often in very different ways, on the system as a whole. This is due to

the intertemporal nature of finance, whereby actions undertaken now will have a probable, but uncertain and stochastic, effect in future, and to innovation, whereby the regulated will seek to mitigate any constraints placed on them by external regulation.

One example of an externality is the cutback in lending that an individual bank resorts to when its liquidity and capital adequacy come under pressure. But this simply transfers the pressure to the rest of the system. So, while it certainly remains essential to measure the liquidity and capital adequacy of each (systemic) individual institution, it will also be necessary to carefully monitor aggregate developments in financial conditions. Moreover, such developments have time-varying implications. A generalised rapid expansion (increased leverage) in domestic (bank) credit will initially enhance asset prices, profitability and economic activity. If pursued too far, however, so that asset bubbles develop, it will raise the probability of future bad debts, financial problems and future crashes. A problem is that such a future reversal remains stochastic, more likely but still uncertain. Accountants prefer to stick with what they can objectively measure, which does not include time and state varying probabilities of default. Hence attempts to measure financial fragility, such as in the Spanish dynamic pre-provisioning approach, frequently collide with the precepts of accountants, (and of the tax authorities who fear that the use of probabilistic measures can lead to the manipulation and deferment of taxes).

Unless regulation binds, it will not be effective. Effective regulation will prevent the regulated from carrying out their preferred policies. If so hindered, they will try to evade regulation by innovating their way around it. As Ed Kane has frequently emphasised, the regulatory process is dialectic, in which the regulated have more money, skills and incentive than the regulators. Those who have the greatest incentive to avoid the constraints of regulation, usually via innovation, are those who command the residual profits of the enterprise, especially since they can transfer all losses, via limited liability, to the public sector insurer and hence to the taxpayers. In this context a major error of Anglo-Saxon (banking) governance mechanisms was to seek to align the incentive structure, embedded in remuneration, of bank executives (and of key employees more generally) with that of shareholders (Bebchuk and Spamann 2009). Perhaps the more (bureaucratic) incentive structures of Asian banking were a strength rather than a weakness? I have, on occasion, advocated, with tongue only slightly in cheek, the allocation of a non-transferable unlimited-liability share to all senior bank executives that could be cancelled only on death or n ($n=3?$) years after leaving the bank. Some have retorted that this would unduly diminish risk-taking, the basis for the capitalist dynamic. Perhaps so, but then what remuneration structure would provide the optimal degree of risk-taking, given that alignment with limited liability shareholders leads to excessive risk-taking and unlimited liability to excessive risk aversion? Much more analytical research needs to be done here.

The question of sanctions is equally important and just as difficult. Indeed, one of the greatest weaknesses of the Basel Committee on Banking Supervision (BCBS) was that, as an advisory committee without any constitutional backing, it was constrained from considering or even advising on sanctions, since such legal matters lay in the province of each nation state. Thus the BCBS restricted itself to advising on principles and norms, without giving any advice on what to do if regulated entities either approached or fell below desired levels. Since the BCBS has taken the lead on (international) banking regulation, the proper structure of sanctions (to maintain and uphold good behaviour amongst the regulated) has been an under-researched field. This is particularly important since the choice of minimum satisfactory levels, eg of Tier 1 capital or of liquid assets, will always be somewhat arbitrary. What is necessary is to start putting remedial pressure on the regulated, as an institution falls below 'good' levels, in a graduated, but, steadily increasing, manner. About the only regulation to do so is the US FDIC Improvement Act of 1991, which was influenced by two economists, George Benston and George Kaufman.

There are several ways to apply sanctions. They could take the form of straight payments to the public sector authorities, premia for insurance, increasing in line with the measured risk.

Alternatively, they could take the shape of requirements for countercyclical or risk-weighted capital or additional liquidity. These measures would impose costs on banks (and may or may not provide income to the public sector) as they became riskier, raising the risks of the financial system as a whole. In short, risks increase with leverage and with the extent of maturity mismatching. The solution, therefore, is to raise taxes on banks in line with the extent of leverage and of maturity mismatch. The aim is to mitigate cycles in financial leverage and maturity mismatch.

Essentially the Anglo-Saxon model has been short of one necessary instrument, the ability to adjust regulatory pressure so as to restrain such financial cycles. Indeed, the direction of policy movement until recently, with the introduction of Basel II and mark to market accounting (both procyclical), was counterproductive and did nothing to restrain the recent severe financial cycle. The problem now is to design and to introduce a new instrument(s) that will provide such mitigation with the least cost to financial intermediation, and the best influence on appropriate innovation and risk-taking. This will not be easy, and is at an early stage of design. Some academic examples can be found in the Geneva Report (2009) and in Restoring Financial Stability (NYU, 2009, eds. Acharya and Richardson). Less has been written on this in official reports, since they have been more tentative (eg the white papers in the UK and of the US Secretary of the Treasury) and rarely couch the problem in this stark fashion.

IV. A synthesis of models?

As outlined above, the Anglo-Saxon model has now been shown to be flawed and will have to change in several significant respects. The public sector has clearly become the guarantor of all systemic financial institutions, providing both liquidity and solvency insurance. Fear of bankruptcy, especially within the context of limited liability (for shareholders and bank executives), will not restrain moral hazard. The public sector, as the provider of ultimate insurance, will now need to apply new instruments to prevent its insurance function being misused.

In the Asian model, the close links between the authorities and the key financial intermediaries have generally been more realistically appreciated. But the way in which such exposure to insurance payouts has been handled has been rather by direct external control measures than by broader market mechanisms. In the Anglo-Saxon model the aim is to induce the agent, in this case the bank executive, to follow desirable (ideally welfare-maximising) lines of behaviour by setting general market mechanisms, such as regulations, market prices, taxes and subsidies, and then letting the agent decide on his own (maximising utility) within this general framework.

That framework was found to be insufficient and Anglo-Saxons may, at least for a time, be less arrogant about the superiority of their approach. But they may succeed in patching up their framework by adopting generalised regulatory measures that apply countercyclical pressures to financial cycles in leverage and maturity mismatching. If they succeed in this approach, should Asian countries adopt similar mechanisms? And if they do, will this result in a closer match, a greater synthesis, between the two models?

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Contagion and risk premia in the amplification of crisis: evidence from Asian names in the global CDS market

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1. Introduction

The overriding analytical question of the global turmoil of 2007–09 is that of amplification. The turmoil started out in the floating-rate segment of the US subprime mortgage market, a relatively small part of the US mortgage market. Had the losses of US and other financial institutions been limited to those caused by defaults on subprime mortgages, the losses would have been easily absorbed and there would have been no global crisis. US and many European financial institutions, however, suffered losses on most other credit instruments as well, and so heavy were these losses that many of these institutions had to be rescued by their respective governments. Even Asia was not spared. In a region where exposures to US subprime mortgages were much smaller, borrowers' credit spreads rose in tandem with those in Europe and the United States. The question of amplification is then, how did a small problem get to be so big? In this paper, we focus on a particular aspect of that question: can one explain how the problem spread to the credit markets in Asia?

There has been no shortage of proposed amplification mechanisms.⁴ One mechanism is a positive feedback loop between conditions in the real economy and those in the financial system. Here, losses on mortgages led to a contraction in credit, which in turn caused the economic slowdown. The slowdown, in turn, led to further credit losses. Greenlaw et al (2008) propose a deleveraging mechanism. Given that financial institutions on average have a target leverage of ten to one, estimated losses of \$500 billion would imply that their balance sheets need to shrink by \$5 trillion, unless the institutions in question could raise new capital to cover these losses. During the crisis, the efforts to shrink balance sheets took the form of both asset sales and cut-backs in lending, both of which exacerbated the situation. Brunnermeier (2009) proposes a liquidity spiral that arises from a maturity mismatch in leveraged financing. When asset prices and liquidity fell during the crisis, the collateral values of assets held by financial institutions deteriorated. This made it difficult for them to raise funds and forced them to reduce leverage, leading to further asset price declines. Gorton (2009) focuses on a panic in the “shadow banking system”, in which

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⁴ Krishnamurthy (2009) surveys a number of recent papers that have analysed amplification mechanisms. He groups these mechanisms into two broad categories. Mechanisms in the first group work primarily through balance sheets (eg, leverage, tight credit conditions, limited capital), and the second group may be described as information amplifiers, such as complexity and opaqueness of instruments and Knightian uncertainty. To be sure, the mechanisms in these two categories are not mutually exclusive. As will become clear in our discussion, our paper examines an amplification mechanism which combines elements from both categories discussed by Krishnamurthy (2009).

financial firms de facto made runs on other financial firms by withdrawing from participation in the repo market. This led to massive deleveraging and resulted in an insolvent banking system. An aspect of this run was a sudden aversion to complex credit instruments, such as collateralised debt obligations.

In this paper, we propose that valuation losses played a large role in the amplification process and, importantly, that these losses rose because of a rise in the price of risk as well as because of an increase in risk itself. We argue that contagion to Asian borrowers occurred because the repricing of risk was a global phenomenon. We analyse valuation losses as something distinct from actual losses incurred from defaults. For major Asian borrowers valuation losses are closely linked to credit spreads on these names. The default risk of these borrowers, as we show below, did not rise very much during the crisis. However, with mark-to-market accounting, sharp increases in risk premia resulted in losses that devastated financial institutions even without any defaults occurring.⁵ In our story of the amplification process, the price of risk in global credit markets had declined over several years earlier this decade, thus helping to inflate what we characterise as a credit bubble. Several events between August 2007 and September 2008 then caused the price of risk to soar, serving to prick the bubble. Valuation losses have been so large precisely because the underlying bubble had become so large.⁶

We provide empirical evidence that shows that when valuations of credit instruments rose before the crisis and then fell during the crisis, it was not so much because of a reassessment of default risks as because of movements in credit risk premia which are closely linked to the price of credit risk. In the case of Asian borrowers (excluding Japan), credit spreads rose sharply after mid-2007 because default risk premia were driven by a global risk factor, which acted as the source of contagion. To measure credit spreads, we rely on credit default swap (CDS) contracts, which have continued to trade actively. Since these are rather simple derivative instruments, the sudden onset of aversion to more complex credit instruments did not affect their pricing drastically.⁷ To measure the “pure” default risk of a borrower, we rely on estimates by Moody’s KMV of its expected default frequency (EDF).⁸ An EDF takes into account information contained in the balance sheets of the firm, the market value of its assets and liabilities, and the volatility of its asset values. As such, EDFs are forward-looking estimates of risk that take into account possible knock-on effects of slowing economic activity. To consider additional risk pricing factors, we use the principal components derived from the major CDS indices for Europe, the United States and Japan. Our econometric results suggest that credit spreads even for Asian borrowers were driven in large part by movements in global risk aversion as well as by changes in default risk.⁹ Our results appear to be robust to whether financial institutions are included in the sample or not.

The remainder of this paper is organised as follows. Section 2 poses the question of amplification and contagion and offers as a hypothesis the bursting of a global credit bubble.

⁵ A large Dutch bank was rescued by the Netherlands government in October 2008 because valuation losses had rendered it insolvent even though, according to a senior supervisor, there was “not a single penny of default”.

⁶ Eichengreen et al (2009) also document that credit valuation losses since the onset of the crisis have been a global phenomenon and that credit valuations have moved together closely across all major regions. Chen (2008) and Chen et al (2009) also discuss evidence for changes in the price of credit risk.

⁷ Giesecke (2009) provides an overview of analytical issues associated with credit derivatives.

⁸ “EDF” is a registered trademark of Moody’s KMV.

⁹ It is a common assumption in macroeconomic models that risk aversion is a deep parameter that is fixed. However, there is strong empirical evidence that risk aversion varies over time and indeed can be quite volatile. See, for example, Ait-Sahalia et al (2001), Bliss and Panigirtzoglou (2004) and Bekaert et al (2009).

Section 3 specifies our analytical framework and presents stylised facts about our data on CDS spreads and EDFs for Asian names and CDS indices. Section 4 performs a preliminary analysis of the panel-dataset properties of the relationships between CDS spreads and EDFs for the Asian names. Section 5 provides our examination of what drives changes in credit spreads for major Asian borrowers. Section 6 concludes.

2. Amplification, contagion and the credit bubble

2.1 Amplification and contagion

The global financial meltdown of 2007–09 started out in the floating rate segment of the US subprime mortgage market. Total issuance in this market during 2005–07 amounted to \$1 trillion. This is relatively small compared to the total stock of US mortgage debt on one- to four-family homes of about \$11 trillion. By analysing different vintages of the subprime mortgages, Goldman Sachs (2007) estimates that default losses would total around \$250 billion. By including knock-on effects from a decline in housing prices, Greenlaw et al (2008) estimate that such default losses could reach \$500 billion. Because US financial institutions hold less than half of the subprime mortgages, their exposure to these losses would amount to an easily manageable 1% of their assets. These direct losses, however, have somehow led to losses on other credit instruments that have been far more serious. In total, these valuation losses have been so heavy that governments in the United States and in Europe have had to step in a massive way to save their financial systems from collapse. The most recent estimates by the IMF (2009, p xi) of potential write-downs for assets originated in mature markets total \$4 trillion, eight times the Greenlaw et al (2008) estimate of losses on US subprime mortgages. Government rescue packages in the Eurozone, the United Kingdom and the United States now amount to about \$6 trillion.¹⁰ The question of amplification is then: how did a small problem get to be so big?

An interesting aspect of the meltdown is how it has affected Asia. In a region where exposures to US subprime mortgages have been minimal, credit spreads for major borrowers have risen at least as much as they have for major borrowers in the United States and Europe. From the start of the crisis in August 2007 to its peak in November 2008, credit spreads for the 125 US investment-grade borrowers included in the DJ CDX IG index rose by an average of more than 170 basis points, while spreads for the 125 European borrowers in the iTraxx Europe index rose by more than 120 basis points. The credit markets seem not to have made a distinction for Asian borrowers. During the same period of the turmoil, the spreads for borrowers included in the iTraxx Asia ex-Japan index rose by more than 320 basis points.

What was behind these global co-movements in credit spreads since the onset of the crisis? Had ample liquidity in credit markets been priced in the spreads, and had liquidity for all credit instruments on these borrowers then vanished at the same time? Was the crisis a wake-up call for a global reassessment of risks, in which investors decided that they had previously badly underestimated risks and were now just correcting their mistakes? While not wishing to dismiss the potential explanatory power of these hypotheses, in this paper we examine a different mechanism, viz that the events that marked the crisis affected the risk aversion of global investors and that it was largely the resulting increase in risk aversion that led to the widening of credit spreads.

¹⁰ In terms of the amounts already spent, the rescue packages include \$1.8 trillion from the US Treasury, \$1.7 trillion from the US Federal Reserve, \$680 billion from the UK government, and \$1.4 trillion from Eurozone governments.

2.2 The rise and fall of the credit bubble

We propose that the contagion in Asia as reflected in credit spreads has been part of a larger phenomenon, namely that of a global credit bubble that inflated over time and that burst during the crisis. Such a bubble would be a simple answer to the amplification question: the crisis got so big because the underlying bubble was so big. The subprime mortgage disaster was merely the pin that pricked the bubble.

We study valuation in credit markets by analysing data on credit default swaps (CDSs). One advantage of relying on CDS spreads is that they do not raise the issue of complexity, since these are rather simple derivative contracts. Since the early 2000s, these CDSs have been among the most liquid credit instruments available and seem to have maintained a modest degree of liquidity even during the crisis.¹¹ By far the most actively traded of such instruments are the CDS index contracts, such as the DJ CDX NA IG Index for US names, the iTraxx Europe Index for European names, and the iTraxx Asia ex-Japan Index for Asian names outside Japan. Among the single-name CDS contracts, the most liquid ones have been those that are included in the indices.¹² The DJ CDX NA IG Index contains 125 investment-grade US corporate names, the iTraxx Europe Index consists of 125 investment-grade European corporate names, and the iTraxx Asia ex-Japan Index is composed of 64 corporate and six sovereign names, 50 of which are investment grade and 20 high-yield. The indices are constructed as simple averages of the spreads on the constituent names.

The behaviour of average credit spreads, as measured by CDS indices, depicts the evolution of a global credit bubble since 2002. As shown in Figure 1, CDS indices started to decline in late 2002.¹³ At the end of May 2003, the US index stood at 77 basis points and the European index at 52 basis points. Both spread series declined further over the next four years. By May 2007, the US index had fallen to 31 basis points and the European index to 20 basis points, about two fifths of their former levels. Calculations show that this narrowing of spreads implies that the corporate bonds underlying the US index had risen in value by an average of about 2.3% and those underlying the European index by an average of about 1.6%. These are very large valuation gains as investment-grade corporate bonds go, and they constitute a sign of the inflation of the global credit bubble.

The deflation of the credit bubble is generally deemed to have started on 9 August 2007, when BNP Paribas announced that it was suspending valuation of three of its funds, which had experienced large losses on their exposure to US subprime mortgages. This event triggered a widespread and prolonged decline in the amount of outstanding asset-backed commercial paper, not just in real estate-backed short-term instruments. The bubble was pricked for a second time following the weekend of 15–16 March 2008, when liquidity problems forced Bear Stearns to let itself to be taken over by JP Morgan Chase. The third and most devastating lancing of the bubble occurred after the collapse of Lehman Brothers on 15 September 2008 and of Washington Mutual a few days later. By November 2008, the US IG index had risen to 240 basis points and the European index to 180 basis points. The valuation losses implied by the widening of these spreads averaged about 10.4% for US investment-grade corporate bonds and about 8.0% for European bonds. At the end of July 2007, just before the start of the crisis, the size of the global corporate bond market as a whole stood at \$48 trillion. Assuming that the names in the CDS indices constitute a

¹¹ Remolona and Shim (2008) analyse the market for these instruments with regard to major Asian borrowers.

¹² A primary criterion for inclusion of a corporate name in a CDS index is the liquidity of its credit instruments. Membership in CDS indices is generally reviewed every six months, and names that have become less liquid are replaced by those that are more liquid.

¹³ Credit spreads were elevated from mid-2001 to late-2002, a period marked by several large-scale corporate accounting scandals and associated valuation losses in both equity and corporate bond markets.

representative sample of the whole market, the implied valuation losses during the crisis would total \$4.1 trillion.

The slow growth and swift collapse of the credit bubble raise the question of what elements of valuation were involved. In this paper, we pose this question in terms of two elements that enter credit spreads, default risks and the risk premia associated with these risks. When the bubble was growing between 2002 and 2007, was it primarily because investors believed that default risks were declining, or was it because the price of default risk declined, ie because investors were willing to accept a lower compensation for bearing default risk? And, when the bubble burst, was it because perceived default risks rose suddenly, or was it mainly because the price of default risk jumped upwards?

3. Analytical framework and data

3.1 Risk-neutral and physical probabilities

We now specify a framework of analysis that allows us to distinguish between risk and the price of that risk in the valuation of credit instruments. We apply the framework particularly to credit default swaps (CDSs) and expected default frequencies (EDFs), the former representing “risk-neutral” expected losses from default and the latter “physical” default probabilities.

The CDS spread can be decomposed as: CDS spread = (Actual) Expected Loss + Default risk premium. Technically speaking, we can represent a CDS spread as a risk-adjusted (or risk-neutral) expected loss rate: $CDS_t = E_t^Q(\lambda^Q L)$, where λ^Q is the risk-neutral default intensity and L is loss-given-default.¹⁴ It is important to keep in mind that this expression can differ from the actual expected loss rate $E_t^P(\lambda^P L)$, both because λ^Q can be different from the physical default intensity λ^P , and also because the uncertainty associated with the movement of λ^Q can command a risk premium. These effects can lead to a non-trivial default risk premium. Indeed, Driessen (2005) reports that λ^Q , on average, exceeds λ^P by a factor of about two; for BBB/Baa bonds, Amato and Remolona (2005) report a factor of four. Berndt et al (2008) find that the ratio λ^Q / λ^P varies over time. Thus, a substantial part of the CDS spread variations may be due to fluctuations in a time-varying default risk premium.

In order to quantify the part of the CDS spread variation that is attributable to variations in the default risk premium, one needs to have information on the physical default probability, with which to calculate the actual expected loss. For this purpose, we take the EDF measure calculated by Moody’s KMV as a proxy for the actual default probability, following the approach taken by Berndt et al (2008). As explained below, the EDFs are calculated based on a Merton-type structural model of credit risk using data on a firm’s balance sheet, asset values and equity volatility. A firm’s τ -year EDF at time t is defined as

$$EDF_{t,\tau} = 1 - P(t, t + \tau),$$

where $P(t, t + \tau)$ is the actual (physical) probability that a surviving firm at time t will also survive τ periods later. The physical default intensity λ^P can be inferred from $P(t, t + \tau)$, as they are related via

¹⁴ More precisely, the CDS spread is a present-value-weighted risk-neutral expectation of $\lambda^Q L$.

$$P(t, t + \tau) = E_t^P \left[\exp \left(- \int_t^{t+\tau} \lambda^P(s) ds \right) \right].$$

For relatively short horizons τ , such as one year, $EDF_{t,\tau} \approx E_t^P \left(\int_t^{t+\tau} \lambda^P(s) ds \right)$. Thus, the actual expected loss rate can be approximated as the one-year EDF times the mean loss rate.

In view of the close relationship between the EDF and the physical default intensity, in our regressions of the CDS spread (or monthly change in CDS spread) we shall use the EDF (or the monthly change in the EDF) as a proxy for the variation in the amount of the default risk, and we shall include other regressors to capture the effects of variations in the price of default risk. As we explain below, the EDFs are a forward-looking measure of default risk that incorporate the near term prospects of the economy as perceived by investors.

3.2 Data

Our main dataset consists of monthly-frequency values, for the period from January 2005 until January 2009, for CDS spreads and EDFs for 38 corporate names from the Asia-ex-Japan region. The CDS data were obtained from Markit, and the EDF data from Moody's KMV. The names are listed in Table 1. This set is the subset of all names that were listed in one or more of the iTraxx Asia-ex-Japan CDS indices (either IG or HY) for which we were able to construct complete monthly CDS and EDF series. We focus on these 38 names because they would seem to be among the names whose default risk would be unlikely to be affected directly by troubles in the US subprime mortgage market. Moreover, EDFs are available for corporate names, while they are not for sovereign names. Among the 38 corporate names in our sample are eight financial institutions, seven telecommunication firms and four semiconductor firms. Ten of the names are from Korea, six from Singapore, five from India, four each from China and Malaysia, three each from Hong Kong and Thailand, and one each from Indonesia, the Philippines and Taiwan.

The monthly-frequency CDS data were constructed from daily CDS values, using quotes from the last available day in each month; in most cases, this was the last trading day of the month. CDS spreads are quoted in over-the-counter markets; the world's largest financial institutions are usually the main market makers in these products.

The EDF data are also for the end of each calendar month. Aspects of the design of the models that underlie the proprietary calculation methods for EDFs by Moody's KMV are discussed in Agrawal et al (2004) and Levy (2008). In general, the EDFs are calculated based on a Merton-type structural model of credit risk using data on a firm's balance sheet, asset values and equity volatility. A wide class of Merton-type models have been described and their empirical performance assessed by Huang and Huang (2002) and Eom et al (2004). According to Moody's KMV, their EDF data are used by a clear majority of major financial institutions as well as by many investment houses.

In addition, we use monthly-frequency data on the values of the iTraxx Asia ex-Japan CDS indices (both IG and HY), as well as data for the DJ CDX NA (both IG and HY) CDS indices and the iTraxx Europe CDS index. We also use the CDS spreads for the constituent names of the latter three indices.

We treat the following three dates as markers for the global financial crisis: (i) 7 August 2007, when BNP Paribas' decided to suspend valuation of three of its mutual funds; (ii) 17 March 2008, the day after the weekend when Bear Stearns was taken over by JP Morgan Chase; and (iii) 15 September 2008, the day that Lehman Brothers declared bankruptcy. As may be readily seen from the time series shown in Figure 1, spreads on the DJ CDX IG and iTraxx Europe indices rose abruptly around each of these three events. For the sake of brevity, we

will refer to the period from August 2007 to the end of the sample in January 2009 as the crisis period, noting that the crisis of course did not consist of a single defining event.

The crisis seems to have driven an increasingly wide wedge between the time series of the average CDS spreads of the names in our sample and the time series of the average expected losses. Figure 2 shows the evolution of these time series over the sample period. Expected losses are calculated based on the EDFs and assuming a loss given default (LGD) of 0.5.¹⁵ Over the whole period, CDS spreads were much wider than expected loss rates, with the risk premium accounting for the differential. Based on the summary statistics provided in Table 2, on average the risk premium accounted for 85% of the spread and the expected loss for 15%. CDS spreads began to rise from a very low level in July and August 2007, rose rapidly in the first quarter of 2008, retraced some of that run-up during the second quarter, soared dramatically to about 750 basis points in October 2008, and remained very high over the remainder of the sample period. In contrast, expected losses did not begin to move up noticeably until September 2008, and even then they rose much less than CDS spreads moved. The challenge we face is how to explain the sharp widening of the differential between CDS rates and expected loss rates, ie the risk-premium component of CDS rates.

The major CDS indices exhibit a high degree of co-movement. Figure 3 shows the time series of the first three principal components (PCs) computed from the log-levels of the following four CDS indices: Dow Jones CDX IG, Dow Jones CDX HY, iTraxx Europe, and iTraxx Japan. The first PC explains about 98% of the total variation of the four series. As shown in Figure 3, this PC exhibits a strong time trend over the sample period: it first declines steadily, until mid-2007, and then rises sharply on balance over the remaining 18 months. In contrast, the second and third PCs (as well as the fourth, which is not shown to reduce clutter) are clearly stationary and thus describe only deviations from the dominant trend.¹⁶ The factor loadings of the logs of the individual CDS indices on the second through fourth PC do not lend themselves to any clear-cut economic interpretations. Figure 4 shows the time series of the principal components computed from the first-differenced four CDS indices; it is evident that while all PCs are stationary, the first PC is by far the most variable of the group. Figure 5 depicts the cross-sectional dispersion of EDFs and CDS spreads, averaged separately for the pre-crisis and crisis periods. In both subperiods, CDS spreads with only very few exceptions exceed EDFs considerably (there are only two points below the 45-degree line).¹⁷

Summary statistics for CDS spreads and EDFs on the 38 Asia-ex-Japan names, as well as for several CDS indices are given in Table 2 separately for the full sample period, the pre-crisis period, and the crisis period. As elsewhere in this paper, the crisis period is defined as the period from August 2007 to January 2009. Assuming an LGD of 0.5, the CDS spreads of the Asia-ex-Japan investment-grade names exceed expected losses by a factor of almost eight, while spreads of the high-yield names exceed expected losses by a factor of almost seven. This shows that by far the larger part of the spread is accounted for by the risk premium. In terms of first differences, the volatility of CDS spreads is about 60% higher than that of EDFs.

¹⁵ The factor 0.5 is close to the historical average LGD rate for Asian firms in Moody's database.

¹⁶ The fact that only one PC has a trend also implies that the five CDS index series, which are individually non-stationary, have a single cointegrating vector.

¹⁷ A separate analysis, not shown in Figure 4 to reduce clutter, suggests that the slope coefficient of a simple bivariate regression of CDS spreads on EDFs is virtually the same across the two subperiods, but that the intercept term is larger in the crisis subsample. This may suggest that investors required, for a given amount of risk, higher compensation than during the pre-crisis subperiod.

4. Modelling the relationship between the levels of CDS spreads and EDFs

A natural starting point for our empirical analysis is to specify and estimate a bivariate relationship between EDFs (the independent variable) and CDS spreads (the dependent variable). Berndt et al (2008) found that a linear specification for the relationship between levels of CDS spreads and EDFs, over their sample period from 2000 to 2004, was unsatisfactory for two reasons: first, they noted the presence of heteroskedasticity in the regression errors; second, a scatterplot of pairs of CDS spreads and EDFs revealed that the bivariate relationship between the levels of the two variables tended to be concave rather than linear. To address these two issues, they took logarithms of both the dependent variable (the CDS spreads) and the regressor (the EDF rates).

We attempted to replicate the pooled double-log specification of Berndt et al (2008) for our full dataset, which consists of 38 Asia-ex-Japan corporate names during the period from January 2005 until January 2009:

$$\log CDS_{it} = a + b \log EDF_{it} + u_{it}$$

The OLS regression results are reported in column (1) of Table 3. The estimated intercept and slope coefficients are both positive and strongly significant by ordinary statistical conventions. However, the Durbin-Watson statistic of this regression is only 0.07.¹⁸ As was noted first by Granger and Newbold (1974) and was explained rigorously by Phillips (1986), very small values of the Durbin-Watson statistic are generally strong warning signals that the regression relationship may be spurious and the variables in the regression may therefore not be related to each other. Indeed, further tests showed that the EDFs and CDS rates of individual names, though clearly non-stationary, are not cointegrated with each other.¹⁹

Given the known presence of strong trend components in the CDS spread indices and the EDFs, the rejection of the maintained hypothesis that the simple model is specified correctly is not unexpected. We next estimated the following, expanded model:

$$\log CDS_{it} = a + b \log EDF_{it} + c_1 \log PC_{1t} + c_2 \log PC_{2t} + u_{it},$$

where $\log PC_{kt}$ denotes, with some abuse of notation, the k th principal component of the logarithms of the CDS indices. The results of this regression are reported in column (2) of Table 3. Adding these two additional regressors unfortunately does not ameliorate the misspecification problem. We next considered the possibility that a structural break in the relationship between (log) CDS spreads and EDFs around the time of the onset of the crisis

¹⁸ The DW statistics of the individual, ie non-pooled regressions were also uniformly very low, indicating that the result for the pooled regression is not an artifact of an invalid pooling assumption. As has been noted recently by Bai et al (2009) and Breitung and Das (2008), in panel cointegration models with cross-sectional dependence generated by (usually unobserved) global stochastic trends, the least squares estimator is in general inconsistent owing to spuriousness induced by the $I(1)$ trends. Bai et al (2009) suggest an iterative estimator to address this issue. Additional references to the panel unit root testing and cointegration literature are Gengenbach et al (2005), Levin et al (2002), and Pedroni (2004).

¹⁹ Because EDFs are estimated rather than directly observed, they contain measurement error. However, unless there are significant methodological shifts in the calculation methods of EDFs – which was not the case in our sample – it may be assumed that these measurement errors are stationary. Granger (1986, p 217) noted that if two time series are cointegrated but are observed with measurement error, the two observed series will also be cointegrated as long as the measurement errors are stationary. Therefore, (stationary) measurement errors in EDFs cannot explain our finding that EDFs and CDS rates are not cointegrated. Inference issues arising in models in which observed variables contain $I(1)$ measurement error components are examined in more detail in Gyntelberg et al (2009).

may give rise to this problem. However, letting each of the three slope coefficients vary across the pre-crisis and crisis periods did not solve the mis-specification problem either.

Rather than apply a direct “correction” of the serial correlation of the regression residuals, such as the Cochrane-Orcutt procedure, we chose to add the lagged endogenous variable to the basic regression; see column (3) of Table 3. With this modification, the regression model no longer appears to be statistically mis-specified, and the R² statistic jumps to 96%. However, the numerical magnitudes of the coefficients of the constant term and the log EDFs drop to nearly zero (even though they remain statistically significantly different from zero). Put differently, the inference that the intercept and slope coefficient of the simple bivariate model are both nonzero is not robust once a better-specified model is obtained.

We also considered the possibility that the lack of robust statistical evidence for a relationship between the variables could be driven by the fact that the full sample contains both financial and non-financial firms. If the relationship is not homogeneous across these subsets of firms, spurious regression results might be generated. We re-estimated regression models (1) through (3) on the subset of non-financial firms, but the results were qualitatively very similar to those obtained for the full sample. Hence, they do not appear to be caused by heterogeneity in the composition of the sample.

These results are negative, in the sense that the statistical model using the log levels of the variables does not let us draw robust conclusions regarding the relationship between CDS spreads and EDFs (and hence the difference between these two series). Nevertheless, these findings suggest that cross-sectional relationships between the two series are dominated by time trends in the series. This is a useful result, as it motivates us to study the relationship between the variables in a first-differenced model, the subject of the next section.

5. What drives changes in credit spreads?

5.1 Variables

To explain how credit spreads narrowed between 2002 and 2007 and how they widened afterwards, we analyse first differences in CDS spreads on the 38 names in the iTraxx Asia ex-Japan Index for which we have good data. We also analyse a subsample of 31 names that excludes financial firms. Our explanatory variables consist of a measure of default risk and of variables representing risk pricing factors. For changes in default risk, we use first differences in EDFs for each of our 38 names. For risk pricing factors, we extract the principal components from the first differences of the four CDS indices (two from the United States, one each for Europe and Japan).

5.2 Principal components

Before we report the results of our regression analysis, it is useful to discuss the main properties of the principal components (PCs) that we constructed from the first differences of the four CDS indices.²⁰ As shown in Table 4, the first PC explains about 80% of the movements of the four CDS indices. An analysis of its loadings and time series properties suggests that it is a global risk pricing factor: it has roughly equal loadings on all four CDS indices, it is highly correlated with all four stock market index returns shown in Table 4, and it is also (albeit with the opposite sign) highly correlated with changes in equity market volatility

²⁰ Longstaff et al (2008) provide a useful summary of the properties of the principal components obtained from sovereign CDS spreads.

and fluctuations in the steepness of the US Treasury yield curve. The second PC explains an additional 13% of the variance of the movements in the indices, and its loadings and its higher correlations with changes in the spread between three-month OIS and eurodollar rates suggest that it is a credit and liquidity crisis risk pricing factor. The third PC, which explains about 6% of the movements in the indices, appears to be a Japan-specific risk pricing factor. The fourth PC contributes a negligible amount to explaining the total variance.²¹

5.3 Estimates

Our basic estimating equations are

$$\Delta CDS_{it} = b_0 + b_1 \Delta EDF_{it} + u_{it} \quad (1)$$

$$\Delta CDS_{it} = b_0 + b_1 \Delta EDF_{it} + b_2 \Delta PC_{1t} + b_3 \Delta PC_{2t} + b_4 \Delta PC_{3t} + u_{it}, \quad (2)$$

where Δ denotes first differences, the subscript i the i th name in the panel, the subscript t the observation month, and ΔPC_{kt} (again with some abuse of notation) the k -th principal component of the first-differenced CDS indices. The first equation uses only the EDF variable as an explanatory variable. The second includes the first three PCs of the first-differenced CDS indices. We fit the equations to data involving a cross-section of 38 names and a time series of 48 months, running from February 2005 to January 2009.²²

The panel regression results show that fluctuations in the risk pricing factors as well as reassessments of default risk have been important drivers of changes in CDS spreads. As reported in columns 2 of Table 5, the EDF variable as well as the first three principal components are all statistically significant at conventional confidence levels. Notably, the fitted model that only has the EDFs as explanatory variables has an adjusted R2 of 24%. Once the principal components are included, the adjusted R2 jumps to 39%. The Durbin-Watson statistics are close to 2, suggesting that taking first differences of the data indeed succeeded in eliminating the trend components noted in Section 4. The onset of crisis seems not to change the relationships.²³

The coefficients of some of the explanatory variables are estimated rather tightly, and it is interesting to interpret their economic significance. In the more comprehensive model, the coefficients of the EDF variable and of the first three principal components are estimated with very small standard errors. In the case of the EDF variable, a 100 basis-point move, *ceteris paribus*, on average results in a 72 basis-point change in the spread in the same direction. This is a surprisingly weak effect, given that EDFs are always much smaller and less volatile than the corresponding CDS spreads. Put another way, a one standard-deviation move in the physical probability of default on average leads to a change in the risk-neutral probability of only 0.42 of its standard deviation.

The estimated coefficients of the first three principal components are smaller in absolute value than the coefficient on the EDF variable. However, the risk pricing factors are also

²¹ Goyal et al (2008) discuss methods for estimating principal components that are common to variables across groups of variables, as well as specific to individual groups of variables. In future work, we plan to employ their methodology to test for commonalities among the principal components of each of the three groups.

²² Relative to the regressions reported in Section 4, the use of first-differenced data causes the “loss” of 1 observation in the time-series dimension.

²³ When we added dummy variables for the crisis period, both as intercept terms and as interactive variables, the adjusted R2 did not rise substantially, and the augmented model was characterised by severe multicollinearity among some of the regressors.

more volatile than the EDF variable. Indeed, a one standard-deviation move in the first principal component leads, *ceteris paribus*, to a change in the CDS spread of an Asian name by 0.32 of its standard deviation. This is of the same order of magnitude as the economic effect of changes in EDFs, and it is an effect that is neglected in the literature on the crisis. Similarly, a one standard-deviation move in the second PC leads on average to a change in the CDS spread by 0.12 of its standard deviation, a not insignificant economic effect.

Note that because these results are based on the economic significance of the coefficients, they do not hinge on us having access to the precise measures of default risk that were on the minds of investors. Our inference requires only that we have an unbiased measure of default risk.²⁴

Our results appear to be robust to a number of specification choices. For instance, because EDF estimates are likely to be less reliable for financial institutions, which tend to have very high leverage, we ran the same regressions for only the subsample of 31 Asian names that are non-financial firms. As shown in columns 3 and 4 of Table 5, we do get a slightly better goodness of fit when financial firms are excluded. However, the qualitative results do not change. We also interacted our explanatory variables with dummy variables that represent various phases of the crisis. The interaction terms do not result in statistically significant coefficients, suggesting that the crisis did not change the relationships among the variables. If the liquidity of CDS contracts did change because of the crisis, this did not seem to discernibly affect the price determination process.

Summing up, our analysis shows that valuations in credit markets do react consistently to reassessments of default risk. However, this reaction is not the only important one. Instead, changes in valuations appear to be driven also by changes in the price of default risk, and this price seems to be affected by both global and region-specific fluctuation in investors' risk aversion. The idea that risk aversion is an important determinant of credit spreads is not entirely new. It is consistent with the results of Tang and Yan (2009), for example. They find that at the level of the market, a variable representing investor sentiment is the most important determinant of credit spreads. Moreover, at the level of individual firms, they identify implied volatility, which should incorporate the influence of risk aversion, as "the most significant determinant of default risk".

6. Conclusion

A striking feature of the 2007–09 global financial meltdown is the fact that credit spreads widened sharply for everyone, even for large borrowers in Asia who were far removed from the problems of the US subprime mortgage market. As a consequence, valuation losses on credit instruments were massive, dwarfing losses from actual defaults. We propose that these valuation losses played an important role in the amplification of the crisis. While it could be argued that the decline in valuations simply reflected the knock-on effects on default risk of an anticipated economic slowdown, our results do not bear this out. In this paper, we take account of such knock-on effects on large Asian borrowers and still find strong effects on spreads that seem to stem from shifts in risk aversion, both of global investors and investors with a regional focus.

To analyse valuation, we rely on spreads on CDS contracts, which are rather simple derivative instruments that continued to trade even during the crisis. To account for the

²⁴ Because default probabilities are not observable, one cannot test this unbiasedness hypothesis directly. However, KMV aims to have EDFs equal actual default frequencies over suitably chosen longer time intervals.

knock-on effects on default risk, we rely on EDFs, which are estimates of default probabilities that exploit the forward-looking nature of stock prices. To account for global and regional risk aversion, we extract principal components from the movements of various CDS indices comprising US, European and Asian names. We then regress monthly first-differences in CDS spreads for a cross-section of Asian names on monthly first-differences in their respective EDFs as well as the principal components. We find statistically and economically significant effects of EDFs and principal components that represent risk aversion. The results suggest that shifts in risk aversion as well as reassessments of risk drive valuations of credit instruments. Moreover, there is an important global component to risk aversion, and a rise in such risk aversion would naturally be a source of contagion.

These results do not just apply to the period of the crisis of 2007–09. They account for the narrowing of credit spreads before the onset of the crisis as well as for the widening of spreads around each of the various events that marked the crisis. We find no change in the price determination relationships between the pre-crisis and crisis periods. Our results are consistent with the notion that the global turmoil was an accident waiting to happen. Between 2002 and 2007, as risk appetites in credit markets grew, a large credit bubble developed. The troubles in the US subprime mortgage market were merely the trigger for the crisis. If not for these mortgages, something else would inevitably have pricked the bubble. And the crisis became so large because the underlying bubble was so large. We conclude that periods of rising credit bubbles are to a large extent periods of declining risk aversion. When a bubble bursts, it bursts because risk aversion suddenly jumps. To better understand the formation of bubbles and their destruction would require a better understanding of the behaviour of investor risk aversion.

Table 1
Asian names, by economy and industry

Company	Economy	Industry
Bank of China Ltd.	China	Banking
CITIC Resources Holdings Ltd.	China	Diversified
CNOOC Ltd.	China	Oil and gas
Xinao Gas Holdings Ltd.	China	Energy
Hutchison Whampoa Ltd.	Hong Kong	Diversified
PCCW HKT TEL Ltd.	Hong Kong	Telecommunication
Road King Infrastructure Ltd.	Hong Kong	Infrastructure
Bank of India	India	Banking
ICICI Bank	India	Banking
Reliance Communications Ltd.	India	Telecommunication
Reliance Industries Ltd.	India	Oil refining
Tata Motors Ltd.	India	Automobile
PT Indosat Terbuka	Indonesia	Telecommunication
Hana Bank	Korea	Banking
Hynix Semiconductor Incorp.	Korea	Semiconductor
Hyundai Motor Co.	Korea	Automobile
Industrial Bank Korea	Korea	Banking
KT Corp.	Korea	Telecommunication
Korea Electric Power Corp.	Korea	Electricity
POSCO	Korea	Steel
Samsung Electronics Co. Ltd.	Korea	Electronics
SK Energy Co. Ltd.	Korea	Oil refining
SK Telecom Co. Ltd.	Korea	Telecommunication
Genting Bhd.	Malaysia	Casino/hotel
IOI Corp. Bhd.	Malaysia	Agriculture
Telekom Malaysia Bhd.	Malaysia	Telecommunication
Tenaga Nasional Bhd.	Malaysia	Electricity
Philippines Long Distance Telephone	Philippines	Telecommunication
Capitaland Ltd.	Singapore	Real Estate
Chartered Semiconductor Manufacturing Ltd.	Singapore	Semiconductor
China Fishery Group Ltd.	Singapore	Fishery
Noble Group Ltd.	Singapore	Diversified
Stats Chippac Ltd.	Singapore	Semiconductor
United Overseas Bank	Singapore	Banking
Cathay Financial Holdings Co. Ltd.	Taiwan	Insurance
Aromatic Thailand Public Co. Ltd.	Thailand	Petrochemicals
PTT Aromatics and Refining Pub. Co. Ltd.	Thailand	Oil refining
PTT Public Co. Ltd.	Thailand	Oil and gas

Source: Bloomberg.

Table 2
Summary statistics for CDS spreads and EDFs

	Full sample ¹		Pre-crisis period ²		Crisis period ³	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Levels						
CDS spreads						
Asia ex-Japan: 38 names	178.0	291.7	69.1	66.4	328.4	397.0
26 IG names	98.0	128.7	40.1	24.4	188.5	167.5
12 HY names	380.8	449.3	157.8	75.3	608.2	547.8
EDFs						
Asia ex-Japan: 38 names	38.3	144.6	16.4	28.1	68.4	217.1
26 IG names	15.0	29.7	11.1	11.3	21.2	44.8
12 HY names	97.2	258.8	32.8	49.8	162.8	352.8
CDS index spreads						
DJ CDX NA IG	76.4	54.3	44.3	10.5	131.5	55.3
DJ CDX NA HY	483.2	275.9	335.7	62.2	737.3	316.2
iTraxx Europe	56.3	42.7	32.0	7.4	98.2	45.9
iTraxx Japan	65.3	81.8	25.0	4.7	134.7	103.8
iTraxx Asia ex-Japan IG	85.0	98.2	34.4	6.9	172.0	120.3
iTraxx Asia ex-Japan HY	372.2	344.3	199.9	42.7	668.8	429.2
First differences						
CDS spreads						
Asia ex-Japan: 38 names	14.2	103.1	0.1	15.0	33.7	156.1
26 IG names	7.8	53.4	0.2	8.0	19.5	83.5
12 HY names	30.6	173.3	-0.3	26.9	62.2	241.1
EDFs						
Asia ex-Japan: 38 names	4.3	58.9	-0.8	7.9	11.4	89.9
26 IG names	0.9	12.5	-0.5	3.5	3.1	19.3
12 HY names	13.1	108.5	-1.5	14.6	27.9	152.2
CDS index spreads						
DJ CDX NA IG	3.2	18.5	1.2	8.4	6.5	28.4
DJ CDX NA HY	22.9	95.4	6.6	49.0	50.0	140.7
iTraxx Europe	2.6	14.2	0.6	5.9	6.0	21.8
iTraxx Japan	7.0	25.6	0.5	4.6	17.7	39.8
iTraxx Asia ex-Japan IG	6.4	31.6	0.1	5.0	16.9	50.3
iTraxx Asia ex-Japan HY	22.4	124.9	-1.3	25.1	61.9	198.6

¹ January 2005 to January 2009. ² January 2005 to July 2007. ³ August 2007 to January 2009.

Sources: Markit; Moody's Investors Service; JPMorgan Chase; authors' calculations.

Table 3

Regression results for log-log modelDependent variable: Log CDS_{it} . Full sample (38 names).

	(1)	(2)	(3)
Constant	3.274*** (0.052)	3.697*** (0.041)	0.353*** (0.033)
Log EDF _{it}	0.495*** (0.052)	0.299*** (0.015)	0.021**% (0.006)
Log PC1 _t	—	0.338*** (0.009)	0.062*** (0.004)
Log PC2 _t	—	0.192 (0.088)	-0.235*** (0.030)
Log CDS _{i,t-1}	—	—	0.918*** (0.008)
R-squared	0.306	0.626	0.961
Adjusted R-squared	0.305	0.625	0.960
S.E. of regression	0.956	0.702	0.230
Durbin-Watson statistic	0.072	0.077	2.073

Sample period: Jan. 2005–Jan. 2009. Standard errors shown in parentheses. ***, **, and * indicates significance at 1%, 5%, and 10% levels.

Sources: Markit; Moody's Investors Services; authors' estimates.

Table 4

**Properties of the first three principal components
of the four first-differenced CDS indices**

	$\Delta PC1$	$\Delta PC2$	$\Delta PC3$
Factor loadings			
iTraxx Japan	0.497	-0.375	0.747
iTraxx Europe	0.479	0.697	0.187
DJ CDX NA IG	0.530	0.244	-0.443
DJ CDX NA HY	0.493	-0.560	-0.459
Fraction of variance explained	0.797	0.127	0.062
Correlations with economic variables			
ΔVIX	0.6268	-0.1041	-0.0876
$\Delta(3\text{mo}-10\text{yr term spread})$	0.3579	-0.1917	0.0118
$\Delta(3\text{mo US dollar Libor-OIS spread})$	0.0739	0.2199	-0.0576
$\Delta(\log \text{S\&P500})$	-0.8002	0.1910	-0.0985
$\Delta(\log \text{Nikkei})$	-0.6540	0.1492	-0.2234
$\Delta(\log \text{MSCI World})$	-0.7407	0.2191	-0.1335
$\Delta(\log \text{MSCI Asia Japan})$	-0.6373	0.1903	-0.2018

Table 5

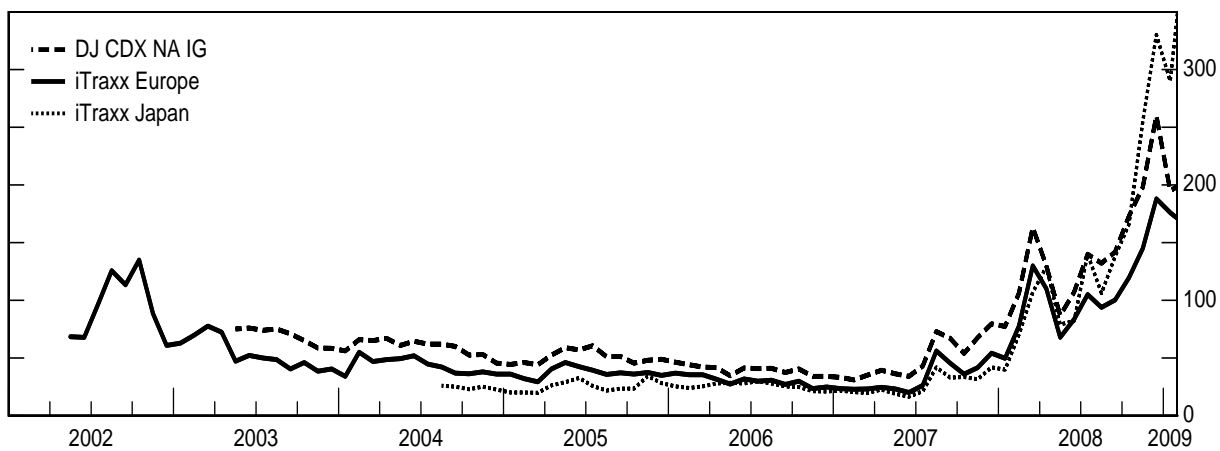
Regression results for first-differences modelDependent variable: $\Delta CDS_t (= CDS_t - CDS_{t-1})$

	Full sample (38 names)		Non-financials only (31 names)	
	(1)	(2)	(3)	(4)
Constant	10.491*** (2.378)	9.761*** (2.122)	11.377*** (2.707)	10.588*** (2.419)
ΔEDF_t	0.863*** (0.040)	0.724*** (0.038)	0.855*** (0.042)	0.714*** (0.039)
$\Delta PC1_t$	-	0.173*** (0.012)	-	0.187*** (0.013)
$\Delta PC2_t$	-	0.134*** (0.029)	-	0.138*** (0.032)
$\Delta PC3_t$	-	0.399*** (0.041)	-	0.433*** (0.046)
R-squared	0.243	0.388	0.257	0.408
Adjusted R-squared	0.242	0.386	0.256	0.406
S.E. of regression	89.858	80.769	93.718	83.733
Durbin-Watson	2.148	2.287	2.103	2.261

Sample period: Feb. 2005–Jan. 2009. Standard errors shown in parentheses. ***, **, and * indicates significance at 1%, 5%, and 10% levels.

Sources: Markit; Moody's Investors Services; authors' estimates.

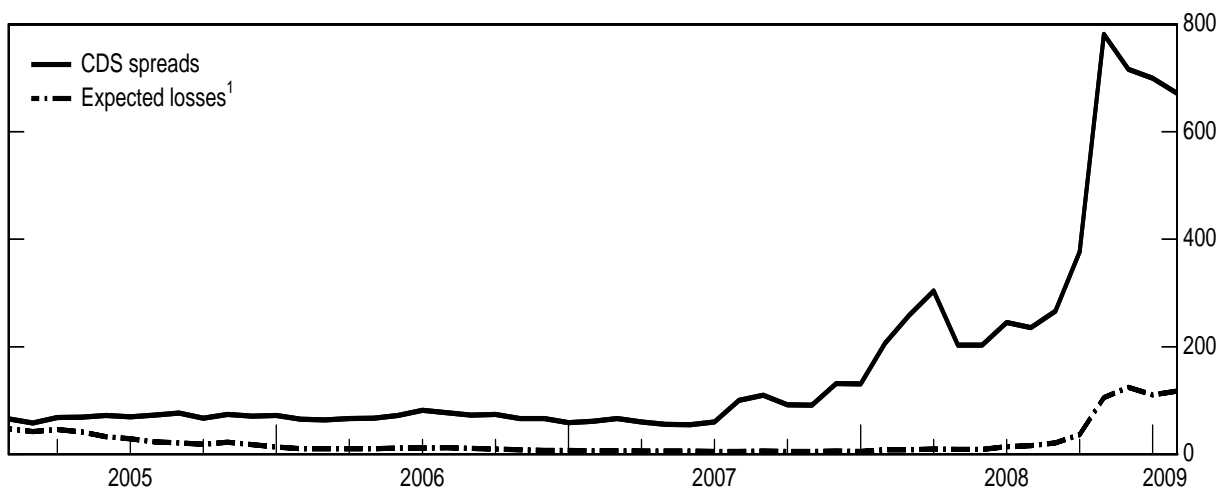
Figure 1
CDS indices
 In basis points



CDS indices are equal-weighted averages of the spreads on the underlying five-year CDS contracts.

Source: JPMorgan Chase.

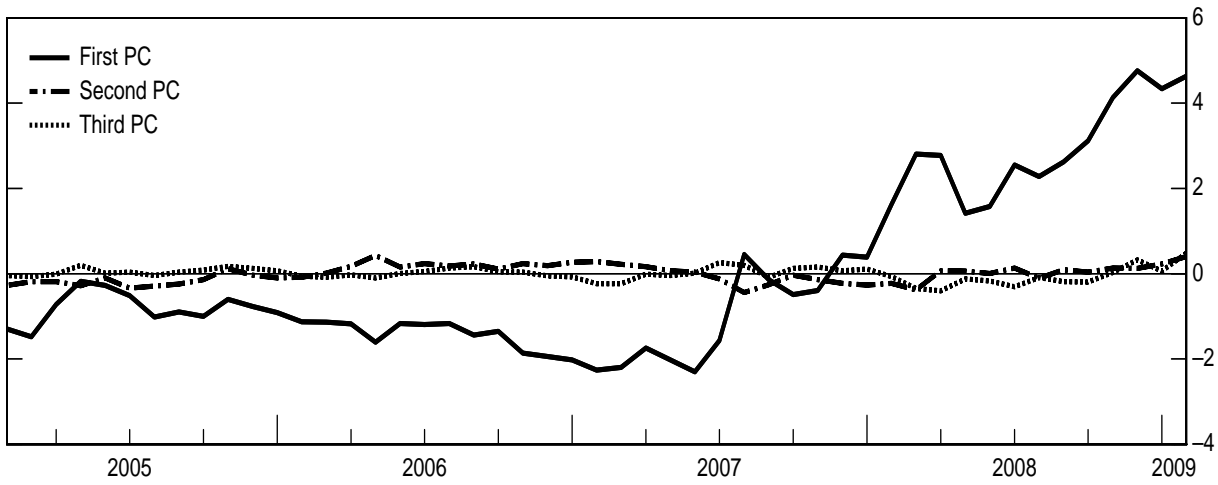
Figure 2
CDS spreads and expected losses
 Averages over 38 Asia-ex-Japan names, in basis points



¹ Average EDF multiplied by 0.5, which is the historical loss given default.

Sources: Markit; Moody's Investors Services; authors' calculations.

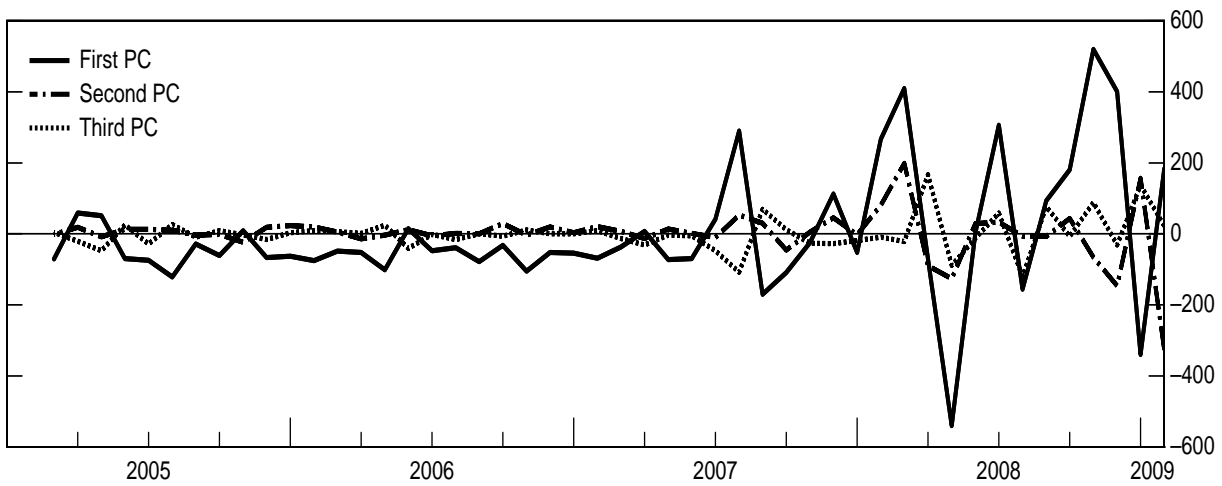
Figure 3
Principal components of logarithms of four CDS indices¹



¹ The four CDS indices are: US CDS NA IG, US CDX NA HY, iTraxx Europe, and iTraxx Japan.

Sources: JPMorgan Chase; authors' calculations.

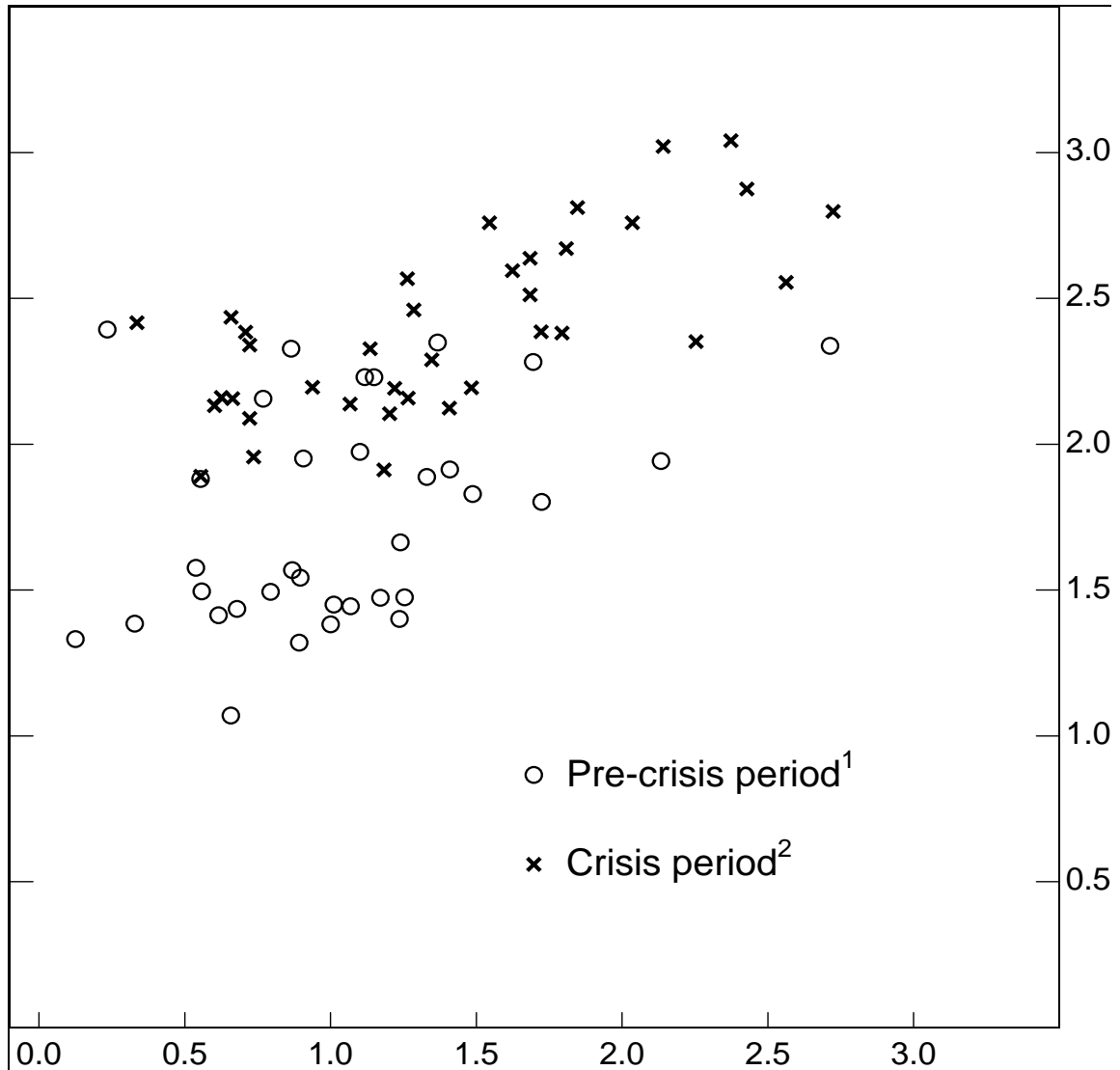
Figure 4
Principal components of the first differences of four CDS indices¹



¹ The four CDS indices are: US CDX NA IG, US CDX NA HY, iTraxx Europe, and iTraxx Japan.

Sources: JPMorgan Chase; authors' calculations.

Figure 5
CDS spreads and EDFs, by Asia-ex-Japan name
 Pre-crisis and crisis period averages shown separately
 In base-10 logarithms of basis points



Horizontal axis: EDFs; Vertical axis: CDS spreads

¹ January 2005 to July 2007. ² August 2007 to January 2009.

Sources: Markit; Moody's Investors Services.

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Determinants of house prices in nine Asia-Pacific economies¹

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1 Introduction

There are good reasons why the public and policymakers should monitor house price developments closely. In most countries, housing is generally households' single largest investment and hence house price risk may be considered to be the major financial risk they face (Cocco, 2004; Yao and Zhang, 2005). Fluctuations in residential property prices tend to have a bigger wealth effect than those of financial assets.⁶ In addition, there are strong linkages between the residential property cycle and the credit cycle, and by extension the banking sector and the macroeconomy. This is because the purchase of a house is predominantly funded by mortgage loans originated by financial institutions, and real estate property is widely used as a major collateral asset for bank loans.⁷ Reflecting these insights, the Financial Sector Assessment Program (FSAP), which was introduced by the IMF and the World Bank in 1999, advocates the inclusion of real estate prices in the recommended set of financial soundness indicators (FSIs).

House price risk has attracted much attention in recent years. A number of industrialised economies, including those of the United States, the United Kingdom and Spain, have witnessed a recent, protracted period of significant increases in house prices. The perceived lower risk has encouraged laxity in mortgage market lending criteria, which lie at the heart of the ongoing subprime crisis. By comparison, housing markets in most Asian economies have been relatively tranquil during the same period. However, the situation has started to change in the past several years. China, Hong Kong SAR and Korea have witnessed very strong

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⁶ On the one hand, booming housing markets can have a significant positive effect on household consumption, as shown by Girouard and Blöndal (2001) in a number of OECD countries and Campbell and Cocco (2007) in the United Kingdom. On the other hand, a sharp decline in house prices tends to have a much bigger impact on output growth than equity price busts do, as suggested by Helbling and Terrones (2003) and Case et al (2005).

⁷ The "financial accelerator" mechanism, developed by Bernanke et al, 1994; Bernanke and Gertler, 1995; Kiyotaki and Moore, 1997; Aoki et al, 2004 and Gan, 2007, provides the theoretical framework to analyse the inter-linkages between the housing market and the banking sector.

house price inflation recently (see Figure 1). Given the not-so-distant experience of financial crises in this region (eg the 1997 Asian crisis and the so-called “lost decade” in Japan), in which booms and busts in real estate markets played a crucial role, concerns have arisen that new housing bubbles could form. There are two opposite views. Pessimists argue that house prices have been overvalued in many countries and will face downward corrections in the near future. At the extreme, some see evidence of new speculative housing bubbles, and call for supervisors and central banks to take active measures to contain them. By contrast, the optimists consider this round of house price growth as a manifestation of recovery from the previous crisis. The optimists argue that, in the aftermath of a previous crisis, house prices were too low compared to their fundamental values. Therefore, the rebound of house prices from very low levels is simply a consequence of the mean reversion process. Moreover, the liberalisation of housing markets and housing finance systems in the past decade, including a general trend towards more market-based housing markets, greater availability of mortgage products and more liquid secondary mortgage markets, have arguably improved market efficiency, stimulated demand and contributed to house price growth.

The paper sheds some light on this debate by examining house price developments in nine economies in the Asia-Pacific area, including Australia, China, Hong Kong SAR, South Korea (Korea hereafter), Malaysia, New Zealand, the Philippines, Singapore and Thailand.⁸ We examine the determinants of house price dynamics in two steps. In the first step, house price fundamentals are determined by country-specific demand and supply factors. In the second step, the characteristics of house price cycles are further explored by investigating evidence of serial correlation and mean reversion embedded in the short-term dynamics of house prices in each country. Not surprisingly, the patterns of national house price dynamics exhibit significant cross-country heterogeneity, which can be attributed to different stages of economic development, different institutional arrangements and market-specific conditions.

We also use the above results to discuss the question whether a bubble in real house prices exists. Importantly, throughout this paper we distinguish between house price overvaluation and a housing bubble. House price overvaluation refers to the fact that current house prices are substantially higher than their fundamental values. The overvaluation consists of two components. For one, imperfections in housing markets, such as lags in supply and credit market frictions, can cause house prices to exhibit fluctuations around their fundamental values in the short run. In this study, we consider this cyclical component of house price overvaluation as simply reflecting inherent frictions in the housing market. On the other hand, the residual component, ie the part of house price overvaluation that cannot be explained by serial correlation and mean reversion of house price dynamics, is most likely driven by overly optimistic expectations of future house price movements and hence treated as evidence of bubbles. Using this definition, we find little evidence of housing bubbles in the Asian economies, at least not at national levels.

The distinction between the cyclical and bubble components of house price overvaluation can be important for policy considerations. To mitigate house price overvaluation driven by cyclical movements related to market frictions, a policymaker should probably focus on measures that aim at reducing the magnitude and frequency of house price cycles, such as loosening land use regulation, improving information availability and transparency and enhancing property right protection. By contrast, to contain a bubble, the policymaker should instead adopt measures that counter the over-confidence of investors in the housing market and their unwarranted expectations of capital gains.

⁸ In this paper, we also loosely use the term “Asian” to represent the sample economies.

The remainder of the paper is organised as follows. Section 2 provides an overview of the literature and highlights the contributions of this study. Section 3 explains the empirical method adopted in this study, and Section 4 describes the data and empirical results. Finally, Section 5 concludes and provides some policy perspectives.

2. Literature Review

Our study attempts to address the following questions: What determines the fundamental values and short-term dynamics of house prices? What are the implications of the institutional arrangements in housing markets (or more generally the business environment) on house price movements? How can one distinguish a speculative housing bubble from an increase in house price fundamentals or the cyclical component of house price overvaluation that is driven by frictions in the housing market? In this section, we first review the existing studies on these issues, and specify the new insights we provide in this exercise.

To monitor the housing market, the first issue is to understand the determinants of house prices. Housing is a special type of asset in that it has a dual role as a consumption and an investment good. From the long-term perspective, the equilibrium price a household is willing to pay for a house should be equal to the present discounted value of future services provided by the property, ie the present value of future rents and the discounted resale value of the house. From the short-term perspective, however, house prices can deviate from their fundamental values, driven by some unique characteristics of the real estate market (such as asset heterogeneity, down-payment requirements, short-sale restrictions, lack of information, and supply lags). For instance, Leung and Chen (2006) show that land prices can exhibit cycles due to the role of intertemporal elasticity of substitution. Wheaton (1999) and Davis and Zhu (2004) develop a model in which there are lags in the supply of real estate and bank lending decisions depend on the property's current market value (labeled as historical dependence). They show that, in response to a change in fundamental values, real estate prices can either converge to or exhibit oscillation around the new equilibrium values.

Existing literature shows that house price movements are closely related to a common set of macroeconomic variables and market-specific conditions. Hofmann (2004) and Tsatsaronis and Zhu (2004) examine the determinants of house prices in a number of industrialised economies, and find that economic growth, inflation, interest rates, bank lending and equity prices have significant explanatory power. The linkage between property and bank lending is particularly remarkable, as highlighted by Herring and Wachter (1999), Hilbers et al (2001), Chen (2001) and Gerlach and Peng (2005). Moreover, housing markets are local in nature. Garmaise and Moskowitz (2004) find strong evidence that asymmetric information about local market conditions plays an important role in reshaping property transactions and determining the choice of financing. Green et al (2005) find that house price dynamics differ across metropolitan areas with different degrees of supply elasticities.

Given the heavy reliance on mortgage financing in the housing market, housing finance system arrangements turn out to be another key factor to be considered in examining house price movements. There are recognisably significant time variation⁹ and cross-country differences in terms of the prevalent contract type, the lending practice, the valuation method of collateral assets, the development of mortgage backed securities (MBSs), the flexibility in

⁹ In the last several decades, housing finance systems have experienced remarkable changes in both industrialised economies (see Diamond and Lea, 1992; ECB, 2003; CGFS, 2006) and emerging market economies (see OECD, 2005; Hegedüs and Struyk, 2005). There is a general trend towards more market-based housing financing systems.

mortgage refinance and mortgage equity withdrawal. Such differences depend on the stage of economic development and the development of credit information systems and the strength of legal rights (Warnock and Warnock, 2007). There has been substantial evidence that institutional arrangements in housing finance systems have important implications on house price dynamics, both in time series (see Peek and Wilcox, 2006; Estrella, 2002; McCarthy and Peach, 2002) and cross-country analyses (see Tsatsaronis and Zhu, 2004; Égert and Mihaljek, 2007).

On the important issue of detecting house price bubbles, several approaches have been adopted in the literature. Bubble episodes are sometimes assessed by market analysts in terms of the price-rent ratio or the price-income ratio. Typically a bubble is identified if the current ratio is well above the historical average. These measures, however, may be inadequate barometers for policy analysis because they ignore the variation in “equilibrium” price-rent (or price-income) ratios driven by fluctuations in economic fundamentals (eg rent growth, income growth and the desired rate of return). To overcome these problems, two methods have been proposed. The first method is to compare observed price-rent ratios with time-varying discount factors that are determined by the user cost of owning a house, which consists of mortgage interest, property tax, maintenance cost, tax deductibility of mortgage interest payments and an additional risk premium (see Himmelbert et al, 2005; Ayuso and Restoy, 2006; Brunnermeier and Julliard, 2007). The second method is to compare observed house prices with fundamental values predicted based on the long-run relationship between house prices and macroeconomic factors (see, Abraham and Hendershott, 1996; Kalra et al, 2000; Capozza et al, 2002, for example). In this paper, we adopt the second method because of data limitations and heterogeneity in what constitutes appropriate measurement of the user cost across countries.¹⁰

This paper examines the characteristics of house price dynamics in nine Asia-Pacific economies and 32 cities/market segments in these countries, discusses the role of distinctive institutional arrangements and explores the possible emergence of housing bubbles. The two closely related papers are Capozza et al (2002) and Tsatsaronis and Zhu (2004). Capozza et al (2002) characterise the dynamics of house price cycles in US metropolitan areas by computing the serial correlation and mean reversion coefficients, the same two key parameters used in this study. Tsatsaronis and Zhu (2004) compare the features of national housing finance systems in 17 industrialised economies. Both papers find strong effects of institutional arrangements on house price dynamics, as we will illustrate in this study. However, our study differs substantially from those previous ones in three important ways.

First, previous studies have mainly focused on the lessons from industrialised economies. This study is one of the first papers to investigate the evidence in the Asia Pacific area, which has gained an increasing importance in the global economy. Given the remarkable experience of housing bubbles in many of the Asian economies in the 1990s, it is interesting to examine the house price movements after the crisis episode. In addition, Asia-Pacific housing markets differ substantially from those of industrialised economies in terms of the development of institutional arrangements, the reliance on bank lending and the role of government-sponsored agencies. In this regard, the results could provide complementary views to existing studies.

Second, we extend the studies by including a broader set of institutional factors that provides a more robust message about the impact of house price dynamics and housing finance systems. Tsatsaronis and Zhu (2004) define the housing finance system as a combination of different aspects of institutional arrangements, including mortgage rate adjustability,

¹⁰ Rent data in our sample economies are often not available or not comparable with the house price data (referring to different samples). It is also difficult to quantify some key components of the user cost, such as the tax deductibility and the risk premium in individual markets.

maximum loan-to-value ratios, valuation method and mortgage equity withdrawal. These measures are constant over time for each country, implying that the impact of housing finance innovations on each market has been ignored. In Capozza et al (2002), the role of housing finance systems is in effect barely touched because the authors examine house price dynamics in metropolitan areas within the same country. In this study, we construct a measure of institutional factors on the basis of four different aspects of market developments, and this measure not only differs across countries but also varies over time. Therefore, we believe our results are more informative with respect to the role of institutional arrangements.

Third, we extend the housing bubble literature by distinguishing between house price growth and house price overvaluation, and between cyclical and bubble components of house price overvaluation. The first distinction is quite obvious. House price growth may simply reflect the increase in the fundamental value of the property, which is driven by income, mortgage rates and other factors. By contrast, house price overvaluation refers to the situation that current house prices are higher than the fundamental values.

The second distinction is more subtle. A bubble is necessarily related to house price overvaluation, but not vice versa. This is because frictions in the housing market, including lags in supply and credit market imperfections, may cause house prices to deviate from their fundamental values in the short term. In this paper, we consider that this cyclical component of house price overvaluation can be reflected by the serial correlation and mean reversion of house price dynamics, and define the unexplained part as the bubble component that is more likely to be driven by overly optimistic expectations in the housing market. Such a distinction is particularly important from a policymaker's perspective, because policy recommendations are quite different depending on what drives overvaluation of house prices.

3. Methodology

In this section, we describe the empirical methodology used to characterise house price dynamics and to analyse the bubble component in house price overvaluation.

3.1 Characterising house price dynamics

We follow the framework developed by Capozza et al (2002) to investigate the long-term and short-term determinants of house price movements. The approach can be divided into three steps. In the first step, the fundamental value of housing is calculated. In the second step, the short-term dynamics of house prices are determined by a mean reversion process to their fundamental values and by a serial correlation movement. The pattern of house price movements can be characterised by the mean reversion and serial correlation coefficients. In the third step, interactive terms are introduced to investigate the impact of institutional factors on house price dynamics.

3.1.1 *The fundamental value of housing*

It is assumed that in each period, in each area (a country or a city), there is a fundamental value of housing that is largely determined by economic conditions and institutional arrangements:

$$P_{it}^* = f(X_{it}) \tag{1}$$

where P_{it}^* is the log of the real fundamental value of house prices in country i at time t , $f(\cdot)$ is a function and X_{it} is a vector of macroeconomic and institutional variables that determine

house price fundamentals. We choose four blocks of explanatory variables based on theoretic reasoning or previous empirical work.

The first block of explanatory variables are demand-side factors, including real GDP, population, the real mortgage rate and the mortgage credit to GDP ratio. We posit that higher income and higher population tend to encourage greater demand for new housing and housing improvements. In addition, the mortgage rate is expected to be negatively related to housing prices. A higher mortgage rate entails higher amortisation, which, in turn, impinges on the cash flow of households. This reduces the affordability of new housing, dampens housing demand and pushes down house prices. Similarly, the growth in mortgage credit increases the financing capacity of households and stimulates the demand for housing.

The second block of variables are supply-side factors, including the land supply index and the real construction cost. The land supply index, which refers to the building permit index in most countries, measures the flexibility of supply to demand conditions. In the long run, an increase in land supply tends to bring down house prices. By contrast, the burden of higher real construction costs will be shared by purchasers and we expect a positive relationship between real construction costs and equilibrium house prices.

The third block of variables are prices of other types of assets, including equity prices and exchange rates. It is well documented that house prices tend to comove with other asset prices. For instance, Sutton (2002) and Borio and McGuire (2004) find strong linkages between equity price and house price movements. The direction of such linkage, from a theoretical perspective, is not clear, as the substitution effect and wealth effect point in opposite directions¹¹. Moreover, a real effective exchange rate appreciation is expected to exert positive influence on property market prices, particularly in markets where there is substantial demand from non-residents for investment purposes. In countries where foreign investments play an important role in the economy such as in Asia, an exchange rate appreciation is normally associated with housing booms.

Lastly, we also include an institutional factor that attempts to account for the impact of market arrangements on equilibrium house prices. The institutional factor is constructed as the first principal component of four index variables: the business freedom index, the corruption index, the financial sector index and the property rights index.¹² The institutional factor is designed to examine the impact of business, regulatory and financial conditions on the determination of house prices.

Several remarks are worth mentioning. First, we adopt a general-to-specific approach in assessing the determinants of house price fundamentals. That is, we start by including the whole list of possible explanatory factors to investigate their long-term relationship with house prices, using either single-equation ordinary least squares (OLS) or panel data techniques.¹³ Only regressors found to be significant at the five percent level are retained.

¹¹ A substitution effect predicts a negative relationship between the prices of the two assets, as the high return in one market tends to cause investors to leave the other market. A wealth effect, by contrast, predicts a positive relationship because the high return in one market will increase the total wealth of investors and their capability of investing on other assets.

¹² Business freedom index measures the ability to create, operate, and close an enterprise quickly and easily. Burdensome, redundant regulatory rules are the most harmful barriers to business freedom. The financial freedom index is a measure of banking security as well as independence from government control. The corruption index is a measure of the perception of corruption in the business environment, including levels of governmental legal, judicial, and administrative corruption. The property rights index measures the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state.

¹³ To avoid simultaneity bias, contemporaneous variables are instrumented with own lags.

Second, since the stochastic variables included in the long-run equation are mostly non-stationary, it is important to establish first the stationarity of the residuals of the cointegrating equation before proceeding to the second stage. Thus, residual tests were undertaken to ensure that the requisite statistical properties are satisfied.

Third, we use the trend series of mortgage credit to GDP ratios and equity prices in explaining the long-run house price fundamentals. The original raw series may contain non-fundamental component, and a housing bubble often comes with excessive growth in mortgage credit and sometimes interact with extreme equity price movements. Using the trend series of the two variables can ensure that our estimates of house price fundamentals are not contaminated by the non-fundamental (or bubble) components and by extension, minimise potential errors in the analysis.

3.1.2 Short-run dynamics

Arguably, equilibrium is rarely observed in the short-run due to the inability of economic agents to adjust instantaneously to new information. As suggested by Capozza et al (2002), house price changes in the short run are governed by reversion to fundamental values and by serial correlation according to:

$$\Delta P_{it} = \alpha \Delta P_{i,t-1} + \beta (P_{i,t-1}^* - P_{i,t-1}) + \gamma \Delta P_{it}^* \quad (2)$$

where P_{it} is the log of (observed) real house prices and Δ is the difference operator.

If housing markets are efficient, prices will adjust instantaneously such that $\gamma = 1$ and $\alpha = 0$. Given that housing is a slow-clearing durable asset, it is reasonable to expect that current price changes are partly governed by previous changes in own price levels ($\alpha > 0$), by the deviation from the fundamental value ($0 < \beta < 1$) and partly by contemporaneous adjustment to changes in fundamentals ($0 < \gamma < 1$).

The above model specification allows for rich dynamics of house price movements, depending on the size of the coefficients α and β . To examine the dynamics, we first rewrite the equation 2 as a second-order difference equation (the subscript i omitted):

$$P_t - (1 + \alpha - \beta)P_{t-1} + \alpha P_{t-2} = \gamma P_t^* + (\beta - \gamma)P_{t-1}^*$$

We then proceeded to study the characteristic roots of the corresponding characteristic equation given by $b^2 - (1 + \alpha - \beta)b + \alpha = 0$, which determine the properties of house price dynamics. In graphical form, house price dynamics can be depicted as in Figure 2.¹⁴

To summarise, the sufficient and necessary condition for a house price cycle to be stable is $\alpha < 1$ and $\beta > 0$. If satisfied, there are two possible types of house price movements: (i) if $(1 + \alpha - \beta)^2 - 4\alpha \geq 0$ (see Region I in Figure 2), the house price will converge monotonically to the equilibrium level. In this case, the transitory path itself does not generate house price cycles; in other words, house price cycles only reflect cyclical movements in their fundamental values. The speed of convergence depends on the magnitude of the two coefficients: the convergence rate is generally higher when α and β are larger. (ii) if $(1 + \alpha - \beta)^2 - 4\alpha < 0$ (see Region II in Figure 2), the transitory path in response to changes in equilibrium house price values exhibits a damped fluctuation around the equilibrium level. The magnitude of the two coefficients, again, decide on the property of the oscillation.

¹⁴ The strict proof is available upon request.

Generally, a higher α implies a higher amplitude and a higher β implies a higher frequency of the fluctuation process.

If $\alpha \geq 1$ or $\beta \leq 0$, then the house price cycle is unstable. House prices may either diverge or exhibit an amplified fluctuation away from the equilibrium level, but such movements cannot be sustainable. In general, such features should not exist in any housing market for a prolonged period.

3.1.3 The role of institutional factors

Given the importance of mean reversion and serial correlation coefficients, the question to be asked is: what determines α and β ? Following Capozza et al (2002), we posit that they are determined by region-specific factors, including the stage of economic development, the elasticity of land supply and other institutional factors that reflect differences in business environment and housing finance system arrangements.

Formally, we introduce interactive terms in the mean reversion and serial correlation coefficients:

$$\Delta P_{it} = [\alpha_0 + \sum_j \alpha_j Y_{ijt}] \Delta P_{i,t-1} + [\beta_0 + \sum_j \beta_j Y_{ijt}] (P_{i,t-1}^* - P_{i,t-1}) + \gamma \Delta P_{it}^* \quad (3)$$

where Y_{ijt} is a list of region-specific economic and institutional factors that may affect the property of house price dynamics.¹⁵ Introducing the interactive terms allow the two coefficients to differ across regions and to vary over time. For each country, the average serial correlation and mean reversion coefficients are $\alpha_i = \alpha_0 + \sum_j \alpha_j \bar{Y}_{ijt}$ and $\beta_i = \beta_0 + \sum_j \beta_j \bar{Y}_{ijt}$, respectively, where \bar{Y}_{ijt} represents the time average of Y_j in country i .

3.2 Detecting housing bubbles

We employ the above empirical results to investigate the issue of house price overvaluation, and to quantify two components of such overvaluation: a cyclical component that is attributable to the intrinsic house price cycles (related to macro and institutional factors and house market frictions) and a bubble component that cannot be explained by these cyclical factors.

House price overvaluation is defined as the fact that observed house prices (P_t) are higher than predicted house price fundamentals (P_t^*) (see section 3.1.1, subscript i omitted). Intuitively, it is distinct from high house price inflation because the latter may simply reflect the increase in house price fundamentals.

More importantly, we also make a clear distinction between house price overvaluation and a house price bubble, the concepts of which are often mixed in the existing literature. Throughout this paper, a housing bubble is defined via component analysis of house price overvaluation. As suggested by Wheaton (1999) and Davis and Zhu (2004), frictions in housing markets can generate intrinsic house price cycles, causing house prices to deviate (sometimes substantially) from their fundamental values in the short term. We consider this cyclical component of house price overvaluation to be reflected in our estimates of short-term dynamics. The residual component that cannot be explained by the intrinsic adjustment

¹⁵ Similarly, we also adopt a general-to-specific approach, in that we start by including a list of possible factors but the final model specification only includes those variables with significant interactive effects.

process is what we define in this paper as the “bubble” component (also see Brunnermeier and Julliard, 2007).

More specifically, for a given house price overvaluation ($P_t - P_t^*$), the cyclical component is calculated as $P_{t-1} + E(\Delta P_t) - P_t^*$, where $E(\Delta P_t)$ is the predicted value from short-term dynamics (see Equation 3). Notice that the sum of the first two elements is the predicted house price based on short-term dynamics, its deviation from the fundamental value P_t^* is attributable to the short-run cyclical movement of house prices. By comparison, the residual component, labelled as the “bubble” component in this study, is defined as house price overvaluation minus this cyclical component. Intuitively, house price overvaluation is not equivalent to a house price bubble in our framework.

There are certain limitations in our definition of a housing bubble. For one, it is defined loosely. The definition of the bubble component is contingent on the accuracy of the model used to estimate house price dynamics. Strictly speaking, a house price bubble in our paper refers to the component that cannot be explained by the list of macro-financial variables or institutional factors used in this study. If the list of variables is incomplete, then the bubble may mistakenly include a fundamental-related component. By contrast, if the estimates of house price fundamentals are not efficient and include a non-fundamental-driven component, they will introduce errors in the decomposition analysis. Certain aspects of the methodology are designed specifically to minimise the relevance of these concerns. For example, we use a trend series of mortgage credit to GDP ratios and equity prices in examining the determination of house price fundamentals. Moreover, whenever data are available, we adopt panel regressions to estimate house price fundamentals, in the hope of revealing the general relationship between house price fundamentals and macrofinancial factors. Nevertheless, these refinements are by no means perfect.

The above empirical methodology also provides another item of complementary evidence for the characteristics of house price cycles. If $\alpha \geq 1$ or $\beta \leq 0$, house prices are on a divergent path, their movement cannot be sustainable. Such evidence, although not directly related to the bubble component analysis, can shed light on irrational developments in the housing market under review.

4. Data description and empirical findings

In this section, we first briefly describe the data used in this study, then report the empirical results. The empirical results consist of two parts: the characteristics of house price dynamics, and the analysis of house price overvaluation and its bubble component.

To start with, Table 1 summarises and compares the developments of housing markets in the nine Asia-Pacific economies. Culturally, there was a general trend towards encouraging home ownership in Asia during the period under review. The property sector is normally dominated by a few major developers. The banking system, alongside the government housing finance system, plays an important role in meeting the demand for housing in most sample economies. The national housing markets share certain similarities (eg the prevalent use of floating-rate mortgage contracts), but there are also important differences.

4.1 Data description

Quarterly data for residential property sector in nine economies and 32 cities/market segments in Asia¹⁶ were used in the analysis. Where data are available, quarterly series spanning the period 1993-2006 were used.

The house price data have certain limitations. There are some subtle variations in the definition of house prices used in the estimation (see Appendix A). While some series are derived using a hedonic pricing method, some are simply based on floor area prices collected by the authorised land registration authorities and the private sector, for which no quality adjustment was done. Moreover, the time series are relatively short. Except for Hong Kong SAR, Korea, Singapore and Thailand, quarterly house price data only cover the post-Asian crisis period. However, longer time series of house price data may not necessarily improve the results, in the sense that many Asian economies have experienced a regime-shift in housing markets and house finance systems, which has arguably led to discontinuities in the dynamics.

Apart from the residential property price index, other series used in this study include real GDP, population, the construction cost index, the land supply index, mortgage credit to GDP ratios, real mortgage rates, real effective exchange rates, the stock price index, and four institutional indices: the business freedom index, the financial freedom index, the corruption index and the property rights index. Table 2 reports summary statistics of key variables used in this study, for each country and for the whole sample.

A key explanatory variable used in this study is the institutional factor, which is defined as the first principal component of the four institutional indices as mentioned above. It is constructed so that we can investigate the role of institutional factors in determining long-run and short-run dynamics of house prices in a parsimonious way. It turns out that the first principal component has approximately equal weights of the four indices, and can account for about 80% of the variability in the four index series. A higher score in the institutional factor is associated with higher business freedom, better regulatory conditions, lower corruption, a greater range of intermediation functions by the financial sector and a higher degree of flexibility in acquiring land and better legal protection to land/home owners. Therefore, a higher institutional factor score tends to reduce the searching and transaction cost, facilitate credit transactions and allow investors to respond more quickly to changes in the housing market. As shown in Figure 3, the institutional factor exhibits substantial time variation and cross-country differences. The nine economies can be easily divided into two groups: Australia, Hong Kong, New Zealand and Singapore as more business-friendly and the other five economies less so. Overtime, Australia and New Zealand experienced major improvements, while Malaysia and Thailand witnessed deterioration in their business environment during the period under review.¹⁷

4.2 Characterising house price dynamics

To investigate the characteristics of house price dynamics, we follow the Capozza et al (2002) approach as described in Section 3.1. We run three different regressions.

¹⁶ At the city level, Beijing, Chongqing, Guangzhou, Shanghai, Shenzhen and Tianjin are included in China; Busan, Daegu, Daejeon, Gwangju, Incheon, Seoul and Ulsan are included in Korea; Johor, Kuala Lumpur, Pahang, Perak and Pinang are included in Malaysia; Caloocan, Makati, Manila, Pasay, Pasig and Quezon are included in the Philippines. In addition, for Hong Kong, Singapore, Bangkok, Manila and Kuala Lumpur, there are two separate sets of house prices for the average market and for the luxury market segments respectively.

¹⁷ The differences in institutional factors are highly consistent with the differences in housing finance system developments. Among the nine sample economies, Australia, Hong Kong, New Zealand and Singapore have more advanced housing financing systems and more active secondary mortgage markets (see Zhu, 2006).

The first regression relies on a panel data technique to estimate the determinants of fundamental house prices (Equation 1) and the short-run dynamics (Equation 3), with the results reported in Table 3. The regression attempts to capture the common picture, if any, of house price cycles for the nine economies during the sample period, ie 1993-2006. In stage 1, the determination of house price fundamentals yields results that are largely consistent with the theoretical predictions (Table 3.A). First, higher income, prospects of higher capital gains from real effective exchange rate appreciation and greater credit availability (mortgage credit-to-GDP) are associated with increases in house prices in Asia-Pacific economies. Second, increases in real mortgage rates have a dampening effect on house prices by raising the cost of housing purchase, but the magnitude is relatively small. Third, the coefficient of the land supply index is positive, which conflicts with the theoretical prediction that increases in land supply have a dampening effect on house prices in the long run. This may, however, reflect a linkage in the opposite direction, ie higher house prices provide an incentive for developers to build new residential property projects. Fourth, the institutional factor has a positive and significant effect, suggesting that the improvement in business environment (higher transparency in business regulations, lower corruption, a higher degree of financial sector development) facilitates additional transactions and exerts a positive impact on house prices. Lastly, equity prices are negatively related to house prices, suggesting that the substitution effect prevailed over the wealth effect during the sample period.

Results for the short-term dynamics, using the house price fundamentals predicted in the panel regression results, are reported in Table 3.B. Figure 4 summarises the characteristics of house price dynamics in each of the nine economies, by plotting the average persistence and mean reversion coefficients using the time-average of country-specific variables. They are separated into two groups. Australia, Hong Kong, New Zealand and Singapore typically observe damped oscillation of house prices if the fundamental values change, whereas China, Korea, Malaysia, the Philippines and Thailand observe a convergence to the fundamental values.¹⁸ The speed of convergence is the lowest in China and the Philippines, suggesting that the price discovery function is the weakest in these two markets.

The differences in national house price dynamics can be explained by differences in market arrangements, such as the supply elasticity, mortgage rate adjustability and the institutional factor (Table 3.B).¹⁹ First, the land supply index has a negative interactive effect on the persistence coefficient. As expected, increases in the land supply index and the construction cost index (proxies for higher supply elasticity) temper the magnitude of house price cycles. Second, changes in mortgage rates have a positive interactive effect on the mean reversion coefficient. This is probably because larger changes in mortgage rates may reflect a more liberalised mortgage market or higher flexibility in mortgage rate adjustment, which is often associated with a faster speed of convergence to the equilibrium price (a higher mean reversion coefficient). Lastly, the institutional factor has a positive interactive effect on the persistence parameter and a negative interactive effect on the mean-reversion parameter. That is, a higher score in the institutional factor tends to increase the amplitude but lower the frequency of house price cycles. This is quite surprising as it indicates that a more flexible market is associated with more significant house price fluctuations.²⁰ There might be two

¹⁸ No country is in the zone of unstable divergence or amplified oscillation.

¹⁹ Notice that we do not have the time series of housing finance variables, such as loan to value ratios and real estate taxes. Instead, we use the changes in the nominal mortgage rate to proxy for mortgage rate adjustability and the institutional factor to proxy for the flexibility of housing markets and housing finance systems.

²⁰ Along the same lines, Zhu (2006) also suggests that house prices in Hong Kong and Singapore, the two economies with the most flexible housing finance arrangement, are much more volatile than a number of other Asian economies.

reasons. For one, the housing market is characterised by many frictions, making housing a unique type of asset. By introducing more flexible housing finance systems and improving the business environment, the role of housing as an investment good expands and the price-discovery function in the housing markets strengthens. This probably explains the higher volatility when housing markets become more market-oriented. On the other hand, the less volatile house prices in those economies with a lower score in their business freedom index is probably attributable to more extensive government support and finance-linked subsidies in these economies.

The second regression (Table 4) is similar to the first one, except that country-specific regressions are used to identify the determination of house price fundamentals.²¹ It is commonly known that housing is a local product and the determination of house prices tend to be market-specific. To reflect this we allow the house price fundamentals to be determined in each country-specific analysis, and use the country-specific predicted fundamental values in the analysis on the short-run dynamics.

Table 4.A. confirms that the driving factors of house price fundamentals are market-specific. Therefore it is important to incorporate this heterogeneity in the analysis. Nevertheless, the results of short-run house price dynamics are quite robust, as reported in Table 4.B. The sign and significance of all coefficients, including the interactive terms, are retained. The cross-country differences in term of the average persistence and mean-reversion coefficients, do not change in the regression that allow for country-specific fundamentals (Figure 5 versus Figure 4).

The third regression (Table 5), instead, employs city-level data. As in the second regression, the fundamentals are determined on the basis of country-specific or market-specific analysis. The panel regression results of the endogenous adjustment equation, as shown in Table 5, show significant and positive interactive effects of a dummy variable that defines the most important market segments in each country.²² By contrast, the interactive effects of supply and construction cost indices are washed out. This suggests that the high-end markets or the leading markets are more likely to be associated with lower response of supply to market demand, which causes them more likely to face a higher volatility of house price movements. By contrast, the negative (positive) interactive between the institutional factor (mortgage rate adjustment) and the mean-reversion parameter remains robust.

4.3 Detecting housing bubbles

Following the methodology described in Section 3.2, we try to address the question of whether house prices in selected Asia-Pacific economies are overvalued, and if so, whether there is evidence of some bubble being formed in this region.

The analysis is based on the second regression described above, which treats the determination of house price fundamentals as country-specific and relies on a panel data regression to analyse the patterns of short-run dynamics. In Figure 6, we first plot the deviation of house prices from predicted fundamentals, represented by the blue bars. At the national level, the evidence of house price overvaluation in recent years is rather weak. Except for Hong Kong SAR (where the house price was 10% higher than predicted

²¹ For those countries with city-level data, the country-specific analysis is based on a panel regression within the country. This seeks to overcome major data limitations, ie the short time series and the quality difference in computing house price indices.

²² It equals one for high-end markets (in Bangkok, Hong Kong SAR, Kuala Lumpur, Manila), the Singapore private housing market, and major commercial cities in the country (Beijing and Shanghai in China and Seoul in Korea).

fundamentals in year 2005), the deviation of house prices from fundamental values is quite small. The result contrasts sharply before the Asian-crisis, where house prices are about 20% higher than their fundamental values in Korea and Malaysia. It appears that the recent strong house price growth (eg in Australia, China, Korea and Hong Kong, see Figure 1) is mainly attributable to strong macroeconomic fundamentals.

When the cyclical component, depicted by the red bars in Figure 6, is plotted against total house price overvaluation, the evidence of a house price bubble is even weaker. In Hong Kong, the modest house price overvaluation in year 2005 was mainly driven by the cyclical component, ie intrinsic house price adjustment due to house price frictions and other market factors. It was only in Korea and Thailand where the bubble component is positive, but at very low levels. Again, this contrasts to the findings before the Asian financial crisis, when the bubble component explains seven percentage points of house price overvaluation in Korea and Malaysia and a double-digit bubble component in the Philippines. Therefore, a general conclusion is that, at least at the national level, there is little evidence of either substantial house price overvaluation or house price bubbles in the selected economies in recent years.

The analysis also extends to city-level (or market-level) house price dynamics. Figure 7 plots, for each country, the house price deviation from fundamentals in the high-end market (or a leading market) versus the average market. There are two interesting findings. First, except for Malaysia, a more remarkable overvaluation has been detected in the leading market compared to the other markets in the current run-up of house prices. In other words, the house price overvaluation that is observed at the national level comes mainly from the leading market segment. Moreover, over the whole sample period, house prices in the leading market are more likely to deviate substantially from their fundamental values. These results are consistent with the conventional view that the leading market is more volatile than the average market. Second, the breakdown analysis suggests that speculative housing bubbles may exist at particular market segments, for instance, the luxury market in Manila and to a lesser degree in Bangkok, Seoul, Beijing and Shanghai. From a policy perspective, it is important for policymakers to implement market-specific diagnoses and to find the right policy instruments that can ideally distinguish between cyclical and bubble components.

5. Conclusion

The study documents evidence of serial correlation and mean reversion in nine Asia-Pacific economies and analyses the patterns of house price dynamics in relation to local institutional features. Notwithstanding the nuances in each market, the regression results validate the hypothesis that the current run-up in house prices reflects mainly an adjustment to more buoyant fundamentals than speculative housing bubbles. However, national average house prices mask the volatility in house price movements in leading cities/markets.

Despite the relatively benign housing market environment in Asia, it remains crucial for regulators to understand the potential risks embedded in the evolving housing market structure. Whereas our study tries to investigate the determination of house price dynamics and evidence of house price bubbles, the answers are far from complete. Further exploration calls for improved data compilation and a better understanding of the mechanism of house price determination. For most of Asia, there appears to be a pressing need to improve the quality and timeliness of house price data if these are to aid in better analysis for policy decision-making purposes. Reliable information on city level or across market segments is crucial to the understanding of possible local/ market segment bubbles.

Appendix A.

House prices: definitions and data sources

Country	Series definition	Sources	Remarks
Australia	Residential property price index	national source	Weighted average of eight capital cities in Australia, namely Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, Darwin and Canberra.
China	Property price index (both residential and commercial)	CEIC	Same source: city level information is also available. Beijing, Chongqing, Guangzhou, Shanghai, Shenzhen and Tianjin are included in this study
Hong Kong SAR	(i) Residential property price index (repeat sales); (ii) Capital value of luxury residential property	(i) CEIC; (ii) Jones Lang LaSalle (JLL)	(i) A composite index for all classes of private domestic, the most common official figures for property price measurement; (ii) Top capital value for a prime quality residential property in the best location
Korea	Residential overall house price index (including detached house and apartment prices)	CEIC	Same source: city level information is also available. Busan, Daegu, Daejeon, Gwangju, Incheon, Seoul and Ulsan are included in this study.
Malaysia	(i) Residential house price index; (ii) Capital value of luxury residential property in Kuala Lumpur	(i) National source; (ii) CEIC	(i) Nationwide, all dwellings (per sq.m) is from national source. City-level/state-level residential house prices are from CEIC, using hedonic method. Johor, Kuala Lumpur, Pahang, Perak and Pinang are included in this study; (ii) Top capital value for a prime quality residential property in the best location in Kuala Lumpur
New Zealand	Residential property price index	National source	Total New Zealand index is from the total current valuations of the relevant local authorities combined and used to calculate the current average valuation for each quarter. These current valuations are then used to calculate the price index using sales price

Philippines	(i) Residential property price index; (ii) Capital value of luxury residential property	(i) NSO; (ii) JLL/Colliers International	(i) Constructed from available value of building permits and corresponding floor area. City level information is available for the National Capital Region (represented by Caloocan, Makati, Manila, Pasig, Pasay and Quezon; 2000=100); (ii) Top capital value for a prime quality residential property in the best location in Manila, Makati and Ortigas Center.
Singapore	(i) Residential property price index; (ii) Capital value of luxury residential property	(i) CEIC; (ii) JLL	(i) HDB resale price index, which is calculated from the quarterly average resale price of HDB flats by date of registration; (ii) Top capital value achievable for a prime quality residential property in the best location
Thailand	(i) Residential property price index; (ii) Capital value of luxury residential property in Bangkok	(i) BOT; (ii) JLL	(i) Bangkok and vicinities, single detached house and town house, including land (hedonic method); (ii) Top capital value achievable for a prime quality residential property in the best location in Bangkok

Table 1
House market conditions in selected Asia-Pacific economies

Country	LTV ratio	Mortgage credit Mortgage rate	Loan term	Government housing finance corporation ¹	Home-ownership rates ²
Australia	60-70	variable	25	-	72.0 (2002-04)
China	80	variable	10-15 (≤ 30)	HPF	59.0 (2000)
Hong Kong SAR	70	variable	20	HKMC	57.0 (2004)
Korea	70	variable	3-20	KHFC	56.0 (2000)
Malaysia	80	variable	30	Cagamas	85.0 (1998)
New Zealand	80-85	variable	25-30	-	68.0 (2002-04)
Philippines	70	variable	10-20	HDMF	71.1 (2000)
Singapore	80	variable	30-35	HDB	92.0 (2005)
Thailand	80	variable	10-20 (≤ 30)	GHB	82.4 (2005)

Sources: Global Property Guide (2007); Zhu (2006); national sources.

Notes: ¹ China has provident fund schemes, with housing loan facility made available to members. Shanghai pioneered the Housing Provident Fund (HPF) scheme in 1991, which became the model for national housing provident scheme introduced in 1994. The Philippines has Home Development Mutual Fund (HDMF), Government Service Insurance System and the Social Security System. ² Various survey years reported in Cruz (2006) for Southeast Asian and East Asian countries and Ellis (2006) for Australia and New Zealand.

Table 2
Summary statistics

Variables	Total	AU	CN	HK	KR	MY	NZ	PH	SG	TH
RHP	109.07	109.05	108.35	114.28	116.87	102.29	116.87	105.95	95.73	109.50
	20.0	26.0	10.0	27.1	13.4	3.7	24.6	20.2	13.9	11.7
ΔRHP(%)	0.19	1.08	0.80	-0.25	-0.45	0.31	1.41	-0.93	0.60	-0.36
	5.5	1.8	0.9	6.3	2.2	1.1	2.0	12.5	4.1	5.0
ΔReal GDP (%)	5.12	3.72	9.08	4.33	5.26	5.66	3.51	4.36	6.18	4.01
	4.0	1.2	1.5	4.3	4.3	4.9	1.7	2.0	4.8	5.3
Population (mn)	161.41	19.09	1249.03	6.57	46.37	22.62	3.87	73.73	3.87	61.73
	380.5	0.9	39.5	0.2	1.3	2.1	0.2	5.6	0.3	2.4
RMR (%)	4.84	5.13	2.32	4.75	2.98	3.33	6.60	6.06	5.37	5.64
	3.3	1.7	6.1	3.9	0.7	2.1	1.3	2.4	1.3	2.4
Mort/GDP(%)	97.09	151.76	8.22	164.21	7.60	91.26	252.49	20.55	147.19	15.38
	82.1	40.6	1.7	34.5	7.6	15.1	37.5	5.9	31.3	1.4
LSI	147.05	105.95	108.47	91.74	123.18	87.94	119.26	115.26	138.75	440.68
	185.7	14.5	56.4	47.8	32.8	18.3	29.1	30.5	137.8	448.7
RCC	102.53	99.39	108.51	92.15	103.96	102.02	102.34	105.12	103.60	104.47
	7.7	3.1	11.1	5.9	4.9	3.7	3.5	10.1	4.4	5.9
EPI	104.16	110.89	94.48	93.24	103.46	106.14	120.41	102.72	100.31	105.83
	13.3	10.4	8.8	10.5	11.0	11.1	13.5	12.6	5.7	12.0
REER	110.32	93.82	73.67	74.13	110.41	99.76	108.94	130.99	90.00	106.04
	57.9	27.8	21.2	17.8	32.3	22.7	16.7	41.8	16.0	11.7
BFI	60.64	60.37	31.74	89.78	52.80	61.73	72.55	35.35	90.36	52.12
	21.4	13.9	5.8	0.8	9.4	10.0	8.1	9.4	1.2	7.1
FFI	63.46	90	40	88.33	56.67	40	90	48.33	70	50
	21.0	0	10.1	5.6	9.5	10.1	0	5.6	0	0
CI	64.83	83.33	31.583	85.67	58.75	61.583	92.18	27	91.08	54.58
	25.1	8.1	2.1	5.3	13.5	10.1	2.5	5.5	1.5	18.5
PRI	72.80	90	30	90	83.33	60	90	53.33	90	70
	22.0	0	0	0	9.5	10.1	0	16.2	0	14.3

Notes: This table reports the summary statistics of key variables, in each country and in the whole sample (1993-2006). For each variable, the numbers in the first row represent sample mean and those in the second row represent the standard deviation. RHR: real house price index; ΔRHP: real house price growth (quarterly); RMR: real mortgage rate; Mort/GDP: mortgage credit/GDP ratio; LSI: land supply index; RCC: real construction cost index; EPI: equity price index; REER: real effective exchange rate; BFI: business freedom index; FFI: financial freedom index; CI: corruption index; PRI: property rights index.

Table 3

Panel regression results

3.A. Determinants of house price fundamentals, dependent variable: log of real house prices

Variables	Coefficient	t-statistics
Real GDP	0.36	2.0
Real mortgage rate	-0.033	6.4
MORT/GDP trend	0.37	4.6
Land supply index	0.078	4.1
Real effective exchange rate	0.55	3.8
EPI trend	-0.22	3.6
Institutional factor (IF)	0.14	3.4
Adjusted R ²	0.55	

3.B. Short-run house price dynamics, dependent variable: real house price growth

	Coefficient	t-value
Persistence parameter (α)	0.24	5.1
Mean reversion parameter (β)	0.22	7.8
Contemporaneous adjustment parameter (γ)	0.30	5.6
α^* (change in land supply index)	-0.42	3.9
α^* (change in construction cost)	-10.95	2.9
α^* institutional factor	0.37	6.9
β^* (change in mortgage rate)	0.14	4.4
β^* (change in land supply index)	-4.67	2.4
β^* institutional factor	-0.12	4.3
Adjusted R ²	0.36	

Notes: This table shows the regression results for the long-term determinants of house price fundamentals and short-term house price dynamics. Both regressions adopt the panel data regressions with fixed effects. "MORT/GDP trend" and "EPI trend" refer to the HP-filtered trend series of mortgage credit/GDP ratios and equity price indices, and the institutional factor refers to the first principal component of four institutional variables: BFI, FFI, CI and RPI as defined in Table 2. In panel A, all variables (except for mortgage rate and "MORT/GDP trend") are in logs. To avoid simultaneity bias, regressors are instrumented with own lags. Panel unit root tests on the residuals reject null of unit root process. Moreover, panel B uses the model as specified in Equation 3.

Table 4

Panel regression based on a country-specific model of house price fundamentals

4.A. Determinants of house price fundamentals, dependent variable: log of real house prices

	AU (OLS)	CN (panel)	HK (OLS)	KR (panel)	MY (panel)	NZ (OLS)	PH (panel)	SG (OLS)	TH (OLS)
Constant	4.21	4.07	-8.39	5.60	2.42	-4.01	3.50	-4.82	4.76
Real GDP	0.38	0.18	0.022	-	0.41	0.56	-	-	-0.18
Mort/ GDP ¹ trend	0.92	-	-	-	0.24	-	1.08	-0.031	0.98
Real mortgage rate	-	-	-0.051	-0.034	0.010	-	0.017	-	-
Land supply index	0.23	-3.51	-	-0.16	-	-	0.16	-	0.074
Real construction cost	-	0.25	-	-	-	-	-	0.78	-
REER ²	-	-	0.99	-	-	0.32	-	1.30	-
Equity price trend	-0.84	-	2.22	-	-	0.98	-	-	-
Adjusted R ²	0.99	0.77	0.87	0.51	0.82	0.98	0.41	0.65	0.88

Notes: The results are based on country-specific regression results, by either using national level data (OLS) or a pooled city-level and national level data (panel). All equations are cointegrated at one percent level of significance. Regressors are expressed in logs except for mortgage credit-to-GDP ratio and real mortgage rate. Insignificant explanatory variables are dropped out in the model specification. To avoid simultaneity bias, regressors are instrumented with own lags. ¹Mortgage credit-to-GDP ratio. ²Real effective exchange rate.

4.B. Short-run house price dynamics, dependent variable: real house price growth

	coefficient	t-value
Persistence parameter (α)	0.12	2.5
Mean reversion parameter (β)	0.26	2.6
Contemporaneous adjustment parameter (γ)	0.68	10.9
α^* (change in land supply index)	-0.46	3.7
α^* (change in construction cost)	-10.8	3.1
α^* INSTITUTION	0.20	4.1
β^* (mortgage rate)	0.018	1.8
β^* (change in land supply index)	-0.45	3.8
β^* institutional factor	-0.085	1.8
Adjusted R ²	0.51	

Notes: The regression is based on a panel data of the nine sample economies (with fixed effects). House price fundamentals are determined by the country-specific regression results as reported in Table 4.A. The institutional factor refers to the first principal component of four institutional variables (defined in Table 2).

Table 5

City-level endogenous adjustment panel regression results

	coefficient	t-value
Persistence parameter (α)	-0.14	5.7
Mean reversion parameter (β)	0.54	11.8
Contemporaneous adjustment parameter (γ)	0.91	29.4
α^* (change in land supply index)	0.068	2.4
α^* (dummy for major cities)	0.22	2.4
β^* (change in mortgage rate)	0.084	2.6
β^* institutional factor	-0.086	3.0
β^* (dummy for major cities)	0.084	2.6
Adjusted R ²	0.32	

Notes: The regression is based on a panel data for 32 cities (markets) in seven Asia-Pacific economies (Australia and New Zealand excluded), using the panel regression with fixed effects. House price fundamentals are determined by the country-specific panel regressions or market-specific regressions, which are not reported here. The institutional factor refers to the first principal component of four institutional variables: BFI, FFI, CI and RPI as defined in Table 2. The dummy for major cities (markets) equals one for the following cities (markets): Kuala Lumpur luxury, Bangkok luxury, Manila luxury, HK SAR luxury, Singapore private, Beijing, Shanghai and Seoul.

Figure 1

House price inflation (yoy) in average residential markets, 1994-2006

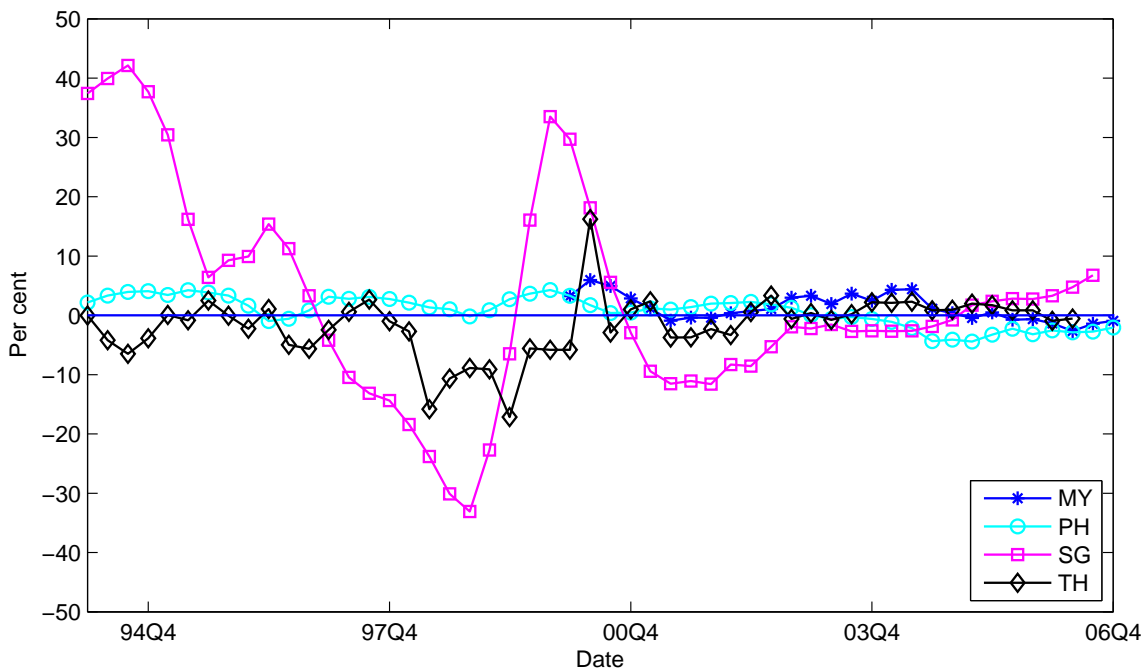
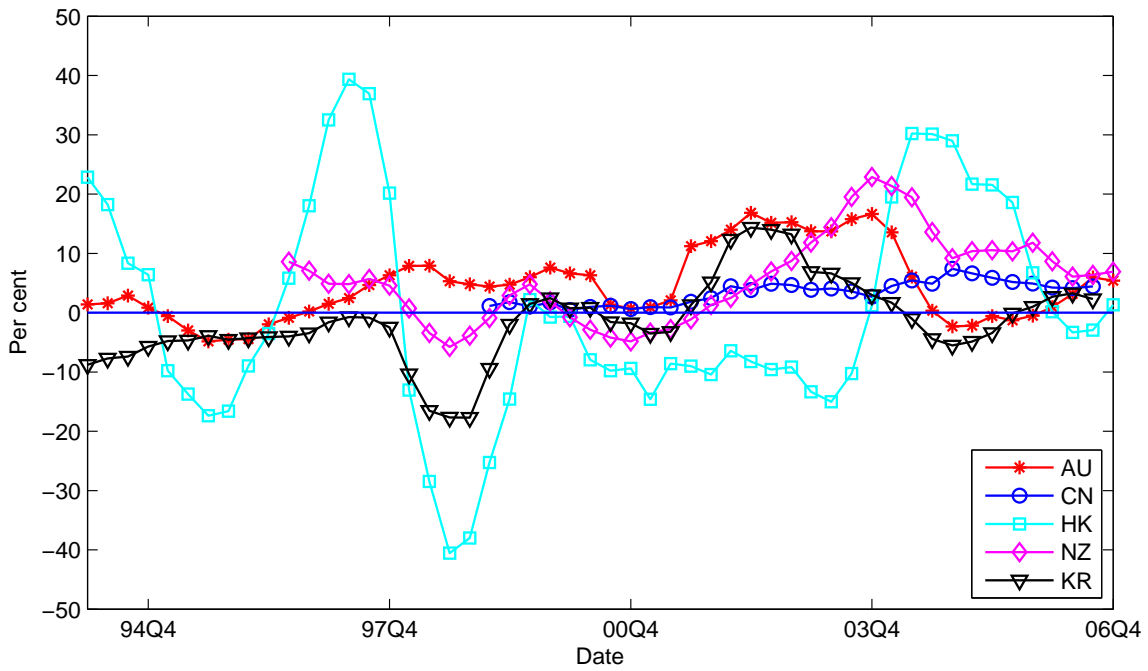
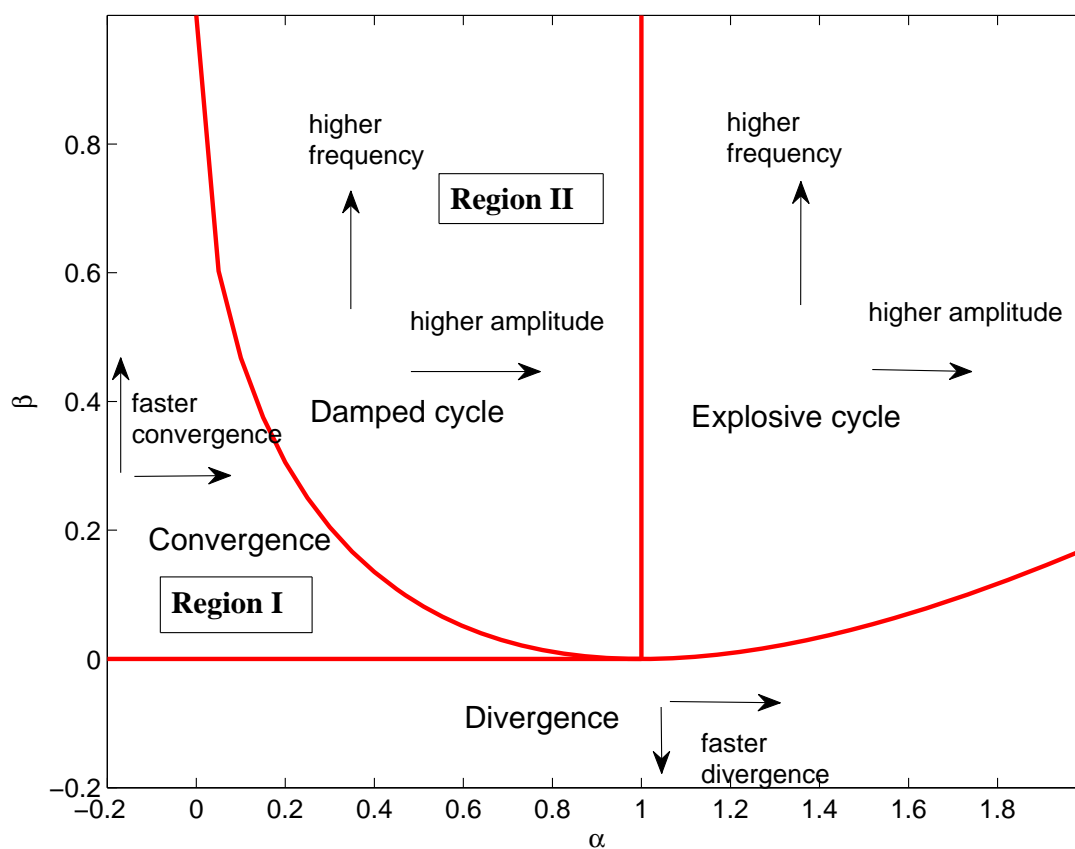


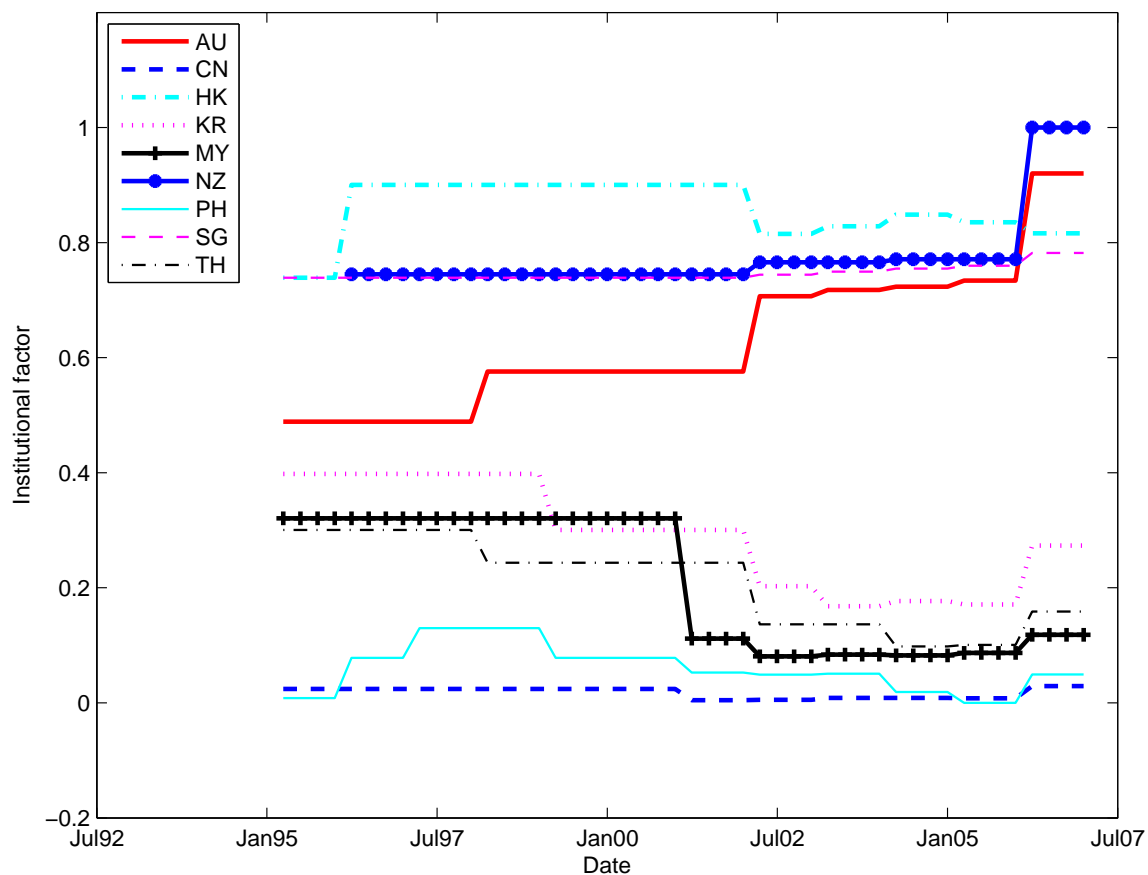
Figure 2
Characteristics of house price dynamics: illustration



Note: The figure plots the characteristics of house price dynamics for different combinations of persistence (α) and mean-reversion (β) parameters.

Figure 3

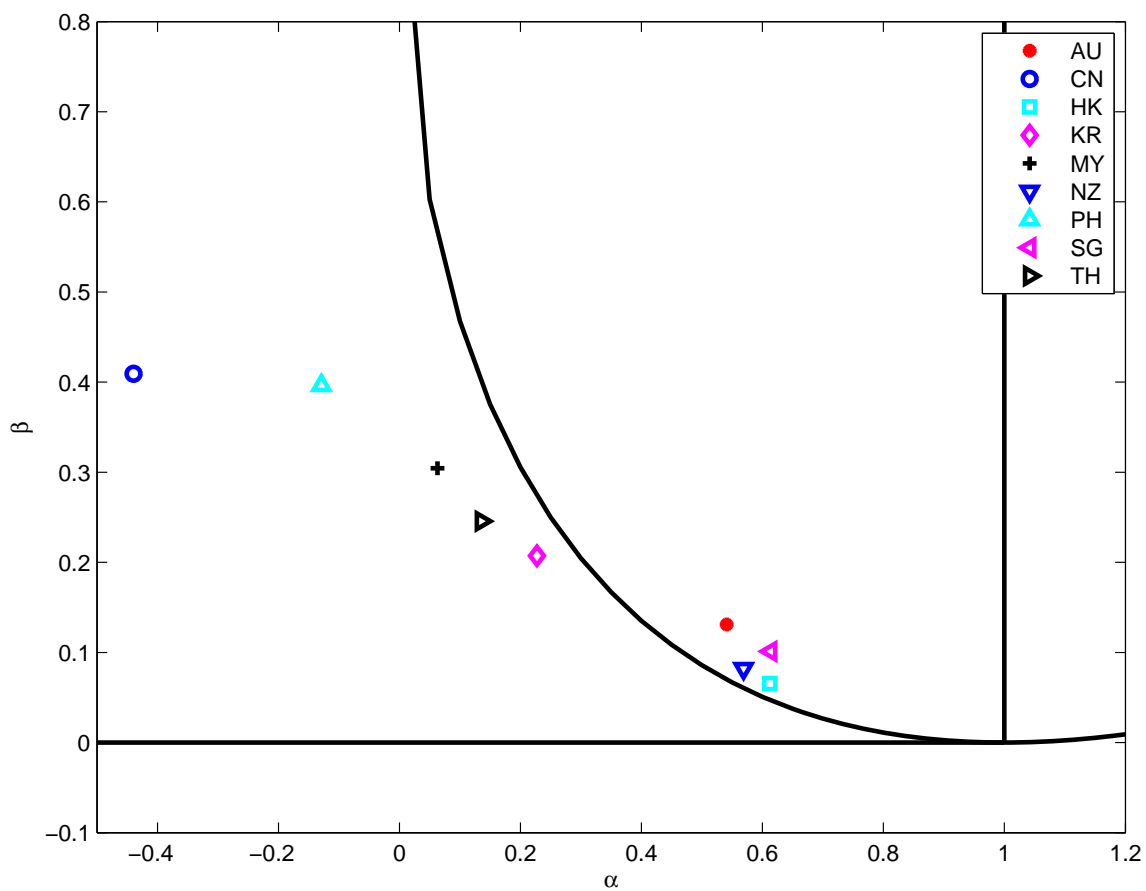
Institutional factors in nine Asia-Pacific economies



Note: The figure plots the time series of the institutional factor in each of the nine economies under review. The institutional factor is defined as the first principal component of four index series: the business freedom index, the financial freedom index, corruption index and the property right index. The institutional factor is re-scaled into 0 and 1.

Figure 4

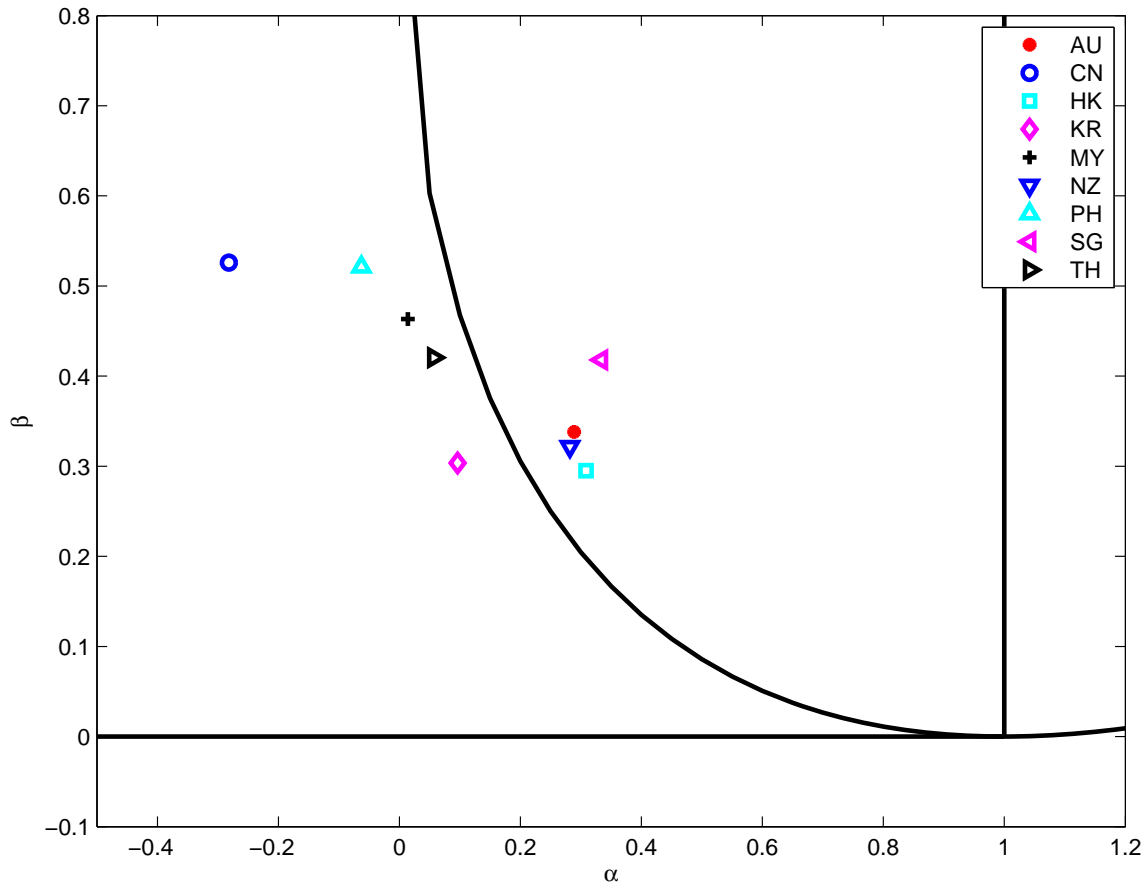
House price dynamics: panel regression results



Note: The results are based on a panel regression on the determinants of house price fundamentals and a panel regression on the short-run dynamics (with fixed effects in both regressions).

Figure 5

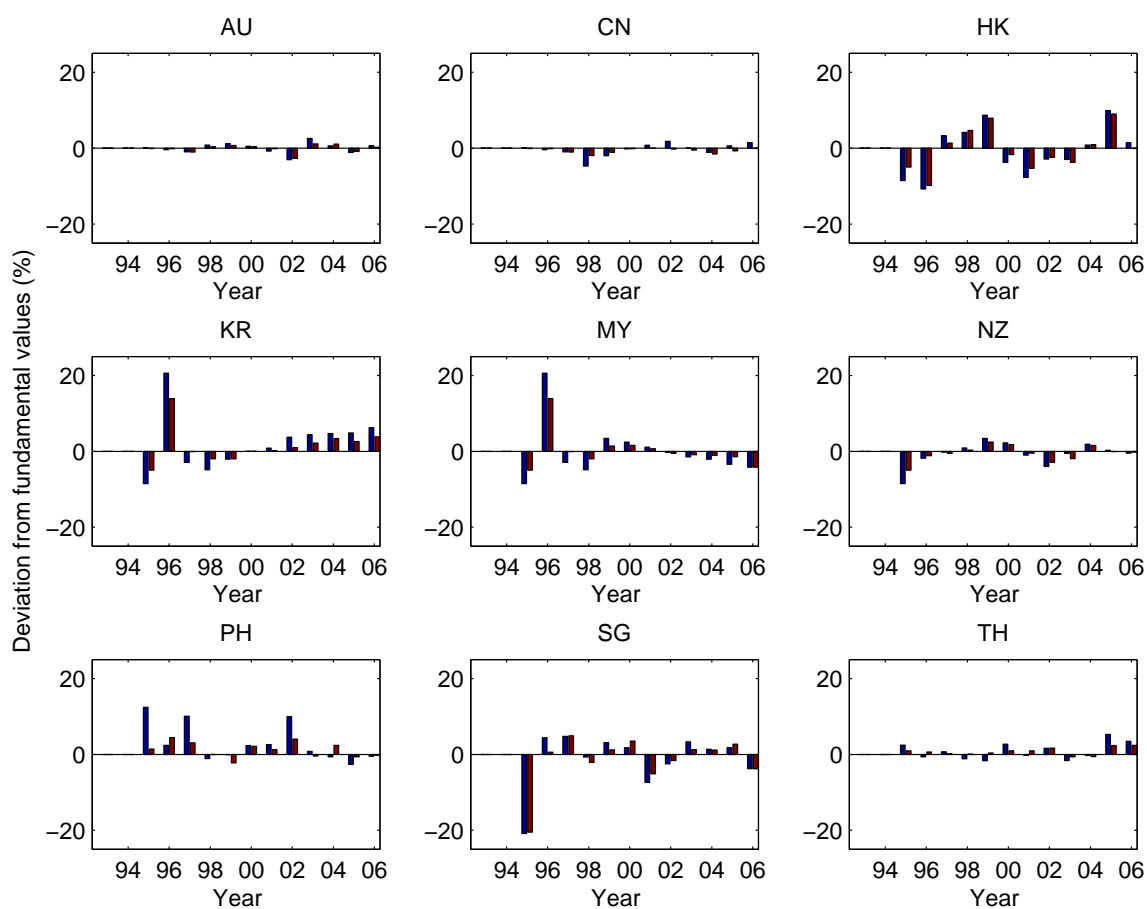
House price dynamics: baseline results



Note: Notes: The results are based on country-specific regressions on the determinants of house price fundamentals and a panel regression (with fixed effects) on the short-run dynamics.

Figure 6

Deviation of country-level house prices from fundamental values



Note: The blue bars represent the average annual deviation of observed house prices from their fundamental values, and the red bars represent the cyclical component of this average annual deviation, ie the component that can be explained by the short-term dynamics. The results are based on country-specific regressions on the determinants of house price fundamentals and a panel regression (with fixed effects) on the short-term dynamics.

Figure 7

Deviation of city-level house prices from their fundamentals

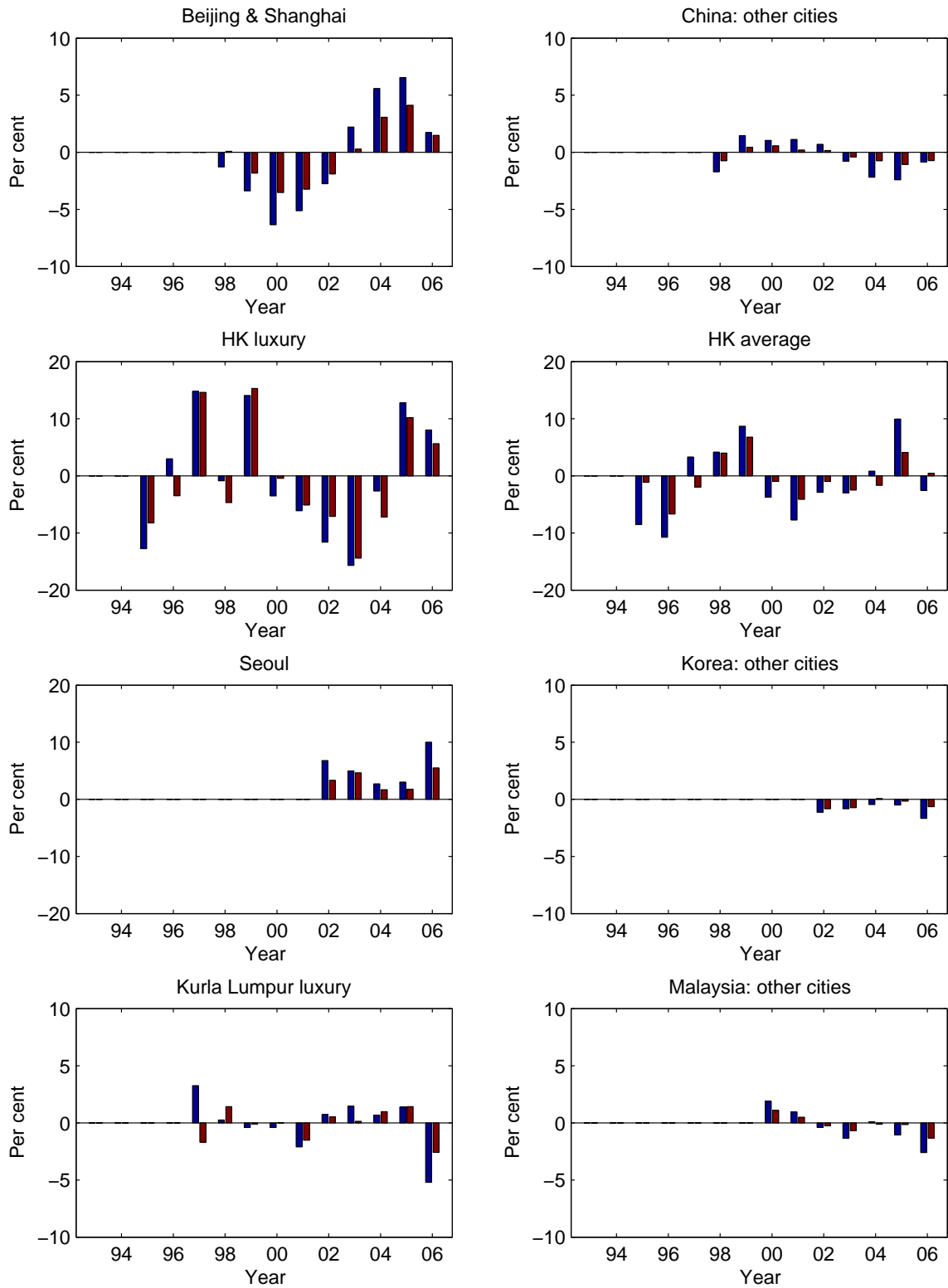
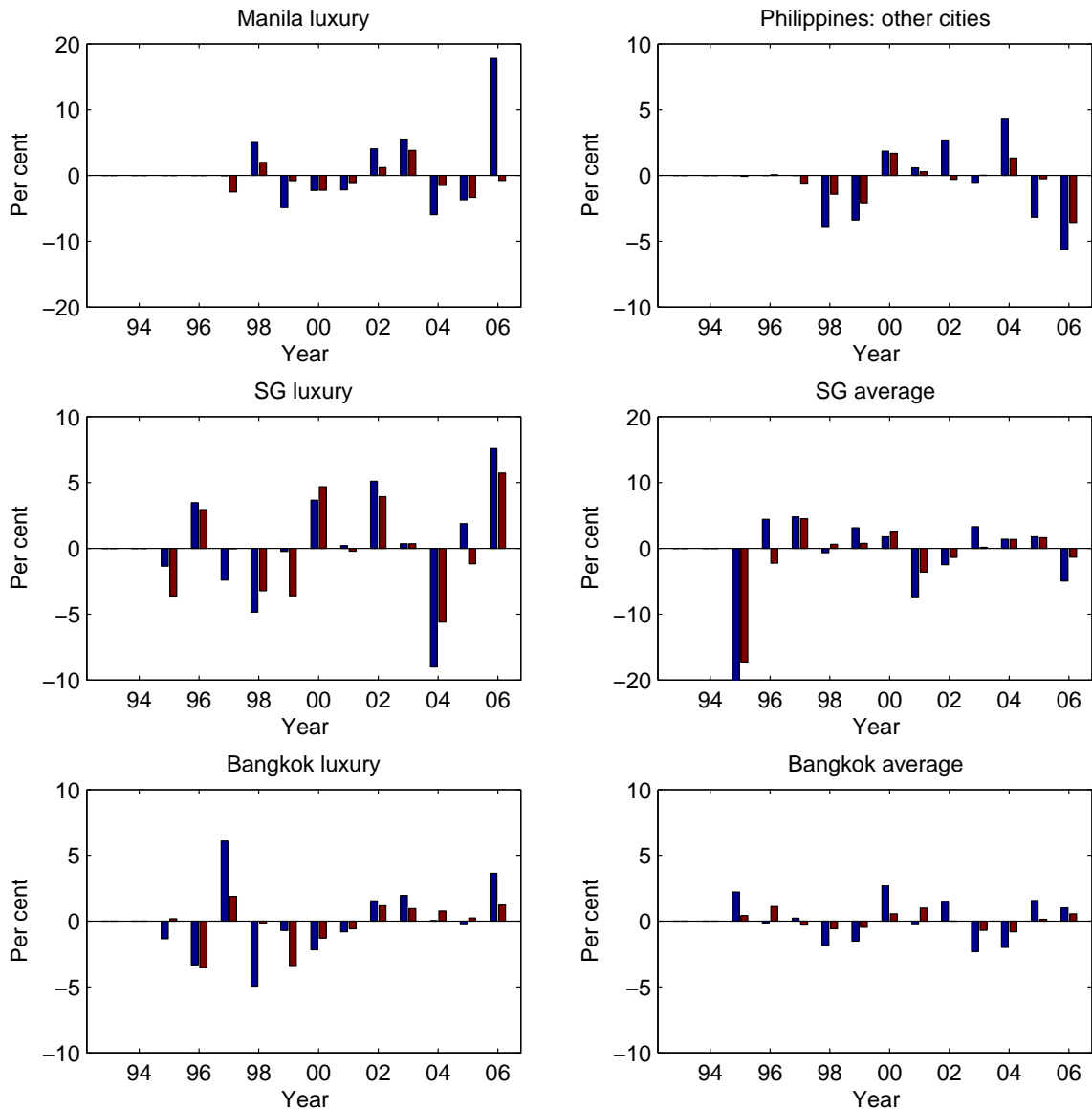


Figure 7 (cont)

Deviation of city-level house prices from their fundamentals



Note: The blue bars represent the average annual deviation of observed house prices from their fundamental values, and the red bars represent the cyclical component of this average annual deviation, ie the component that can be explained by the short-term dynamics. The results are based on a city-level analysis. In China, “other cities” refer to the average of Chongqing, Guangzhou, Shenzhen and Tianjin. In Korea, “other cities” refer to the average of Busan, Daegu, Daejon, Gwangju, Incheon and Ulsan. In Malaysia, “other cities” refer to the average of Johor, Kuala Lumpur average market, Pahang, Perak and Pinang. In the Philippines, “other cities” refer to the average of Caloocan, Makati, Manila average market, Pasay, Pasig and Quezon.

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Discussant remarks: financial stability issues in Asia and the Pacific

Diwa C Guinigundo¹

The first paper entitled “Contagion and Risk Premia in the Amplification of Crisis: Evidence from Asian Names in the CDS Market” is a very interesting one. It reminds me of Mervyn King’s latest speech before the Worshipful Company of International Bankers at the Mansion House on the role of risk aversion in the aggravation of the global financial crisis. Don, Miko and Eli’s paper is more specific, focusing as it does on credit default swaps (CDS) and expected default frequencies (EDF) as an amplification mechanism for the recent financial crisis. They also argue that shifts in risk aversion, more than the reassessment of risk, are what drives valuation of credit instruments. This has significant implications for both monetary and prudential policy. This is what we saw last October, when CDS spreads jumped as a result of the sudden shift in risk aversion following the closure of Lehman Brothers. In the case of the Philippines, sovereign CDS spreads tripled in the month of October, although macroeconomic fundamentals remained sound.

I have a few comments on the first paper.

Understanding and managing risk aversion is indeed very critical. To be able to do this, it would be useful to bear in mind three things:

One, the true nature of risk is very hard to perceive. That is why it was useful for this paper to focus on the CDS and EDF. As their results show, funding became very difficult to come by not because the risk per se increased but because the repricing of risks made it so. Valuation losses, as distinguished from actual losses, drove the whole process.

In more general terms, the sudden reversal of investors’ appetite away from the risky assets of emerging economies is often cited as a factor explaining crises in financial markets in this region. The alternation between periods of bullishness prompting investors to make risky investments, and periods of bearishness, when they retreat to the safest forms of investments, could indeed be at the root of sharp fluctuations in asset prices.

Thus, it is imperative that we delve deeper on how better to address risk aversion. While the so-called conventional judgment finds it hard to take an independent view of the future, the contrarians are in no better a position. This will suggest that the market could always be subject to sudden and violent changes. The picture becomes more complicated when we argue that speculative mania takes place not only because of financial engineering, but also because of gullible investors.

From the regulatory perspective, as Mervyn King of the Bank of England would propose, financial regulation should be simple and robust. Complex measures of risk and capital adequacy are rarely sufficient to capture developments that are “easy neither to anticipate nor calibrate”. I agree that efforts should be taken to address both the cross-section and time series aspects of bank dynamics. Bank interconnectedness should be established, particularly the abetting effects of complex transactions such as derivatives. The procyclical behaviour of risk-taking should also be studied. The challenge is to translate these general principles into some form of constrained discretion very much akin to its application to monetary policy so that excessive risk-taking can be monitored and appropriately dealt with.

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The paper is very useful in that it argues that risk premia may be used to calibrate capital standards over the cycle and help mitigate procyclicality. This is the practical value of the paper and this is very significant.

Two, given that this is an issue of market confidence, communication may be strategic. Communication is a crucial part of the job of everyone charged with management of the economy. Perceptions held by domestic and international audiences of the state of our economies are too important to be left unmanaged. Experience has shown that, in times of crisis, better economic fundamentals are not properly appreciated by the market. Thus, there is a need to proactively and aggressively communicate the strength of one's economy to restore investor confidence.

And three, on a broader scale, we also have to pause and assess the direction we want to take in further propagating financial globalization. The question is: if contagion seems to strengthen with globalization, what does that make of globalization? Without a doubt, globalization has had a deep impact on the way modern economies function. The benefits of globalization have accrued to diverse communities and regions but it has also brought with it significant risks. Economic and financial globalization thus not only calls for policy responses at the national level but also at the international level. It also calls for the consideration that such policy responses may have implications that extend beyond the domestic borders. I share the view of Joseph Stiglitz who once remarked, "I am a great cheer for globalization when it is managed well." This is something that is being done now in various forums and we hope good progress is made in this direction.

Let me say a few words on the second paper "Determinants of House Prices in Nine Asia-Pacific Economies"

This second paper is a very good example of collaborative study, in this case by economists from the central banks of the Philippines, Thailand and Hong Kong together with the BIS.

The first idea is that, in identifying the determinants of house prices in nine Asia-Pacific economies, the paper showed the absence of a significant bubble episode, considering that the period after the Asian crisis has generally been a period of economic growth as well as financial reform and consolidation in the region.

The result also shows that the detection of a housing bubble could be very challenging. The methodology that they used is very sensitive to their ability to list macro-financial variables or institutional factors. If the list is incomplete, one can argue that what may be considered a bubble actually includes factors that are acceptably fundamental. This is very tricky.

Thus, what can we say at this point?

Let me start from the most basic. Statistics: I share the view that the challenge for emerging markets is to develop and improve their house price series. This call assumes greater urgency considering that house prices have become more relevant as an asset price in monitoring and forecasting domestic inflation.

The results also support the observation that the resiliency of the Asia-Pacific region in the current crisis may be explained by the fact that we learned from the 1997 Asian crisis which largely emanated from the real estate bubble. Moreover, substantial support was also provided by the government housing finance systems, which makes up for the constrained access to housing credit from banks. In the Philippines, for example, government agencies account for 75% of cumulative housing loan releases for the period 2001-06. In addition, remittances from overseas Filipino workers (OFW), a main driver of the current account surplus, play an important role in the growth story and in the reinvigoration of the housing market. The seeming bubble detected for Manila luxury housing market during the period under review may be indicative more of a transition towards a new equilibrium – as 2006 was marked by renewed economic confidence with the fiscal house finally put in order.

My third point is that, even if house price statistics are available, one key issue is the determination of the long-run equilibrium level of house prices, their direction and the extent to which one can say there is an emerging misalignment or bubble.

Finally, given these difficulties, we can only sympathise with monetary authorities who may have to increase their policy rates enough to have some perceptible impact on a surging housing market. This could inflict collateral harm on, for example, the foreign exchange market and real sector activity. I therefore agree that we need to give due attention to house price dynamics in financial stability deliberations. For instance, a run-up in house prices reflecting better fundamentals may result in tighter monetary and regulatory policies. Similarly, a cyclical run-up due to market imperfections may need actions which differ from those needed to deflate asset price bubbles.

Having said that, let me cross the t's and dot the i's.

I call for better housing price series because determining whether housing price inflation represents a bubble or a cyclical development could be tricky. We can only imagine the serious policy implications if the central bank fouls up on this.

At this point, let me stress that the issues raised in the two papers are just some of the challenges facing us, monetary and regulatory authorities, today as we continue to try to preserve financial stability in our respective jurisdictions. The current global financial crisis has highlighted several issues and challenges and some of them have already been touched upon by our keynote speaker, Mr Goodhart.

Let me just highlight a few of these challenges.

Policy mix to preserve monetary and financial stability.

It is clear that restoring financial stability during the global market turmoil would not have been possible without combining traditional regulatory and prudential measures with exchange rate and monetary policies, of which interest rates have been only one important instrument. Moreover, it would not have been possible without the close coordination of monetary, fiscal and regulatory authorities.

Procyclicality of the financial system.

The first paper is especially useful in raising the issue of valuation losses and, therefore, research on the dynamics of risk premia, default probabilities and systemic banking health will be most instructive. Mr Goodhart mentioned today that the adoption of Basel II, combined with the simultaneous application of mark to market fair value accounting had the unintended effect of making the official regulatory system much more procyclical and unstable than previously. Given this, should we dispense with these international standards? Easing the mark to market rule, for one, does allow markets that have broken down to adjust and correct themselves in the midst of a crisis. On the other hand, a blanket suspension of mark to market accounting may not create a positive long-term solution as it leaves market players without indicators to guide them, which could lead to a prolonged illiquidity of the market. To which we can say that even if one were to assume that the market is liquid and one were to use mark to market, market values are far from market-based. They are driven by panic, uncertainty, even speculation – both in good times, ie to a lesser degree, and in bad times, ie to a higher degree.

The reason is quite obvious. Both accounting and regulatory capital requirements are based on estimated probabilities of default and estimates of losses given the possibility of default.

These two parameters move in sympathy with the economic cycle. In some jurisdictions, in the UK, for instance, some have proposed to relate the capital requirements to average loss rates through the cycle rather than on estimates of loss which differ across the cycle. A similar approach seems to be evolving in Basel.

Macroprudential framework for addressing risks at the system-wide level.

Certain realities pose some challenges to the implementation of a macroprudential approach to regulation. Closer coordination between monetary and supervisory authorities is required. There is no question that monetary authorities should be responsible for conducting the macro risk analysis. However, more thought should go into identifying what should be enforced in terms of appropriate macroprudential tools. This is especially a concern if supervisory authorities are saddled with mandates that are inconsistent with the macroprudential objectives. Given that the recent global financial crisis was in more ways than one an informational failure, making the judgment on the state of the business cycle and whether and when to change the rules, monetary authorities should play a leading role but in close consultation with the supervisory authorities.

The second paper on housing prices will be most useful in the following areas:

1. It raises the issue of whether greater weight should be assigned to housing price dynamics in policy deliberations to avoid inappropriate adjustment of regulation or the policy rates.
2. It highlights the role of liquidity and risk-taking in generating asset bubbles and the implications for the transmission of monetary policy and the design of macroprudential frameworks.

The fourth issue is the preservation of financial stability while fostering financial innovation to achieve greater productivity and efficiency.

I do not want to think that we should postpone the implementation of important financial innovation in a period of financial instability. We need to strike a balance here.

Over-reliance on private self-regulation may expose financial systems to risks of the type we have seen over the past few years. There was a clear failure of banks and investors to identify, price and manage risks. But too much public sector regulation may stifle innovation, affect the financial system and slow economic growth. The challenges that policymakers face in this regard are therefore big. I believe that the prerequisite to embracing financial innovation is appropriate prudential regulation, including appropriate disclosure and transparency standards. These would ensure that all stakeholders are fully aware of the risks that they are taking on.

Indeed, preserving financial stability is not an easy task. We have to continually put our heads together to come up with the best solutions. In the EMEAP region, we have established the Monetary and Financial Stability Committee which has been tasked with the responsibilities of doing both surveillance and examination of key economic and financial issues in the region. We are also drafting a medium-term work programme to be able to address emerging issues within the next two years. There are three working groups working on issues in monetary policy, financial markets, banking supervision and the payments and settlements system. We are designing a weekly template of high-frequency data to be given

to member countries if only to alert everyone to any irregular movement of any of the monitored indicators.

In the ASEAN and ASEAN+3, we have realised that we need a more concrete form of regional cooperation and mutual support. Thus, we have decided to pool our resources to form a \$120 billion fund that will be made available to any member country experiencing a balance of payments need. An integral component of this facility is the mechanism of enhanced surveillance.

We also realise that institution building should be pursued. Hence, efforts continue in the area of capital markets development, as well as liberalisation of financial services and the capital account, with due consideration for each individual country's level of development.

Finally, some words on the Asian Research Programme. We are pleased to know that the programme will continue. There will be better synergy and more productive results if we can continue leveraging on these collaborative efforts as we have striven to do in the first three years of the programme.

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High-level policy panel on financial stability issues

Zhou Xiaochuan¹

As a panellist, I would like to talk about financial stability. The subject covers theoretical thinking on the model to be chosen or repaired. It relates to supervisory and regulatory reform, to our analytical framework, and, on the technical side, to the need to find new tools for our toolkit to ensure financial stability. I also want to touch on thinking in China about this subject. As I have talked about these topics on a variety of occasions, at the BIS, the IMF, the FSB, and in the Asian Pacific EMEAP meeting in Hong Kong, today I would like to discuss what kind of model China can choose to safeguard financial stability in the future.

Maybe this is related to Charles Goodhart's topic. Personally, I am very interested in this theme, because in the early 1990s we made various studies in China with a view to pushing forward economic and financial sector reform. On two important issues, ie the corporate governance model and the financial sector model concerning the relationships between banks and clients, we studied the Anglo-Saxon, the Rhine, and also the Japanese and Korean models. I do not think there is yet a Chinese model. China, as an economy in transition, does not have a market tradition. Certainly the economy has certain characteristics. For example, state ownership still plays a large part in the ownership structure. And the older generation has its doubts about the efficient market hypothesis. They cite cases of market failure and argue that government intervention is necessary. Yet all these traditions are changing quite fast.

In the crisis, we need to think about how to formulate a model for the future, one that is not only conducive to financial stability but one that also helps the financial sector to support the real economy. This is an important juncture for China and maybe for other countries in thinking for the future. Charles, in your presentation, you talked about the possible convergence of the Anglo-Saxon model with the Asian ones. Clearly, you had the intention of saying that the efficient market hypothesis is correct. The problem is that sometime a tail event occurs, which may be especially serious when several low-probability events happen together and reinforce each other. Unfortunately, the tail can become quite fat on such an occasion. This raises a number of questions, such as whether or not the risk control model is appropriate for microeconomic institutions, and whether our supervision is adequate. If it is a low-probability event, remedies may exist on the tail side. When a tail event happens, what kind of emergency remedies are available? And, in the case of conditional probability, how do we prevent conditions from moving into the tail side and how do we prevent the tail from becoming fat? In other words, how do we improve risk control models and supervision? In a crisis, we may have to resort to nationalisation or government intervention. But, things should go back to normal if the efficient market hypothesis is valid. Hence, with some improvements in the Anglo-Saxon model, it might be possible to live in the same world as before.

In China, we have had a similar discussion. We use the efficient market hypothesis, meaning that the financial markets, especially the capital markets, contain all important information about the crisis. Somebody is certainly going to challenge this notion: for example, why did prices fail to contain information about this crisis, and why did unhealthy phenomena, such as very high leverage and subprime products, occur? In China, the efficient market hypothesis is often questioned.

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For anti-crisis purposes, Keynesian measures can be used, as we saw in China during the Asian financial crisis in the late 1990s. So we have had the experience of using this kind of policy to get China out of a crisis. There has been a great deal of academic discussion about liquidity traps, as described by Keynes many years ago, and about proposals for Keynesian intervention, ie about public finance for larger rescue packages. However, the outcomes have been mixed and controversial.

In my view, it is dangerous to misread historical experiences and to depend too much on Keynesian models for the future. It is fundamental for us to re-think this issue and I hope that our discussions will also provide a clearer picture for decision-makers in dealing with this crisis, and also for the future. Thank you.

High-level policy panel on financial stability issues: unconventional monetary policy – how central banks can face the challenges and learn the lessons

Masaaki Shirakawa¹

Introduction

Currently, major central banks have introduced “unconventional monetary policy measures” to deal with the economic and financial crisis that materialised in the aftermath of the bursting of the global credit bubble. In this regard, the Bank of Japan has clearly been a forerunner since the latter half of the 1990s. Today, I would like to talk about some of the issues surrounding unconventional monetary policy, while reflecting upon the experiences of the Bank of Japan during the latter half of the 1990s and the earlier part of this decade.

Bank of Japan’s monetary policy since the latter half of the 1990s

In order to refresh the memories of conference participants, I will begin by listing the innovative elements of Bank of Japan’s monetary policy since the latter half of the 1990s, including those which were not necessarily considered to be innovative by outside observers at that time.

First, the overnight interbank rate was brought down truly to zero, to be precise 0.001%. Second, we introduced “quantitative easing” by setting the outstanding amount of reserves at the central bank as an operational target and by raising it to levels well beyond the required amount. At their peak, the excess reserves amounted to 29 trillion yen or 5.8% of nominal GDP. This compares with 6.2% for the Federal Reserve and 3.5% for the European Central Bank during the current global crisis. Third, we extended the maturity of funds-supplying operations. In 2005, during the final phase of quantitative easing, the average maturity of funds-supplying operations was more than six months and the longest operation extended up to eleven months. Fourth, we made commitments on the duration of zero interest rates and quantitative easing. Fifth, we commenced what is now called “credit easing” by purchasing ABCP and ABS. Sixth, although not necessarily part of monetary policy, the Bank of Japan purchased stocks from banks’ equity portfolios in order to help reduce the market risk associated with their shareholdings, which was a significant destabilising factor for the Japanese financial system.

In a nutshell, the Bank of Japan had, in previous years, adopted many of the innovative measures which are now being introduced on a global scale.

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Challenges for the Japanese economy and the Bank of Japan

Though needless to say, such unconventional monetary policy measures were initiated to deal with the difficulties that the Japanese economy confronted at that time. Each crisis is different. But overall, there are many common elements with the challenges that the economies and central banks in Europe and North America are now facing. Specifically, I can raise five points.

First, the risk-taking capacity of various economic entities was severely damaged, and, as a result, the effectiveness of conventional monetary policy was seriously hampered.

Second, in such an environment, the overnight interest rate dropped down to zero, limiting the room for additional easing through conventional monetary policy measures. In Japan's case, the overnight rate fell to 0.5% five years after real estate prices peaked in 1990. In the US, policy actions were faster, but still three years had passed after the residential real estate prices peaked in 2006 before overnight rates came down to levels seen in Japan.

Third, it took time to recapitalise the banking system, which was most effective and vital in revitalising the economy. The injection of public capital into weakened financial institutions was indispensable in stabilising the financial system, but was politically unpopular. In the current crisis, European and US authorities have deployed such measures much faster than in the Japanese case. But more than a year passed after the initial shock, which occurred in the summer of 2007, before such measures were initiated.

Fourth, reflecting the situation I have just mentioned, uncertainty regarding the transmission mechanism of monetary policy is much larger than in normal times. Therefore, regardless of whether experimental types of monetary policy measures were introduced or not, explaining the intentions of monetary policy decisions to markets and to the public at large, or in other words, fulfilling their accountability obligations became a key challenge for central banks.

Fifth, when central banks try to create "productive" policy measures, in an environment where the effectiveness of traditional monetary policy is constrained, they naturally come close to the area of fiscal policy. As a result, the policymakers need to face up to the issue of who should be responsible for such policy actions in a democratic society.

The challenges for central banks

How should central banks deal with such issues? The answer depends on multiple factors. They include, among others, the economic and financial environment that each central bank faces, the laws that set out the responsibilities of each central bank, and the policy tools at its disposal. There is no single universal answer which transcends both borders and the passage of time. I would like to explain my perspectives on unconventional monetary policy, building upon the experiences from both the last Japanese crisis and the current global crisis.

First, the most essential point in dealing with a financial crisis is to maintain the stability of financial markets and the financial system. Central banks need to exert maximum effort in this area. After all, in times of crisis, that is what central banking is all about. In this regard, the Bank of Japan introduced quantitative easing, credit easing, and stock purchases. With respect to Japan's quantitative easing, although the stimulative effects on economic activity through monetarist channels seemed to be self-evident in the eyes of quite a number of economists, the financial system perspective was not fully appreciated. However, looking

back, the most important benefit of quantitative easing was its contribution to financial market and financial system stability through the provision of abundant liquidity.² In the current crisis, major central banks have expanded their balance sheets but, with the exception of the Bank of England, they have not characterised their measures to loosen monetary policy as quantitative easing. This certainly is understandable when we look back on the Japanese experience, where the effectiveness of quantitative easing on real economic activities has not been confirmed.

Second, as I mentioned, in order to stabilise the financial system, the injection of capital into the banking system together with the provision of liquidity is indispensable. This alleviates pressure on the financial intermediation process, but it is not sufficient to resolve the fundamental problem which had led to the crisis.

This raises the third point. The unwinding of various excesses that have built up in the non-banking private sector is just as critical. We must not forget that the injection of public funds as capital into the banking sector, as well as the provision of abundant liquidity through, for example, quantitative easing, do not alleviate the need for the unwinding process in the non-banking sector. It must be recognised that some time is necessary before excesses are unwound and the economy can return to a sustainable growth path. The length of time necessary will depend on the size of the imbalances which built up during the bubble period, and the severity of the negative feedback effect magnified by the loss of confidence during the crisis that follows. In any case, it will not be brief.³

The fourth issue is the fine line between monetary policy and fiscal policy. Measures to take on individual credit risk such as corporate debt are extraordinary steps for a central bank since they come close to the area of fiscal policy which deals with resource allocation at the micro level. I believe such measures are only justified when we are facing a situation where, if left untouched, there is a substantial risk that credit market functions will deteriorate and the resulting weakening of financial conditions could seriously damage the economy. It must also be compatible with the legal framework provided in each country's central banking law. When such measures are introduced, in order to avoid constraining market functioning where market participants become reliant on such extraordinary measures, it would be important to have an appropriate built-in exit mechanism that reduces the incentive to use the facility as market functioning recovers. Additionally, since it is in essence close to the realm of fiscal policy, a clear understanding of which authorities are taking on the risks involved is indispensable. This is also important from the perspective of maintaining public confidence in the financial strength of the central bank. If the central bank's financial strength is perceived to be weakened, concerns may arise, subtly through various channels, with regard to its ability to effectively fulfil its monetary policy mandate.

Fifth is communication with the markets. Without public trust in the organisation, a central bank cannot effectively conduct monetary policy. Words and deeds have to match. There is much uncertainty with regard to the effectiveness of unconventional monetary policy and extraordinary measures may be pushing the boundary of monetary policy. Because of these two aspects, thorough communication with markets and the public becomes all the more important. Careful explanations while continuously evaluating both the positive and adverse

² As for the effect of quantitative easing, see Bank of Japan [2005], Shirakawa [2004, 2005], Ugai [2007].

³ Ahearne et al. [2002] analysed the Bank of Japan's monetary policy conducted during the 1990s, and showed the simulation result that deflation could have been avoided if the Bank of Japan had cut its policy rate to a great extent immediately after the bursting of the asset price bubble. There have been cases where an optimistic view has been expressed, partly based on such analysis, that a recession after the bursting of a bubble could be dealt with by aggressive monetary easing. For instance, Mishkin [2007] noted that, as long as a central bank responds to the bursting bubble in a timely fashion, its harmful effect can be kept to a manageable level.

effects of the steps taken become critical. Even during times of a crisis, if central banks take time-inconsistent policy measures, this could rather have negative effects on confidence in the central bank, and as a result reduce the effectiveness of monetary policy. At the end of the day, the central bank needs to communicate its aims and strategies in response to the characteristics of the problem the economy faces, and also needs to take policy measures which are consistent with the communication. I would like to emphasise once again that, especially in a crisis situation, the central banks must make clear their commitment to the stability of financial markets and the financial system, and take decisive policy actions to achieve such goals.

Concluding remarks

The five issues I raised today were those that the Bank of Japan struggled to solve when it last embarked on unconventional monetary policy. The difference between now and then is that the practical difficulties in dealing with such issues were not fully appreciated by many economists at that time. I am sure many of you can recall the various policy recommendations Japan's policymakers received from economists, both domestically and from abroad, as well as from international organisations since the latter half of the 1990s. Recommendations, some of which were quite bold, were made to the Bank of Japan. Typical of these recommendations were: "all that the Bank of Japan needs to do is to set a high inflation rate target and purchase all types of assets including physical assets to achieve that target", and "the Bank of Japan should monetise the government's budget deficit". One of the most famous was that "the central bank should credibly promise to be irresponsible".⁴ Interestingly, in the current crisis, in spite of the sharp contraction of the economy, very few similar bold recommendations are being made by economists, and such radical measures are not being implemented. When we experience challenges for the first time, the discussion surrounding policy measures tends to swing between the extremes. Such discussions become truly practical once people actually face the challenge of dealing with a crisis. Viewing such changes, I believe that the learning process, the process of moving forward while learning the lessons from past experiences, is working effectively. What is important is to fulfil our basic responsibilities as a central bank. In this regard, an important challenge for us central bankers is to continue to humbly work to increase our understanding of changes in the economy and financial system and to enrich our knowledge regarding the workings of the economy and the art of central banking.

Thank you.

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High-level policy panel on financial stability issues

Tarisa Watanagase¹

Governors, distinguished colleagues,

First of all, let me congratulate the Asian Research Programme for this excellent set of policy-oriented research papers, which should make a valuable contribution to resolving our policy challenges going forward.

Foremost on our minds are a number of financial stability issues that have gained renewed urgency with the current global crisis. In response, we see some key reform agendas emerging, in certain G20 recommendations, for example, with proposals for the reform momentum to be propelled by mechanisms such as the International Monetary Fund and World Bank's Financial Sector Assessment Program. This is very important as it would be a key way of addressing weaknesses in major markets and restoring stability to the global financial system.

However, it is also important for emerging markets to set our reform agendas based on the priority of our policy challenges, and these may differ from those of the developed economies, due to the differences in the structure and vulnerability of our financial systems.

The one key common challenge we share is the challenge of developing and implementing a macroprudential policy framework to safeguard financial system stability. In the context of emerging markets, where policy making is under the environment of rather imperfect information, here, the key hurdles are rather significant and include theoretical, empirical, and infrastructural challenges. This is why the pooling of our scarce technical and research resources with those of the BIS can make a major contribution at this important juncture.

Thus, I believe the key strategic questions we face are:

- how best to approach the financial stability challenges?
- and how best can we direct, as well as prioritise, our regulatory agenda, particularly areas of macroprudential oversight?

Now, as to the first question: how should we approach financial stability problems?

The oscillation between deregulation and re-regulation is familiar, as is the classic debate over the rationale for regulation.

The swing of the pendulum is driven by the key goals of regulation, which are to ensure consumer protection, market integrity and system stability.

The direction and amplitude of the swing is propelled by the gap created by market failures. That is, the gap between the current state of the market – in terms of its stability, integrity and fair consumer treatment – with the market conditions desired by society. Given the extent of the current global crisis, the gap as perceived by society is vast, and thus the demand for strong and comprehensive reforms tends to magnify the swing.

What we really need here, I believe, is to foster the foundation for a “balance of approach” in our regulation. This can happen in a number of ways.

¹ Governor of Bank of Thailand

First, the current “natural” swing is toward tighter regulatory oversight. To an extent we can already observe such a trend already in the United States and the European Union. Here, I agree with Professor Goodhart’s astute observation. If the so-called Anglo-Saxon model has weaknesses as highlighted by this crisis, then perhaps we may benefit from adopting some of the features of what Professor Goodhart refers to as the Asian model.

Second, we should also avoid the tendency to swing too far in the opposite direction, by making a conscious commitment to a balanced middle path.

Third, we should utilise a mixed approach, that is remain agile and flexible with our policy framework, so that we can efficiently address the emerging vulnerabilities, which are changing dynamically.

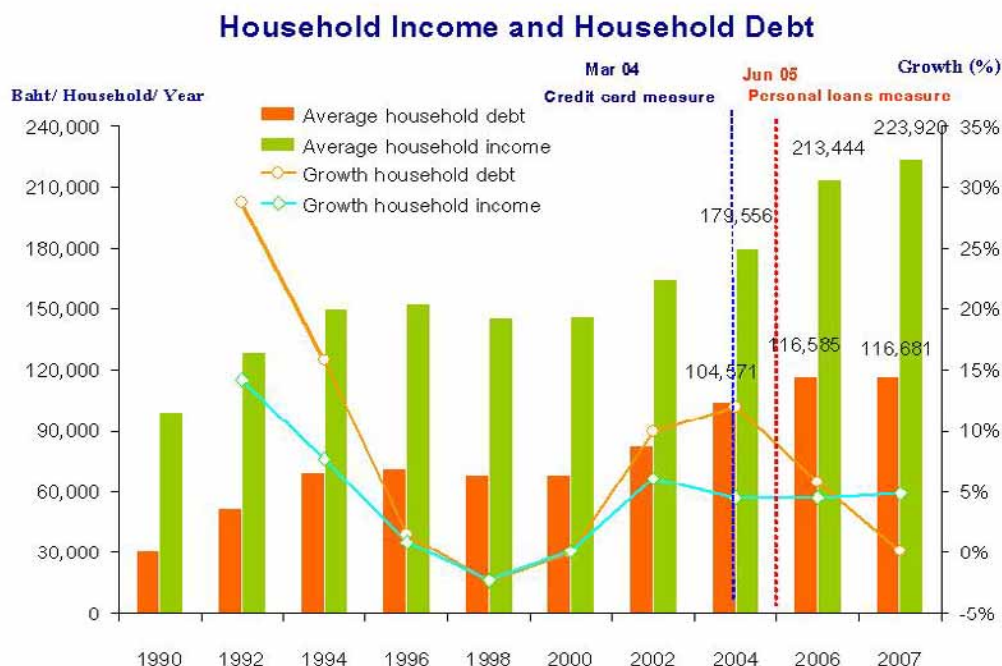
In the case of the Bank of Thailand, we combine market-oriented microprudential risk-based supervision with macroprudential regulatory measures to oversee systemic risk. Such macroprudential measures include measures to prevent asset bubbles by capping loan-to-value ratios for high-value residential real-estate loans, and measures to contain household debt by toughening credit card issuance practice for low-income earners.

From the graph shown below, the macroprudential measures have been instrumental in preventing the build-up of vulnerability.



Curbing Asset Price Inflation & HH Debts

1



Source : NSO NESDB, BOT

So what could help us maintain a balanced approach to regulation. The key is to refine our policy debate so that it can respond to the highly dynamic, interconnected and globally systemic relationships that are the key features of the global financial market.

To help us refine our policy question, we could focus on the causes and impact of market failures, be they externalities, imperfect information or agency problems, as familiar from

economic theory, and we could seek to apply efficient policy tools to each type of market failure.

In this light, the relevant questions for us today would be

- What are the macroprudential policy measures that we can suitably implement?
- How to combine the macroprudential framework with microprudential and monetary policy? The challenges here include the technical questions of policy calibration, as well as the governance question of the policymaker.
- In practice of course, policy is set in a dynamic environment, so “sufficient” policy calibration is often a luxury. Rather, the challenge is how to “lean against the wind” without the benefit of a more precise policy calibration. Here perhaps we can benefit from having a sufficiently flexible and holistic approach that combines policy calibration with moral suasion and utilises the impact of signalling, as well as using incremental and gradual measures that allow new information to be factored into policy setting. Therefore, the challenge is as much in the process and governance aspects as in quantitative modelling.

Of course, we must at the same time continue to forge on with work on how to seek a balance between the need for measures of capital requirement to be risk-sensitive, but avoid the negative consequences of procyclicality.

Of course, with the cross-border transmission of today’s systemic risk, as demonstrated by the work by Kim, Loretan and Remolona, we need to think of a process to better internalise and manage such externality for emerging markets. One of the ways to do this is to incorporate emerging market key agendas in global regulatory reforms.

Thus, we should also foster a “balanced agenda” in regulatory reform, especially in the area of home-host regulators, where the systemic impact on host economies should be a key factor shaping the relationship and degree of coordination.

On the reform agenda, we support the work of the G20, but we should also emphasise our own set of common priorities.

In terms of research, I believe the BIS Asian Research Programme can be instrumental in helping us to operationalise these reforms in the region. I believe that we are on the right path, with valuable work such as those by Eloisa Glindro and her colleagues on asset prices, but I would also urge strengthening the programme in some critical research areas.

These include:

- the means to develop through-the-cycle credit risk data with a view to building up provisioning buffers;
- research on principles on how to improve Pillar 2 and ICAAP in standardised approach banks using the standardised approach to adequately take into account the cyclicity of credit risk data when building capital buffers.
 - Allow me to elaborate on this: currently, in emerging markets such as Thailand, most banks have implemented the Basel II capital framework using the standardised approach. Under Pillar 2, banks should take account of cyclicity in their capital buffer. However, given that the standardised approach banks do not have as sophisticated data analysis facilities as the internal ratings-based banks, there are no clear standards on how to analyse through-the-cycle risk data in terms of either practice or supervisor expectation. Therefore, it will be of great benefit if there could be research and a recommendation on this issue. Further detailed guidelines on ICAAP methodology and/or principles should also be considered.

- It is still unclear how to incorporate history and structural breaks in through-the-cycle data. One way to address this issue is through stress testing. Although there is some methodology and guidance on incorporating stress testing result into ICAAP, further details could be added to operationalise stress testing results in a consistent and sound manner.

Finally, we think that credit risk data is useful not only for analysing capital buffer but also for loan underwriting practices. It would be beneficial to encourage banks' in strengthening their capacity in credit risk data collection and analysis as a foundation for macroprudential objectives. This is not much discussed in the international forum but is an especially challenging issue, given the poor data history and structural breaks that arise from the crisis of the previous decade and also from the current crisis and weakness in financial infrastructure.

Thus, the key output of the policy research should include not only research on quantitative and calibration technique, but also organisational capacity-building principles, including those related to credit risk data-pooling with a view to strengthening loan underwriting.

In closing, I welcome the valuable work done by the BIS Asian Research Programme, and I look forward to its potential contribution to our policy framework in the region.

Thank you for your attention.

Closing remarks

Zeti Akhtar Aziz¹

Honourable Governors,

Colleagues and

Distinguished guests,

Let me begin by extending my congratulations to the BIS Asian Office for successfully completing this three-year Research Programme, and our appreciation and gratitude to the People's Bank of China for hosting this conference.

This research programme has provided the opportunity for us to reflect on the challenging issues confronting the central banks in the region in the areas of monetary policy, financial stability and the development of financial markets. The high-quality papers presented during these one and a half days have certainly helped to deepen our thinking on these issues. I would like to put on record our gratitude to the BIS for the resources that were committed to support this research programme. The participation of the significant number of governors and deputy governors in this conference demonstrates both the interest and the value of the work that has been done under this research programme. The commitment of the BIS to provide further resources for research will provide continuity to this programme. I believe the value of the research programme strongly justifies the support for future programmes.

Ladies and Gentlemen,

It is very likely that the world following this crisis will be fundamentally different. For the central banks, the crisis has prompted a re-examination of the existing approach and frameworks in preserving monetary and financial stability. The issues that have emerged are of great interest to Asia as we develop and reform our financial systems, particularly as we become more deregulated and liberalised and are therefore subject to greater exposure to external developments.

With the increased prospects that Asia will very likely lead the recovery in the global economy, expectations are that the unwinding of monetary policy vis-à-vis the rest of the world could present challenges in managing strong capital inflows, which would have implications for asset prices and exchange rates. This could in turn undermine stability and the process of real economic recovery. Exit strategies, once conditions improve and economic recovery is firmly established, will need to be carefully managed.

A further challenge discussed during this conference is the design of the policy framework for maintaining monetary and financial stability. Related to this is the reassessment of the scope of responsibilities of central banks and whether monetary policy should solely focus on achieving price stability with the attendant benign neglect of other factors that might affect overall macroeconomic stability. As extensively discussed yesterday, there is a strong case for central banks to lean against the wind and focus attention on credit growth and asset prices. There is thus a need to rely on a more optimal policy framework of monetary policy and macroprudential measures.

Many insightful comments were shared yesterday on the development of the financial markets and overall financial system, ranging from the issue of greater openness and

¹ Governor of The Bank Negara Malaysia

financial liberalisation, to the crucial need to ensure greater financial inclusion. Today we have looked at the financial stability issue. Of great value in the discussions was the examination of these issues in the context of the Asian financial system.

Ladies and gentlemen,

The BIS Asian Research Programme has been successful in its intended objectives – providing quality research insights on the many important issues confronting central banks and supervisory authorities. While this wrap-up conference marks the conclusion of this three-year research programme, I am certain that this programme of applied research will continue to contribute much to the intellectual foundation for central banks in the region as we strive to overcome the many challenges in years to come.

Thank you.

Closing remarks

Jaime Caruana¹

Governors and colleagues, the principal mission of the Bank for International Settlements, from its very inception, has been to promote the cooperation of central banks. And, when I look at the fruits of this conference and those of the three-year Asian Research Programme, I feel justified in saying that we have stayed true to the original intent of the Bank's forefathers.

The Asian Research Programme had a very ambitious agenda, and, after listening to your comments, I would conclude that it has achieved its goals. It has certainly increased our analytical capacity and understanding on issues that matter to the central banks of this region. And I hope that it has also contributed to and effectively promoted the policy discussion among Asia-Pacific central banks and the international community of central banks.

Of course, this is not the end of BIS research in Asia. As we have said several times, we are closing the chapter of the three-year Asian Research Programme but, at the same time, we are opening a new chapter of BIS research in the Asian Office. I look forward to close cooperation between the BIS and all central banks and academia in building on the strong foundation that we have already laid.

I found yesterday's and today's discussions highly informative. I am sure that we have each assembled our own take-aways and our own conclusions from these discussions, and I have a few that I would like to share with you.

If we talk about the first day, I would fully agree with Joseph Yam and others that we have to get back to basics: financial markets are here to support economic growth and development, but sometimes this is not the case in practice. While the crisis is teaching us new lessons, it is also, perhaps, reminding us of lessons that never should have been forgotten.

We have also learned – as was pointed out in many of the presentations – that we need to be cautious about excessive simplifications of conventional wisdom. We need to continue to challenge conventional wisdom. We have seen this done effectively in several areas at this conference: in the area of exchange rates by Professor Engle, and in the areas of monetary policy and financial stability by many other researchers.

I agree with Governor Tarisa that, when we talk about monetary policy and the actions of central banks, a new consensus appears to be emerging about the importance of financial stability in central banking. I hope that our discussions here have contributed to a better understanding of the issues.

Certainly these issues are not simple ones. We need to guard against repeating the mistakes of the past. To protect against such errors, we must continue doing research and analysis. And, as Governor Tetangco reminded us, we also need to use good judgment in addressing the delicate balancing act between some of the key elements.

Today's session was no less enlightening. It was, I would say, refreshing to see the Anglo-Saxon banking model subjected to a critique in such beautiful English by Professor Goodhart. He built a strong argument, and perhaps some sympathy, for the Anglo-Saxon model, provided that it is properly amended.

¹ General Manager, Bank for International Settlements.

We heard some very interesting papers that focused on the amplifying mechanisms behind the financial crisis and linkages to housing prices. All these papers are very promising and will help central banks address key policy issues.

I think it was particularly important to hear the experience of Japan from Governor Shirakawa, especially his views about the use of unconventional monetary policy. We should not forget that, after a period of financial excesses and crisis, it is very important to unwind the underlying imbalances, and that this can take time.

The comments by Governor Tarisa rightly highlighted the need to incorporate an emerging market perspective as the agenda of the international financial reform process is developed more fully. It might be appropriate at this point to add that we are all emerging markets now.

It was also very important to reflect on a range of models, as Governor Zhou argued. He emphasised the different challenges facing a fast-growing economy in transition, such as that of China, and reflected on the importance of thinking about tail risks. He is right that we need to construct models that are effective not only in good times but also in times of tail risk.

In sum, our time together has been well spent. We leave with a lot of food for thought.

So, I think it is time for me to officially close this conference, and I would like to do it by thanking many people.

I would like to thank all of you for joining us at this event. I hope you have enjoyed these discussions and the fruits of all the work that the Asian Research Programme has done over the past three years.

I would like to thank you – the keynote speakers, the paper writers, the discussants and the panellists – for all these thought-provoking presentations. Let me remind you that we intend to publish the proceedings, so that we have more time to think about the ideas that we have been discussing here.

I would like to thank Governor Zeti for her leadership at the Asian Consultative Council and her keynote address last night. I truly hope that the lessons from Asia can help us learn how to strengthen our financial systems for the challenges ahead.

And, of course, I would like to thank the host – the People's Bank of China. Governor Zhou, this event has been a great success, and we have enjoyed the fine hospitality that you have extended to all of us.

I think that we all know that behind the scenes there are many people who have worked tirelessly to make this event come together. It would have been impossible to have this kind of conference without them. And I would like to extend my gratitude to all of them. In particular, I would like to give our collective thanks to Cao Li, the head of the BIS Division of the People's Bank of China at the Beijing head office, and her team; and I would like to thank Zhang Xin, the vice president of the PBC Shanghai head office, and his team for the local support here in Shanghai.

I would like to also thank and express my appreciation to Candy Louie and to Ghislaine Wong from the BIS Hong Kong Office, who have been extremely busy in helping to make sure that everything ran smoothly.

Finally, I would like to also join those who wish all the best to Joseph Yam. We hope that we will continue to benefit from your experience and wisdom, perhaps by reading your blog.

So, again, thanks to all of you, and I wish you a safe journey back to your homes. Thank you very much.