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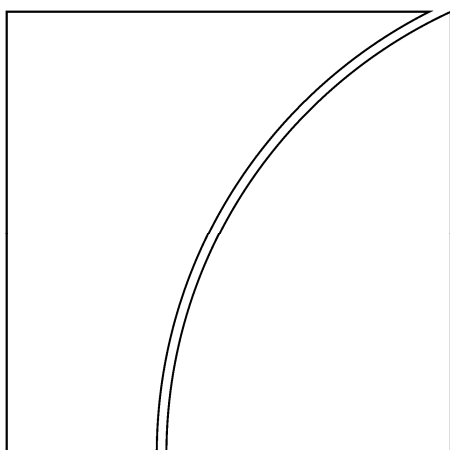
The functioning and
resilience of cross-border
funding markets

Report submitted by a joint CGFS/MC Study Group

This Study Group was chaired by Guy Debelle of the Reserve Bank of
Australia

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Preface

In June 2009, the Committee on the Global Financial System (CGFS) held a series of roundtables with private sector participants to discuss the drivers and implications of the sharp decline in international banking activity since the intensification of the financial crisis in the second half of 2008. These discussions suggested that the severe funding strains during this episode might lead to significant changes in the operations of international banks, especially with respect to funding approaches and liquidity management.

In September 2009, the CGFS followed up on this initial exploration by launching a project to investigate a range of short- and longer-term issues pertaining to changes in the organisation of international banking in response to the crisis. The report on the functioning and resilience of cross-border funding markets is part of this project. It was prepared by a joint Study Group of the CGFS and the Markets Committee. The Study Group, chaired by Guy Debelle of the Reserve Bank of Australia, brought together representatives from 12 central banks. Reflecting the first-hand experience of both advanced and emerging market economy central banks, this report provides a comprehensive view of the recent episode of global funding market stress.

Following the discussion of an initial draft by the CGFS and the Markets Committee in January 2010, the revised report was presented to central bank Governors at the Global Economy Meeting in March 2010, where it also received endorsement for publication. We hope that this report will serve as a relevant and timely input to the ongoing debate about policy actions to address cross-border funding liquidity risks.

Donald L Kohn

Chairman, Committee on the Global Financial System
Vice Chairman, Board of Governors of the Federal Reserve System

Hiroshi Nakaso

Chairman, Markets Committee
Executive Director, Bank of Japan

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Executive summary

The financial crisis that began in 2007 saw unprecedented dislocations in a number of funding markets. These dislocations, which originated in US dollar funding markets, spilled across time zones and currencies, resulting in global market disruptions that led to substantial policy responses in a wide range of economies. The episode raised questions about the functioning and resilience of onshore and offshore funding markets – both unsecured and secured – on which internationally active banks had relied.

This report was prepared by a joint study group of the Committee on the Global Financial System (CGFS) and the Markets Committee, comprising representatives from 12 central banks – from both advanced and emerging market economies – with first-hand experience dealing with these market disruptions. It presents the group's preliminary assessment of issues pertaining to cross-border funding, with a particular focus on what happened in various funding markets as the crisis unfolded and the policy responses that ensued to counter the market disruptions.

The report begins with an overview of the pre-crisis pattern of cross-border funding among internationally active financial institutions and highlights the main vulnerabilities that set the stage for the disturbances that eventuated (Section 2). It then reviews how the onset of market dislocations in the United States in mid-2007 spilled over to other time zones, markets and currencies (Section 3). The various private and public sector responses to the market dislocations are outlined in Section 4. The report concludes with five policy lessons distilled from the episode (Section 5):

1. The build-up of maturity mismatches within and across currencies was a major vulnerability and should be better monitored and managed. In addition to bank-by-bank monitoring, it is important to assess potential mismatches at a more aggregate level and gather better information on off-balance sheet activities.
2. Foreign exchange market infrastructure demonstrated its resilience. The use of Continuous Linked Settlement and Credit Support Annexes contributed to this resilience. However, the implications of introducing central counterparty clearing for the foreign exchange market warrants further investigation.
3. Funding markets are interlinked: spillovers can be substantial across time zones, markets and currencies. It is therefore crucial to enhance the resilience of core currency funding markets beginning in the home market with, inter alia, upgrades in the market infrastructure.
4. Having adequate foreign exchange reserves and using them during the crisis helped to alleviate pressures, though this self-insurance comes at a cost. The appropriate size and composition of reserves will vary with the type of economy (eg high versus low credit ratings), the nature of the crisis (eg balance of payments versus liquidity) and the availability of multilateral insurance.
5. Policymakers should consider developing tools to address systemic cross-border funding pressures. While central bank swap and repo lines have been an effective remedy for the global-scale foreign currency liquidity shortages in the recent crisis, other measures such as cross-border collateralisation and regional swap arrangements with pooled reserves may be more suitable in other scenarios.

This work constitutes part of a broader CGFS project on international banking after the crisis. The other parts of the project will examine the medium- and longer-term issues in international banking from a more institutional and sectoral perspective, which will complement the near-term, market-focused assessment presented in this report.

1. Introduction

The financial crisis that began in 2007 saw unprecedented dislocations in a number of funding markets. These dislocations, which originated in US dollar funding markets, spilled across time zones and currencies, resulting in global market disruptions that led to substantial policy responses in a wide range of economies. The episode raised questions about the functioning and resilience of onshore and offshore funding markets – both unsecured and secured – on which internationally active banks had relied.

This report presents the preliminary assessment of issues pertaining to cross-border funding by a joint study group of the Committee on the Global Financial System (CGFS) and the Markets Committee, comprising representatives from 12 central banks – from both advanced and emerging market economies – with first-hand experience dealing with these market disruptions.¹ It constitutes part of a broader CGFS project launched in September 2009 on international banking after the crisis.

The report begins with an overview of the pre-crisis pattern of cross-border funding among internationally active financial institutions and highlights the main vulnerabilities that set the stage for the disturbances that eventuated (Section 2). It then reviews in Section 3 how the onset of market dislocations in the United States in mid-2007 spilled over to other time zones, markets and currencies. The various private and public sector responses to the market dislocations are outlined in Section 4. The report concludes with five policy lessons distilled from the episode (Section 5).

2. The pre-crisis pattern of cross-border funding

To understand the cross-border funding market dislocations and spillovers in 2007–09, it is first necessary to appreciate the scale and the nature of the dependence of banks on cross-border funding prior to the crisis. Using BIS international banking statistics, McGuire and von Peter (2009) document the rapid expansion of foreign claims of reporting banks over the past decade.² European banks, in particular, accumulated foreign claims at a pace that outstripped domestic credit growth. At the same time, banks also took on more foreign liabilities, reflecting a growing dependence on cross-border funding.³

The currency composition of such claims and liabilities varied. For example, French banks' net foreign position (foreign claims minus foreign liabilities) was almost entirely denominated in euros, which could be financed directly by domestic sources. However, UK, Swiss, German and Dutch banks built up large net foreign positions denominated in US dollars. Since these banks tended not to have a sufficiently large onshore dollar funding base while their US counterparts tended to have no structural needs for European currencies, cross-currency funding (borrowing in one currency to fund assets in another) was needed to fill the gap. In the run-up to the crisis, the cross-currency funding needs of European banks were estimated to reach around \$350 billion (Graph 1, left-hand panel), which appeared relatively

¹ See Annex 1 for the list of Study Group members.

² Note that these data measure only on-balance sheet exposures, not off-balance sheet derivative exposures.

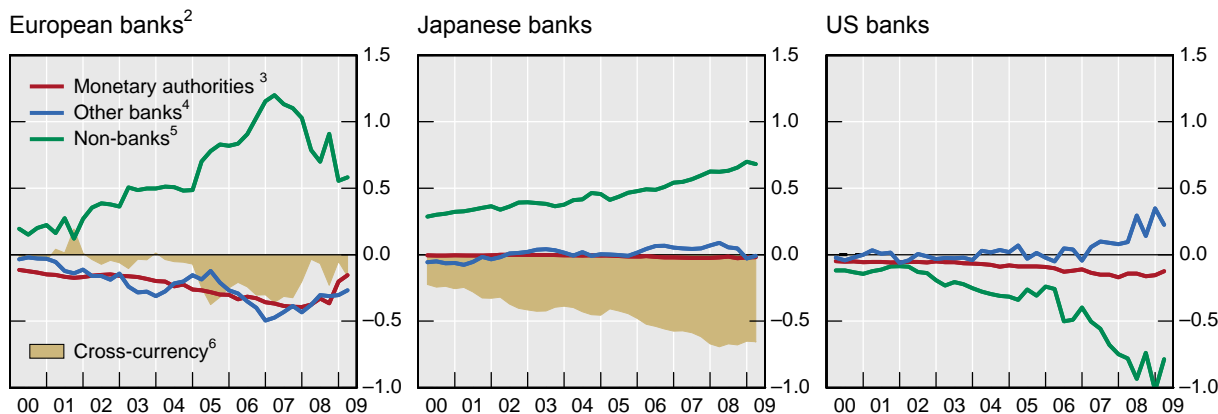
³ Cross-border funding is broadly defined here as including both borrowing from unaffiliated entities of a different nationality as well as inter-office borrowing.

modest when compared to the \$8 trillion gross US dollar liabilities on their balance sheets at the time.⁴

Graph 1

Banks' net US dollar-denominated foreign positions, by counterparty sector¹

In trillions of US dollars



¹ US dollar-denominated foreign claims minus US dollar-denominated foreign liabilities vis-à-vis the indicated sectors. ² Estimates are constructed by aggregating the on-balance sheet cross-border and local positions reported by Belgian, Dutch, French, German, Italian, Spanish, Swiss and UK banks' offices. ³ Cross-border positions in all currencies and local positions in foreign currencies vis-à-vis official monetary authorities. Excluding liabilities to Japanese monetary authorities placed in banks located in Japan. ⁴ Net interbank lending to other (unaffiliated) banks. ⁵ The estimated net position vis-à-vis non-banks is the sum of net international claims on non-banks and net local claims on US residents (vis-à-vis all sectors) booked by the US offices of the reporting bank. ⁶ Implied cross-currency funding (ie FX swaps) which equates gross US dollar assets and liabilities.

Sources: Calculations by McGuire and von Peter (2009); BIS consolidated statistics (immediate borrower basis); BIS locational statistics by nationality.

The need to fund across currencies per se was not the main problem in this episode – rather it was the maturity structure that determined banks' vulnerability.⁵ Much of this build-up in US dollar positions reflected European banks' investments in dollar-denominated assets, which were typically longer-dated or less liquid, to enhance their risk-return profiles.⁶ These investments were financed by US dollar borrowings and FX swap proceeds, which were typically shorter-term, leaving these borrowing institutions vulnerable to rollover risk. Many of these financial institutions initially undertook a lot of their short-term unsecured borrowing through both domestic and offshore interbank and money markets. Some banks also had access through foreign branches and affiliates to foreign currency deposits. Apart from banks, non-bank institutions such as central banks, particularly in the Asian region, and US money market funds also served as significant suppliers of US dollar funds. While unsecured markets were a major source of funding, secured markets such as repo and FX swap markets were also used.

The pre-crisis situation of European banks stands in contrast with that of Japanese banks, which also built up a sizeable net foreign position in US dollars over time, but whose dollar

⁴ See McGuire and von Peter (2009).

⁵ Banks with maturity mismatches were affected first and foremost by rollover risk when conditions in the US dollar funding market deteriorated. The fact that some banks were borrowing outside their home market or in foreign currencies added to the difficulties they faced.

⁶ In particular, some of these investments involved structured instruments. The assumptions about their market liquidity eventually proved ill founded.

claims tended to be more liquid (eg US government bonds). Moreover, Japanese banks tended to be less reliant on short-term interbank borrowings or placements from central banks to fund their dollar assets (Graph 1, centre panel).

Maturity mismatches also became an issue in Korea, where banks, particularly local branches of foreign banks, accumulated sizeable short-term cross-border US dollar interbank liabilities in the years prior to the crisis. This accumulation largely reflected the role of onshore banks as counterparts to Korean corporates in FX derivatives transactions. Dollar-earning Korean corporates, particularly shipbuilders, sold a large portion of their dollar receivables forward to banks, which prepared for future delivery by borrowing US dollars at relatively short terms, selling the dollars in the spot market and investing the won proceeds in local public bonds.⁷ Local branches of foreign banks in particular, which were not subject to local FX liquidity guidelines that applied to domestic banks and could access low-cost funding from parents, borrowed heavily to fund these investments, resulting in large cross-border funding needs.

Cross-border bank claims in the euro and Swiss franc also grew considerably over the past decade, especially in relation to the size of the loan portfolios in the target markets, but to a lesser extent than US dollar activity. Bank loans denominated in the euro and Swiss franc gained popularity among corporates and households in non-euro area EU countries, especially those with relatively high domestic interest rates. However, as documented by Brown et al (2009), banks extended Swiss franc-denominated loans even in some euro area countries, most notably Austria.

The position of the European and Korean banks described above contrasted with banks in other jurisdictions, such as Australia, Canada and Singapore, that accessed cross-border markets but, through hedging, did not run large cross-border currency or maturity mismatches. The fact that banks in these other jurisdictions were perceived to be relatively healthy also helped to spare them from losing access to cross-border markets when the disruptions began. For Canadian banks in particular, operating in the same time zones as their US counterparts also helped them avoid the time zone frictions that affected many of their European counterparts (see Section 3).

Banks in emerging markets, other than Korea and those engaging in euro or Swiss franc borrowing, were not particularly exposed to the type of cross-currency funding needs described above – even those with access to international markets. In Mexico, for example, the predominantly foreign-owned banking system did not have significant holdings of non-peso assets and relied mainly on local funding. In Brazil, foreign as well as domestic banks also relied primarily on local funding and were bound by regulation to limit their foreign currency exposures. Banks in Asian financial centres such as Hong Kong SAR and Singapore tended to be net suppliers of US dollars to the market. These initial conditions explain in part why banks in these markets were relatively unaffected in the early stages of the crisis. In fact, some of these markets became alternative funding sources as borrowing in major centres became more difficult.

It is also important to note that, apart from banks, other institutional investors also engaged in considerable US dollar hedging through the swap market.⁸ For example, Dutch pension funds tended to hedge their US bond and equity positions. Australian superannuation schemes also regularly hedged their dollar holdings.⁹ In Korea, investment trust companies

⁷ See Yang and Lee (2008), McCauley and Zuckunft (2008), Kim and Song (2009) and Kim et al (2009).

⁸ See Baba and McCauley (2009).

⁹ See Australian Bureau of Statistics (2009) and McCauley and McGuire (2009).

were obliged by their clients to hedge the foreign securities portfolios back into won.¹⁰ Thus the transatlantic asymmetry observed for banks (ie the fact that US banks' demand for European currencies is much smaller than European banks' demand for US dollars) also applies to non-banks (ie US real money institutional investors are less likely to hedge their cross-border investments than their non-US counterparts and are therefore also less likely to lend US dollars in the swap market).

Finally, to appreciate the significance of the market dislocation that eventuated, it is important to recognise that the role of the US dollar as vehicle currency is even more dominant in swap transactions than in spot transactions. European currencies tend to have an alternative route via the euro, but most other currencies in the world transact only via the dollar. This fact, together with the substantial participation of both banks and non-banks in FX swap markets, helps to explain the severe pressures on FX swap markets during the crisis (see next section).

3. Market dislocations and spillovers

Strains in funding markets first emerged in the middle of 2007 in the wake of growing unease about the exposure of financial institutions to US subprime mortgages and related structured debt securities. These concerns grew in the second half of the year as more information came to light on the scale of both direct exposures on balance sheets and indirect ones through the sponsoring of off-balance sheet investment vehicles (eg special investment vehicles (SIVs)). Uncertainty about the creditworthiness of counterparties gave rise to a reduction in the size of credit lines and a progressive shortening in the terms for which funds were made available. There was also a growing preference for lending against only high-quality collateral. The systemic nature of this process raised concerns among all participants about the certainty of their own sources of funding and resulted in precautionary hoarding of liquidity. The impact of this on the supply of funds was exacerbated by the broad-based pressure to reduce leverage that gathered momentum through 2007. This combination of increased precautionary demand and reduced supply led to a distinct rise in the cost of unsecured funding starting in August 2007 (Graph 2).

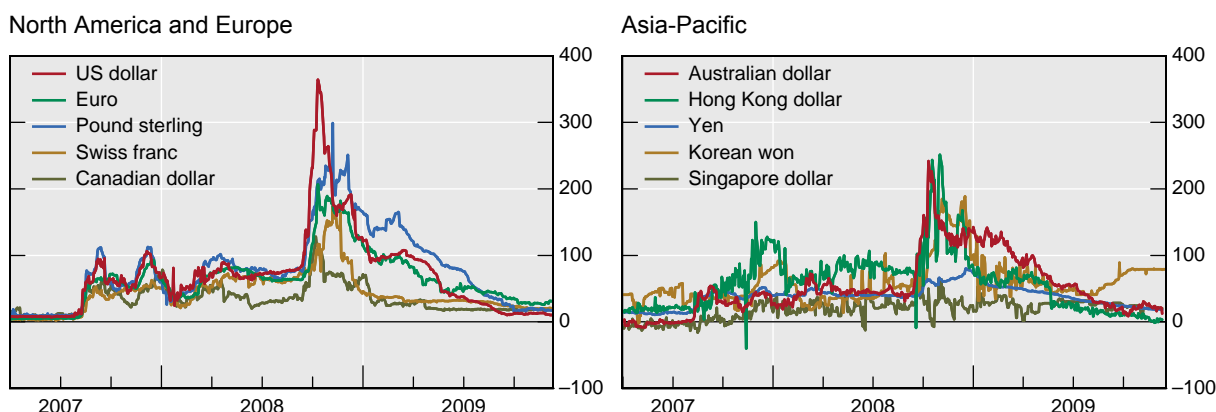
In this environment, financial institutions that had to manage maturity mismatches and cross-currency funding needs were particularly exposed (see Section 2). Notwithstanding the increasingly unfavourable borrowing conditions, the demand for cross-border funding, particularly in US dollars, remained high in part because institutions with longer-term US dollar investments were either unable to sell their assets because of illiquid markets or were unwilling to realise the losses that might ensue from doing so.

¹⁰ See Bank of Korea and Financial Supervisory Service (2008).

Graph 2

Three-month Libor-OIS spreads¹

In basis points



¹ For the Canadian dollar, euro, Hong Kong dollar, Korean won and Singapore dollar, Canadian Dealer Offered Rate, Euribor, Hibor, Koribor and Sibor are used, respectively. For the won, the overnight call rate is used in place of OIS.

Sources: Bloomberg; BIS calculations.

3.1 Spillover of unsecured market pressures across time zones and into secured markets

With counterparty risk being a key concern, it is not surprising that strains soon emerged in markets for unsecured funding. Moreover, these strains quickly became evident also in US dollar markets outside the United States. Foreign banks operating in the United States responded to more expensive funding in US markets by relying increasingly on affiliates located in other jurisdictions to raise US dollars. Market intelligence indicated that European and UK banks had for some time tapped lenders in Asia and Europe to meet US dollar needs.

Time zone differences added to the pressures in offshore US dollar funding markets. As US-based lenders became reluctant to lend early in the US day (Europe afternoon) when their own liquidity positions for the day were not yet known, dollar borrowing late in the European day became more difficult. As a result, European banks increasingly sought to secure funds earlier during Asian trading hours (Europe morning). At the same time, however, the supply of US dollar liquidity in the Asian and European time zones declined as many lenders, particularly official sector lenders, reduced unsecured lending. There are also reports that some foreign banks were effectively shut out of interbank markets in other jurisdictions, particularly in Asia, as counterparty concerns took hold. As a result, US dollar funding pressures tended to build through the Asian and early European trading hours until US banks were prepared to provide liquidity late in their day.

The difficult conditions in unsecured funding markets caused financial institutions to turn increasingly to secured funding sources where counterparty concerns should have been less of an issue. However, secured lending was already under some stress. Funding through the repo market using private sector securities was becoming increasingly difficult due to concerns about the credit quality and market liquidity of collateral, increased volatility in collateral valuations and the withdrawal of liquidity providers. Eventually, a significant portion

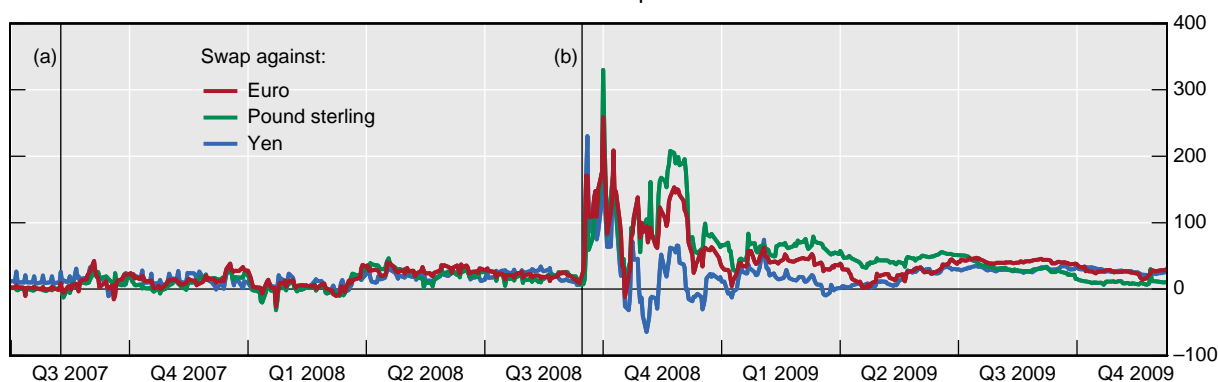
of the securities normally financed through the huge US triparty market were rejected by lenders.¹¹

In the FX swap market, conditions were also tightening in response to a growing imbalance between the demand for and the supply of US dollars. Just as more institutions were switching their funding operations to the FX swap market, potential lenders into the market were withdrawing. This withdrawal was not only a result of counterparty concerns, since counterparty risk is mitigated in the swap market by cash collateral in another currency, but also reflected a preference to keep precautionary balances of US dollars at hand. As in the unsecured markets, it became progressively more difficult to execute term deals, while the terms of the deals that did take place shortened considerably. Reflecting the growing demand-supply imbalance, the swap-implied cost of funding US dollars rose above domestic reference rates for periods over the second half of 2007 and the first half of 2008 (Graph 3).¹²

Graph 3

Dollar basis¹

In basis points



¹ Spread between the three-month FX swap-implied dollar rate and the three-month USD Libor; the FX swap-implied dollar rate is the implied cost of raising US dollars via FX swaps using the funding currency. The vertical lines indicate (a) 9 August 2007, the onset of money market turmoil, and (b) 15 September 2008, the Lehman Brothers bankruptcy.

Sources: Bloomberg; BIS calculations.

3.2 Post-Lehman exacerbation

The strains in funding markets became distinctly more severe in September 2008 following the collapse of Lehman Brothers. The marked reduction in willingness to take on counterparty risk and a significant increase in precautionary demand to hold liquidity among all types of lenders saw many funding markets freeze temporarily. Another major development that exacerbated the situation at this time was the run on US money market funds, which had been a significant source of US dollar funding, particularly for European banks.¹³

¹¹ In late 2009, collateral financed in triparty repos stood at \$1.8 trillion, down from a peak of \$2.7 trillion, and was largely confined to collateral eligible in Federal Reserve open market operations.

¹² See Genberg et al (2009) for the situations of six currencies: the euro, pound sterling, Australian dollar, Japanese yen, Hong Kong dollar and Singapore dollar. See also Baba and Packer (2008) and Coffey et al (2009).

¹³ See Baba et al (2009).

The retreat of lenders also resulted in severe market conditions in other major currencies, making it difficult, for instance, for non-Swiss banks operating in EU countries to obtain Swiss franc funding. Even in jurisdictions with relatively little dependence on cross-border funding (eg most emerging markets), the acute retrenchment of cross-border bank lending in general temporarily cut off the financing of normal activity (eg trade financing), causing considerable difficulties for non-bank corporates as well.

Demand for US dollars through the FX swap market, which remained open, surged, as did the implied cost of that funding.¹⁴ Despite the apparently lucrative arbitrage opportunities available to lenders of US dollars into the FX swap market at that time, balance sheet constraints and the preference for US dollar liquidity meant that the US dollar basis remained high for an extended period (Graph 3). Moreover, published reference rates may not give the most accurate picture of arbitrage opportunities since many market participants could not borrow or deposit funds at these rates.¹⁵

This spillover of pressures in the unsecured funding markets to the FX swap market also had implications for a range of non-bank market participants. In Korea, the difficulty Korean banks had in accessing US dollars threatened their ability to help their corporate customers to manage currency exposures (though shipbuilders' forward selling, and banks' consequent offshore funding needs, substantially declined in the aftermath of the Lehman bankruptcy). In Australia, the dislocation in the FX swap market meant that local banks faced the possibility of being unable to provide hedging services to a range of their customers, particularly domestic fund managers.

3.3 Knock-on effect on domestic liquidity conditions

In some jurisdictions, the tensions in cross-border funding markets affected domestic liquidity conditions. There is some evidence that the upward pressure on domestic currency funding costs at the time reflected demand from institutions looking to lend those currencies into the FX swap market in exchange for US dollars. This behaviour appears to have caused pressures in the US dollar market to transmit to the Japanese, Hong Kong and Singapore markets, where offshore participants borrowed local currencies for the specific purpose of swapping them out for US dollars. In Brazil, the turmoil in offshore funding markets meant that domestic corporates that had previously been able to fund offshore had to return to the domestic market, crowding out smaller enterprises and putting upward pressure on borrowing costs. In Hong Kong and Japan there were reports of tiering between foreign and domestic names in the local market.

Increased risk aversion in international markets also prompted an across-the-board depreciation of a number of currencies, particularly those in emerging markets, triggering further market dislocations in some cases. In Mexico, for example, the depreciation of the peso led to considerable losses in the foreign exchange derivative-related positions of some corporates.¹⁶ These losses, in turn, led to an increase in the demand for US dollars to cover margin calls, leading to an even greater depreciation of the peso.

¹⁴ See Baba and Packer (2009) and Coffey et al (2009).

¹⁵ See Mancini Griffoli and Ranaldo (2009).

¹⁶ Such derivatives had been sold in Brazil, Poland and other emerging markets. See Jara et al (2009), p 55.

4. Immediate responses to the dislocations

There was a wide range of responses to the funding market dislocations and the subsequent spillover to other markets. In the private sector, financial institutions took immediate action in various ways to protect themselves against the impact of the market dislocations described above.¹⁷ As mentioned earlier, many increased their precautionary holdings of liquidity. There was also considerable flight to quality, as former major non-bank suppliers of US dollar funds (eg money market funds) diverted their resources to better-name counterparties, benefiting banks that were perceived to be in healthier conditions (eg Canadian banks). Australian banks took the opportunity of calmer market conditions in early 2008 to frontload their funding needs and reduce their dependence on cross-border funding. Such responses helped to put them in a much better position to weather the most acute phase of the crisis later in the year. European pension funds reportedly tried to find natural funding counterparts in US pension funds in order to bypass the disrupted US dollar market, though apparently no formal arrangements had resulted by the time market calmed down again.

4.1 Pre-Lehman: addressing a transatlantic US dollar liquidity problem

Public sector responses evolved considerably as the crisis unfolded. Prior to the Lehman bankruptcy, cross-border funding problems mainly affected European banks that had built up sizeable funding requirements in US dollars, but had little access to dollars locally and few willing suppliers across the Atlantic, be it for structural reasons (see section 2) or on the account of heightened concerns about counterparty risk. Accordingly, the most prominent policy response at the time was a transatlantic solution. On 12 December 2007, in the context of a joint announcement by seven central banks, the Federal Reserve introduced the Term Auction Facility (TAF), which gave depository institutions access to term funds via competitive auctions using a wide range of collateral. This facility opened up a new direct source of central bank liquidity for the US branches and subsidiaries of European banks. The ECB and the Swiss National Bank (SNB) also announced that they would conduct complementary term US dollar auctions, funded by swap lines with the Federal Reserve, in order to facilitate access to dollar liquidity in Europe early in the trading day.

A variety of central bank measures were also put in place to alleviate tensions in domestic money markets (CGFS (2008)). These measures addressed not only problems in unsecured markets but also the increasingly difficult conditions in secured markets (eg the Federal Reserve's Term Securities Lending Facility (TSLF) and the Bank of England's Special Liquidity Scheme).

4.2 Post-Lehman: broad-based response on a global scale

The Lehman bankruptcy escalated what until then had been mainly a US dollar funding problem among European banks to an acute US dollar shortage on a global scale, with knock-on impacts on local currency liquidity. The seizing up of unsecured funding markets also exacerbated funding conditions in other major currencies such as the euro and the Swiss franc. Policy responses at this stage were accordingly more global in scope and diverse in form.

¹⁷ The medium- and longer-term responses of banks to the crisis will be examined in other parts of the CGFS project on international banking after the crisis.

To stabilise financial institutions, the authorities in many economies concurrently rolled out an unprecedented range of support measures. These included increased deposit insurance to prevent bank runs, government guarantees of other liabilities to ensure access to wholesale funding, recapitalisation to strengthen balance sheets and asset purchase or guarantee schemes to protect financial institutions from extreme losses. These actions complemented the many liquidity-providing facilities and measures put in place by central banks to support their respective financial systems. The Federal Reserve, in particular, introduced a number of targeted measures to help support parts of the shadow banking system (eg money market mutual funds) that had been vital suppliers in the US dollar funding market.

To address foreign currency shortages, there was wider use of foreign reserves to help not only banks but in some instances also non-bank corporates facing cutbacks in the financing of normal activity (eg trade financing) as a result of the sharp retrenchment of cross-border bank lending. In Brazil, for example, the central bank supplied foreign currency through various mechanisms: collateralised loans to banks (specifically for export financing), sales of US dollars with repo auctions, currency swap contracts (with the central bank short in US dollars) and outright sales of US dollars.¹⁸ In Korea, the central bank offered its foreign reserves in FX swap auctions while the government announced its own plans to supply US dollar liquidity that included trade financing and guarantees on the external debts of banks. In Mexico, dollar sales were undertaken to meet the increased demand from companies and other counterparties requiring dollars for collateral or to unwind derivatives positions. To address the knock-on impact of dollar sales on peso liquidity,¹⁹ the central bank amended its regulation to allow the acceptance of US dollar deposits as collateral for liquidity operations.

Cross-border policy responses were also stepped up. Just over six weeks after the Lehman bankruptcy, US dollar swap lines provided by the Federal Reserve were expanded in number (from two to 14), size (to unlimited for four central banks²⁰) and reach (from one to five continents, covering time zones that spanned the entire global trading day). From mid-October 2008, the four central banks with uncapped swap lines began to auction US dollar funds at fixed rate for full allotment. With this step, the US dollar swap lines evolved from mainly being a liquidity backstop to a more direct means of intermediation in funding markets.

There were also policy responses in the euro and Swiss franc markets, albeit on a smaller scale and with a more limited scope. The SNB established swap lines with first the ECB and subsequently the National Bank of Poland and Magyar Nemzeti Bank. The four central banks together conducted primarily weekly EUR/CHF swap operations to supply Swiss franc liquidity to banks that could not access SNB market operations.²¹ The ECB established a swap line with the National Bank of Denmark that facilitated the latter's efforts to improve liquidity in euro short-term markets outside the euro area; it also agreed to provide euros to the Hungarian and Polish central banks via repo agreements.

¹⁸ The recent Brazilian experience with provision of foreign exchange liquidity is analysed in Stone et al (2009).

¹⁹ Central bank dollar sales generated a large demand for pesos, which added to the tightening conditions in the peso interbank market and put upward pressure on peso short-term interest rates. As a result, the US dollar funding rate implied in FX swaps (against the peso) actually turned negative and remained so during most of the last quarter of 2008.

²⁰ The ECB, the Bank of Japan, the SNB and the Bank of England.

²¹ Three-month operations were also offered in late 2008, but were subsequently withdrawn due to lack of demand.

Other external insurance mechanisms were introduced. One example is the IMF's Flexible Credit Line (FCL), introduced in March 2009, which aimed to provide timely and upfront support – with no ongoing (ex post) conditions of the type associated with the traditional forms of IMF lending – for economies with sound economic fundamentals and policies. Within one month of the FCL's introduction, three countries (Colombia, Mexico and Poland) signalled interest and were subsequently granted credit lines worth over \$77 billion in total. The ASEAN Plus Three countries also agreed in May 2009 to bring forward the timetable for multilateralising the Chiang Mai Initiative, which had until then been a collection of bilateral swap agreements that had never been called upon. The new multilateral facility would pool together \$120 billion of reserves, but has so far remained unused.

4.3 Market recovery following policy responses

These interventions, taken as a whole, succeeded in stabilising the major funding markets and the financial system more broadly. The effectiveness of specific measures is hard to discern, not least because of the large number of support measures that were in place simultaneously. Nonetheless, feedback from market participants highlighted the positive impact of central bank swap lines in particular.

In major currency unsecured funding markets, the extraordinary pressures observed in the wake of the Lehman bankruptcy receded, particularly after the uncapping of the dollar swap lines with four central banks and the introduction of fixed rate, full allotment auctions in mid-October 2008. However, market conditions, as judged by deposit-OIS spreads, did not fully revert to their pre-crisis state. Even as late as end-2009, spreads for some maturities remained relatively wide, suggesting a lasting shift in the perception of risk inherent in unsecured money market transactions. Volumes rebounded from the virtual standstill at the height of the crisis, but remained subdued for a time. For example, the 2009 Euro Money Market Survey shows that turnover in the unsecured market for euros declined between Q2 2008 and Q2 2009.²² With an extraordinary amount of central bank and government support still in place through end-2009, it was difficult to judge how far the improved conditions were from where they would be under truly normal circumstances.

Conditions in the FX swap market improved, as evidenced by the narrowing of the major currencies' basis from their peaks in late 2008, even though they continued to be somewhat wider than in pre-crisis times. Data collected by the foreign exchange committees in six major financial centres show that turnover fell by around 25 per cent between April 2008 and April 2009.

The use of foreign currency liquidity support measures decreased over time, although the rate of decline varied across different economies. While a number of central bank swap lines established at the height of the crisis remained untapped, a few central banks saw usage persist at relatively high levels for a number of months before gradually receding. Reflecting the decline in usage and the improvement in market conditions, the US dollar swap facilities were formally terminated on 1 February 2010. The EUR/CHF swap operations supported by SNB swap lines were also discontinued in late January 2010. In emerging markets, following the sudden cutback in foreign currency supply in late 2008, capital inflows began to pick up in the first months of 2009, thus also lessening the need for the authorities to supply foreign currency liquidity.

²² See www.ecb.europa.eu/pub/pdf/other/euromoneymarketsurvey200909en.pdf.

5. Lessons learnt and policy implications

5.1 The build-up of maturity mismatches within and across currencies was a major vulnerability and should be better monitored and managed

The build-up of cross-border maturity and currency mismatches by a large number of financial institutions created a major vulnerability. The direct or indirect exposure of some of these vulnerable institutions to common losses (eg on US subprime-related assets), coupled with their reliance on short-term interbank and FX swap markets for foreign currency funding, contributed to the extraordinary pressures that spread across various funding markets during the crisis.

It should be emphasised that cross-currency funding and cross-border banking per se should not be seen as the main problem in this episode. Rather, it was the *inadequate recognition and management* of the risks involved – in particular, with regard to the reliance on short-term funding and exposure to potentially illiquid assets – that posed a threat to the stability of the system. Thus, an important policy consideration is to appropriately monitor and manage the risks arising from such mismatches.

In many cases, responsibility for monitoring these risks will rest with supervisors of institutions that are likely to have such exposures. For instance, in Australia and Canada, bank supervisors monitor the duration and currency mismatches of the institutions under their responsibility.²³ In Brazil, the regulatory limits on foreign exchange exposures helped banks avoid the same fate suffered by their counterparts in some other jurisdictions. In Korea, prudential ratio requirements of foreign exchange business institutions (eg foreign currency liquidity ratio, currency mismatch ratio, long-term borrowing ratio) have been strengthened.

At the same time, central banks, given their day-to-day contact with the market, also have an important role to play in monitoring the liquidity situation and funding habits of the banks operating in their respective jurisdictions, including the branches and subsidiaries of foreign banks. In cases where branches of foreign banks cannot provide the relevant information, there may be scope for more cooperation between the home and host country central banks.

In addition to bank by bank monitoring, it is also important to have information on the currency and maturity composition of sectoral balance sheets so that potential mismatches can be assessed at a more aggregated level. The BIS international banking statistics are one of the best sources of such information, although more detailed breakdowns by currency and maturity (currently quite limited) would be helpful. The BIS has recently proposed to the CGFS to collect more detailed statistics as a part of the nationality statistics, on the basis that much of the information is already collected.

Information about off-balance sheet foreign exchange activities is vital for forming a complete picture (eg use of FX swaps, gross FX swap market value after netting, forward sales of foreign currencies by exporters). These data are not available from the BIS banking statistics or other collections of international data. The recent review of the BIS banking statistics indicated that it would be costly to obtain information on off-balance sheet positions for the consolidated data. Currently, the Reserve Bank of Australia sponsors the collection of this information from Australian institutions by the Australian Bureau of Statistics as a part of the international investment position survey every four years. In Brazil, the Securities and Exchange Commission (CVM) determined that publicly listed companies should release

²³ In the Australian case, for example, banks report their positions at least once every quarter.

information on all their derivatives operations. The Mexican securities regulator, CNBV, adopted a similar regulation.

While data gathering is important for monitoring, it needs to be borne in mind that there are also significant costs and limitations associated with the collection of data. Such costs and limitations will have to be weighed against the expected benefit of having additional data.

The recent crisis also revealed some “blind spots” in the pre-crisis understanding of the structure and participants of funding markets. One example is the role of the shadow banking system. Off-balance sheet SIVs and conduits, linked to banks via implicit or explicit contingent credit support, were parts of the system that contributed unexpectedly and significantly to the market distress. Subsequent runs on the repo market and US money market funds exacerbated the funding problems among banks. Central banks are in a unique position to capture such developments through dialogue with their day-to-day contacts in the banking and financial community. Such market intelligence is essential for identifying the problems and thus designing stabilisation measures in a timely and appropriate manner.

Apart from monitoring the build-up of exposures, it is also important to encourage prudent and well-informed decision-making among all economic agents. A better appreciation of risks is also crucial for financial institutions engaging in cross-border lending and borrowing: the pre-crisis risk premium in interbank transactions may have been too low, resulting in a greater reliance on market funding and a larger build-up of maturity mismatches than warranted. Financial literacy among the public should also be strengthened to make sure that firms and households are aware of the risks associated with foreign currency loans.

5.2 Foreign exchange market infrastructure demonstrated its resilience

Despite being subject to extraordinary pressures in the immediate aftermath of the Lehman bankruptcy, foreign exchange markets continued to function relatively well. While there were clear signs of dislocation – sharp increases in implied funding costs, credit tiering, shortening of tenors for FX forwards and swaps, and widening of bid-ask spreads in the spot market – foreign exchange markets did not seize up completely as some other markets did. Two infrastructural developments were particularly important for maintaining the relatively smooth operation of foreign exchange markets throughout the financial crisis.

First, the wide-spread use of Continuous Linked Settlement (CLS) has helped to mitigate settlement risk. Indeed, it is likely that confidence in the ability of CLS to mitigate this risk was one of the reasons foreign exchange markets continued to function even at the height of the crisis and picked up activity from other markets that had ceased to function. However, CLS has limitations, since not all currencies, regions or products are currently covered.²⁴ During the crisis, there were reports of banks being excluded from FX swap transactions because they were not CLS participants and/or the transactions involved currencies that were not CLS-eligible. In order to reduce this type of friction that can impair liquidity distribution, there is a case for encouraging increased coverage and wider participation in CLS. Moreover, in a crisis situation non-payment tends to become more frequent, whether deliberately or for reasons of force majeure, and can lead to chain reactions unless funds are made available rapidly to parties affected by the non-payment. In the context of CLS, the prospective

²⁴ CLS currently provides settlement services for 17 currencies: the Australian dollar, the Canadian dollar, the Danish krone, the euro, the Hong Kong dollar, the Israeli shekel, the Japanese yen, the Korean won, the Mexican peso, the New Zealand dollar, the Norwegian krone, the Singapore dollar, the South African rand, the Swedish krone, the Swiss franc, the pound sterling and the US dollar. Foreign exchange products settled include spot, forwards, swaps, option exercises and non-deliverable forwards.

introduction of same-day settlement capacity would be useful for enabling payment on short notice.

Second, the increased use of Credit Support Annexes (CSAs) in ISDA agreements has helped to mitigate replacement risk for longer-term foreign exchange instruments by providing a standardised framework for re-margining exposures.²⁵ Market participants have noted that this practice has become much more prevalent since the beginning of the financial crisis. Nonetheless, to the extent that CSAs are optional (and thus not always used) and do not cover all types of risks, there are limits to how far this innovation could mitigate risks in FX transactions. For example, CSAs typically provide for variation margin only above a defined threshold of net exposure, leaving counterparties exposed to a degree of jump-to-default risk. Indeed, despite the existence of CSAs, some banks were still cut off from market access during the crisis.

Concurrent with the growing importance of CSAs, the use of central counterparties (CCPs) is increasingly being considered as a means to manage replacement risk for longer-term instruments. The main benefits of CCPs to market participants are that they create a common level of counterparty risk (ie that of the CCP) and allow exposures to be netted multilaterally, which should result in more efficient collateral requirements. These benefits are in part premised on the use of standardised terms, which also help to facilitate the monitoring of exposure at the individual institution level as well as in aggregate. Other potential benefits to an individual institution of using a CCP include lower costs from an idiosyncratic credit default event and increased automation of post-trade processes.

However, migrating to a CCP model could be costly and would require justification, especially for markets in which a significant investment has already been made in automation and risk mitigation (eg use of CLS and CSAs). In the case of foreign exchange markets, this sunk cost includes participation in CLS: any migration to a CCP model for a significant part of the FX market will have implications for the CLS business model. Although CCPs have been present in some parts of FX markets, they have not been widely utilised. Usage could potentially be widened, thus allowing more participants to reap the potential benefits, by furthering efforts to standardise longer-term products, reviewing the CCP participation model for FX clearing members and non-members, and addressing other current limitations or impediments. The foreign exchange committees in major financial centres have been examining the implications of wider CCP use for FX market functioning.²⁶ One particular concern is that any forced migration to CCP would end up undermining a market that has proven to function well as it stands. It should be noted that there are also trade-offs from the regulator's perspective: while offering more transparency, CCPs could potentially concentrate counterparty risk in a systemic credit event. Consequently, the CCPs themselves will require stringent risk management to ensure that the risk of failure is as close to zero as possible.

In addition to broadening the use of CLS and CSAs, there are other issues policymakers could consider in order to reinforce the resilience of foreign exchange markets. First, market participants providing the sought-after funding currency in an FX swap will require acceptable instruments for investing the cash collateral received on the swap. The options available to such market participants might become fairly narrow during a crisis. In the event, one

²⁵ A CSA is a legal document which contains the agreed collateral terms between the two parties to OTC derivatives under an ISDA master agreement. Such terms include, for example, thresholds, minimum transfer amounts, eligible securities and currencies, haircuts and rules for the settlement of disputes over valuation of derivatives positions.

²⁶ See, for example, London Foreign Exchange Joint Standing Committee (2009).

possible response to support FX swap market functioning could be for central banks to consider opening their deposit facilities to a wider range of counterparties (ie a type of banking service) under exceptional circumstances. The benefits would, however, have to be weighed against considerations such as the consistency with counterparty policy,²⁷ the impact on the regular conduct of monetary policy and the risk of disintermediation.

Second, FX swap market participants need to maintain confidence that the underlying FX spot market will continue to function properly during periods of elevated stresses in funding markets. If spot market functioning were to deteriorate, central banks might have a role to play in facilitating orderly trading conditions.

Third, the predominant role of the US dollar as vehicle currency in FX transactions may have exacerbated the market “congestion” during the crisis. In principle, this type of congestion could be ameliorated if there is some capacity to transact via alternative routes in case the usual channel becomes blocked (eg the turnover of Hungarian forint and Polish zloty swaps against the euro rose temporarily during the crisis, while transaction against the dollar fell). In practice, however, it is not clear to what extent policies or private sector initiatives could (or should) develop such capacity.

5.3 Funding markets are interlinked: spillovers can be substantial across time zones, markets and currencies

The crisis reinforced the fact that funding markets are interlinked (see Section 3). Conditions in unsecured markets may affect the activity in secured markets (and vice versa), as market participants choose among different funding options. The common use of FX swaps to fund one currency with another while hedging against exchange rate risks also means that tensions in “core” currency markets could spill over to other currencies.

It is therefore crucial to enhance the resilience of the funding markets in core currencies, beginning with the home market. Enhancements could include: (i) more robust clearing and settlement processes; (ii) more transparent, standardised financial instruments; and (iii) a more solid framework governing behaviour of market participants. In this context, the various ongoing private sector initiatives to upgrade the market infrastructure are very much welcome (eg repo market reforms in the United States, Canada and Japan).

At the same time, central banks should be prepared to intervene in the home market when circumstances warrant. However, central bank liquidity support in times of financial stress could raise issues of moral hazard for the private sector and possibly for policymakers as well, distorting market participants’ incentives to manage risk and allocate capital efficiently. Central banks should therefore provide liquidity to core funding markets in a principled way to mitigate this problem.²⁸ Central banks might also want to leave some constructive ambiguity about the timing or availability of liquidity support in times of stress.

Another important issue in terms of market resilience is the role central banks play as clients of commercial banks. As large-reserve central banks have become a significant source of US dollar funding for banks over time, their withdrawal of deposits from banks early on in the crisis exacerbated the tightening conditions in funding markets. Central banks (as well as

²⁷ Some central banks are subject to legal restrictions on the types of counterparties with which they can transact.

²⁸ CGFS (2008) outlines some such principles based on central banks’ experience in the pre-Lehman phase of the crisis. The principles that have guided the use of the Bank of Canada’s liquidity tools are discussed in Zorn et al (2009).

other official sector organisations) need to reflect on the implications of placing unsecured deposits at commercial banks and carefully consider the impact of their actions, especially during times of market distress. Banks should also take into account sovereign and official sector investors' tendency to have low tolerance for credit and counterparty risks.

5.4 Having adequate foreign exchange reserves and using them during the crisis helped to alleviate pressures, though this self-insurance comes at a cost

A number of economies were hit by an acute shortage of US dollars in the aftermath of the Lehman bankruptcy in September 2008. As a first line of defence, these economies deployed their own foreign reserves – often in a suite of instruments, some of which were quite targeted, eg direct provision of foreign currency loans to finance exports (see Section 4).

The advantage of this approach is that it can be implemented relatively speedily. Moreover, since the problem in this crisis was mainly one of liquidity shortages among banks, and not of balance of payments deficits, foreign reserves could be used in a parsimonious way, being lent or swapped out for a definite period of time, without necessarily being sold outright.

This experience demonstrated that having adequate foreign reserves was important even under a floating exchange rate regime. Not only did foreign reserves serve the “self-insurance” purpose, providing an immediate source of foreign currency liquidity, they arguably also helped the economies in question weather the crisis relatively well. By maintaining market confidence, the level of foreign reserves may well have prevented these economies from being hit sooner and harder by the crisis. The amount of reserves needed to maintain confidence is likely to depend on history. Emerging market economies with a history of macroeconomic volatility (and thus typically not very high credit ratings) may need larger reserves to convince the market of their resilience.²⁹

However, there are costs and limitations to this approach. Obtaining and maintaining a sufficient level of this self-insurance during tranquil times could entail considerable financial and opportunity costs, especially in economies with relatively high borrowing costs or rates of return on domestic assets. Such costs come on top of any other distortions that the associated build-up in reserves may imply. Moreover, a country's own foreign reserves are by definition finite in quantity: while they may be effective for alleviating temporary idiosyncratic shortages, they may not be sufficient to insure against large systemic events.

These limitations suggest that in some situations, collective facilities that involve the pooling of global resources (eg via the IMF) or cross-border cooperation (eg central bank swap lines) may offer a more cost-effective solution than self-insurance (see Section 5.5). The availability of collective facilities should in principle lessen the need for individual countries to accumulate large reserves. The extent to which countries can count on this availability as an alternative to self-insurance in practice, however, is a separate question. For example, the emerging market economies that had access to the IMF's FCL during the recent crisis all had sound fundamentals, including relatively high levels of reserves.

Even in economies with adequate levels of reserves, the rate of reserve depletion during times of distress, if judged to be too rapid by market participants, could send a negative signal. History may also play a role in this regard, with economies with a more volatile past possibly being more constrained in their ability to deploy reserves in large quantities. In the light of the need to balance the pros and cons of this strategy, policymakers should assess

²⁹ There is also recent evidence that a higher level of international reserves is associated with lower credit default swap spreads in emerging market economies. See Aizenman and Pasricha (2009).

carefully the extent to which the size of reserves as well as their currency and instrument composition mattered during the crisis (beyond the traditional role as balance of payments safeguard) and the practical challenges of using reserves as a source of funding liquidity in times of market distress.

5.5 Policymakers should consider developing tools to address systemic cross-border funding pressures

One defining feature of the recent crisis is its systemic nature, not just within the borders of specific jurisdictions, but on a global scale. So while it is important to better monitor and manage specific institutions' funding needs and currency and duration mismatches (Section 5.1), strengthen the infrastructure of foreign exchange and core funding markets (Sections 5.2 and 5.3) and self-insure where appropriate (Section 5.4), these actions are aimed mainly at reducing idiosyncratic risks and hence cannot completely eliminate the incidence of system-wide events. It is therefore useful for policymakers to consider a variety of backstop policy options to handle cross-border systemic events.

One highly effective arrangement has been central bank swap lines. Other measures such as cross-border collateralisation and regional liquidity support arrangements could also be employed in suitable situations. Policymakers need not restrict themselves to one option, but should explore all viable alternatives to develop a comprehensive toolkit that can be flexibly deployed in different situations.

Inter-central bank swap lines were highly effective during the crisis³⁰

The extension of US dollar central bank swap lines across a wider number of time zones in the aftermath of the Lehman bankruptcy was a potent and appropriate remedy for the acute, global-scale US dollar shortage at the time. In some jurisdictions, merely the announcement of having established a swap arrangement with the Federal Reserve as a backstop was apparently sufficient to bolster confidence among market participants, making it in turn unnecessary to draw on the swap line (eg in Brazil and Singapore).³¹ In places where the swap lines were drawn upon, the positive signalling effect of having external support was also notable, while the additional resources provided an important complement to these economies' own foreign currency resources (eg in Korea and Mexico).

The euro and Swiss franc shortages in Europe, while not exacerbated by time zone differences as in the US dollar case, also eased as a result of the use of inter-central bank arrangements. The ECB swap and repo lines provided an additional source of euro funds to banks in non-euro area states with no access to the Eurosystem's liquidity operations and facilities. The Swiss franc-providing swap lines extended by the SNB – and the associated EUR/CHF swap operations at the three partner central banks – effectively allowed a broader set of banks in Europe to obtain direct access to Swiss franc funds.

Swap and repo lines are mechanisms for delivering a currency to other jurisdictions; they still leave considerable operational flexibility to the central banks involved. The US dollar swap arrangements, for instance, were adjusted promptly as the crisis unfolded. Particularly

³⁰ Baba and McCauley (2009) report the findings of a number of recent research works on the market impact of central bank swap lines during the crisis. See, for example, Coffey, Hrug and Sarkar (2009), Baba and Packer (2009), Mancini Griffoli and Ranaldo (2009), Obstfeld et al (2009) and Aizenman and Pasricha (2009).

³¹ In some countries (eg Canada), the swap lines were not drawn because US dollar liquidity shortages and FX swap market disruptions were not as serious as in other places.

important was the addition of new swap arrangements to form a global network and the uncapping of lines with four partner central banks to facilitate the provision of dollar funds at fixed rate for full allotment. Flexibility was also evident in the objectives of the swap lines, which evolved from a liquidity backstop to a means of direct intermediation in funding markets.

The recipient central banks also tailored the distribution method (operation frequency, size, tenor, format, pricing, collateral, etc) in agreement with the funding central bank to suit the local market environment and thus to maximise effectiveness. One particularly useful feature employed during the crisis was the offering of longer-term funds (eg 28-day, 84-day), which sought to address the difficulties of making term transactions in the market at the time.³² A number of central banks also offered, in parallel, funds at shorter maturities (eg overnight, one-week) to cater to different needs, and flexibly withdrew those that were no longer in demand.

Central banks also exercised flexibility when pricing such operations. One important lesson in this regard was that pricing should take into account market conditions so as to avoid distortions such as unwarranted over- or undersubscription.³³ Many central bank facilities were priced as backstops, attractive only under stressed market conditions but unattractive when conditions normalise, thus allowing for a built-in exit mechanism. Central banks conducting simultaneous operations were also careful to coordinate the pricing of auctions. This limited the incentives of banks to shop around based on the headline price, even though the effective price might still vary across jurisdictions due to, for example, different collateral requirements or haircuts.

The modalities of distribution operations raise other issues. First, the funding central bank will have a vested interest in ensuring that the distribution of its currency via another central bank remains consistent with its own implementation of monetary policy. Second, the partner central bank distributing the foreign currency will also have an interest in managing the consequent impact on its own liquidity management. For example, the US dollar operations conducted offshore by partner central banks during the crisis were generally organised as repo or loan auctions, which would absorb eligible collateral but would not per se have a direct impact on domestic currency liquidity (although there may be an indirect impact if these auctions in turn helped to reduce the scramble for domestic currency for the purpose of swapping it out for US dollars). By contrast, distributing a currency via FX swaps, as done by the SNB and its partner central banks, would necessarily result in an absorption of the collateral currency (the euro in this example), which may or may not be desirable depending on the circumstances.³⁴

Finally, there is a question of whether distribution operations targeting the partner central banks' usual counterparties (ie mostly banks) effectively bring the liquidity to the true end users (eg other banks with no direct access to the central bank, non-bank corporates). This is especially pertinent in the light of banks' tendency to hoard liquidity during the crisis. In

³² In the special case of Mexico, where banks' US dollar demand was much longer-term in nature, the central bank conducted one auction of 264-day dollar loans in April 2009.

³³ The EUR/CHF swaps, for instance, were initially priced to be more attractive than the stressed conditions in the swap market. This resulted in overbidding, where banks with genuine need for Swiss francs had to compete with other participants seeking to place euro funds at an advantageous rate rather than to obtain Swiss francs. The pricing was subsequently adjusted to mitigate such undesired oversubscription and eventually to further reduce the demand for the swaps.

³⁴ Although using FX swaps may in some cases put extra demand on domestic currency liquidity management, it has the advantage of widening the distribution of funds to banks that do not hold sufficient eligible securities as collateral.

such a case, the typical central bank auction may not be the most effective distribution method. Other mechanisms such as direct intervention in the FX swap market (if that is where support is most needed), auctions to alternative counterparties (subject to consistency with the central bank's counterparty policy), rediscount of export bills, or provision via fiscal agents (using own reserves) instead of the central bank may be more appropriate.

The experience shows that when circumstances warrant, swap arrangements can be put in place quickly and on a scale commensurate with the circumstances. Given the interlinked nature of markets (see Section 5.2), adequate coverage in terms of countries and time zones is likely to be an important consideration. However, the consequences of swap line activation for domestic liquidity management – as well as other related policy and operational issues (eg the importance of mutual consent) – need to be taken into account.

All in all, the experience with inter-central bank liquidity provision arrangements during the crisis was very positive. These arrangements were particularly useful because of the systemic nature of the problem. For less systemic problems, however, it is less obvious that such arrangements would be part of the solution. The appropriateness of such arrangements in the future would therefore depend on the circumstances at the time.

Other possible cross-border policy options

Central bank swap or repo lines, while very useful in the recent episode, are not necessarily the only solution for relieving all types of cross-border funding problems. Depending on the nature of the problem, alternative solutions could also be beneficial.

One such alternative, which some central banks have explored, is the establishment of cross-border collateral arrangements.³⁵ These involve the central bank in one jurisdiction providing domestic currency liquidity to eligible financial institutions against collateral placed by their offices in another jurisdiction into the liquidity-providing central bank's account at the local central bank. In essence, this is another way for central banks to provide a cross-border bridge to support funding requirements in another jurisdiction should interbank cross-border intermediation become impaired. Moreover, such an arrangement would give both participating central banks access to private market information on where the strains in cross-border flows might be. Such a facility could be made available at a penalty rate and could include other safeguards (eg ensuring that decisions on collateral, haircuts and other conditions of liquidity provision rest with the liquidity-providing central bank). The design of such policies should also take into account regulatory liquidity requirements and potential restrictions on cross-currency exposures.

Other alternatives, such as the IMF Flexible Credit Line mentioned earlier, have shown a positive signalling effect that bolsters market confidence in the recipient countries. Such facilities are useful in providing a global insurance mechanism in the event of a systemic event and reducing the need for countries to engage in costly self-insurance. Regional swap arrangements with pooled reserves could serve a similar purpose.

³⁵ The Committee on Payment and Settlement Systems (CPSS) has started examining the mechanics of cross-border collateral arrangements well before the current crisis (CPSS (2006)).

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Annex 1: Members of the Study Group

Reserve Bank of Australia	Guy Debelle (Chair) Alexandra Heath
Central Bank of Brazil	Katherine Hennings André Minella
Bank of Canada	Carolyn Wilkins
European Central Bank	Holger Neuhaus
Hong Kong Monetary Authority	Eric Tak Chuen Wong
Bank of Japan	Hidehiko Sogano Atsushi Takeuchi
Bank of Korea	Seung Ho Lee
Bank of Mexico	David Margolín Schabes
Monetary Authority of Singapore	Luke Goh
Swiss National Bank	Christoph Meyer
Bank of England	Michael Cross
Board of Governors of the Federal Reserve System	Charles Thomas
Federal Reserve Bank of New York	Steven Friedman
Bank for International Settlements	Corrinne Ho (Secretary) Robert McCauley Dietrich Domanski

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