Carry off, carry on

De-risking began to stir financial markets over the review period but the stresses proved short-lived.[1] While markets experienced sharp bouts of volatility, investors quickly reverted to the risk-on mode that had prevailed for several months. Financial conditions thus remained loose. Yet the turbulence illustrates how markets have become vulnerable to swift mood shifts, especially related to current growth jitters.

Although de-risking pressures had been brewing since the beginning of July, the cusp of the stress occurred at the beginning of August. In July, markets had already experienced some corrections, especially in tech stocks that had previously surged in valuations. Volatility had picked up, with early signs of deleveraging and a reversal of trades predicated on past trends and low volatility. In early August, following Federal Reserve and Bank of Japan policy meetings perceived as somewhat hawkish, markets overreacted to a disappointing US labour market release. While the equity market correction began in the United States on Friday 2 August, Japan emerged as a locus of turbulence the following Monday. Leveraged positions, above all carry trades, came under pressure, with the yen appreciating sharply and the stock market selling off. The equity slump and the currency repricing reverberated globally, and the VIX spiked. That said, markets stabilised remarkably quickly and erased losses within days, partly thanks to more benign incoming data and central bank communication. In early September, volatility resurfaced again when negative US macro releases led to another correction in equity markets.

During the August sell-off, currency carry trades unwound amid changing expectations of interest rate paths and heightened volatility. Since carry trades borrow in low interest currencies to invest in higher-yielding ones, the unwinding caused a sharp, if short-lived, appreciation of the funding currencies, predominantly the yen, and a depreciation of the investment currencies, such as the Mexican peso and other emerging market economy (EME) currencies. These fluctuations were large but not outsize compared with past carry trade crashes, and foreign exchange (FX) volatility did not rise nearly as much as that of equity markets. Moreover, even though EMEs were exposed to the unwinding of carry trades and spillovers of the risk-off mood, they withstood the bouts of volatility quite well.

Fixed income markets in major economies mostly reflected shifts in policy expectations and the growth outlook, even amid the turbulence. From July onwards, market participants began reassessing the odds of a soft landing. As signs of an intensification of the slowdown surfaced in early August, government bond yields fell markedly, as investors priced in more aggressive rate cuts. Concerns over a global slowdown led to more internationally synchronised movements across bond markets. This halted the divergence that had sustained US dollar appreciation since 2021.

Credit markets were the least affected by the bouts of volatility and de-risking. Corporate bond spreads did widen across advanced economies, but only marginally, and overall credit conditions remained benign by historical standards. Similarly, bank credit supply terms no longer tightened. Against this background, broad measures of financial conditions loosened. Towards the end of the review period, the risk-on mode was again in full swing but still vulnerable to sudden changes in mood.

[1] The review period covers 1 June to 6 September.

Key takeaways

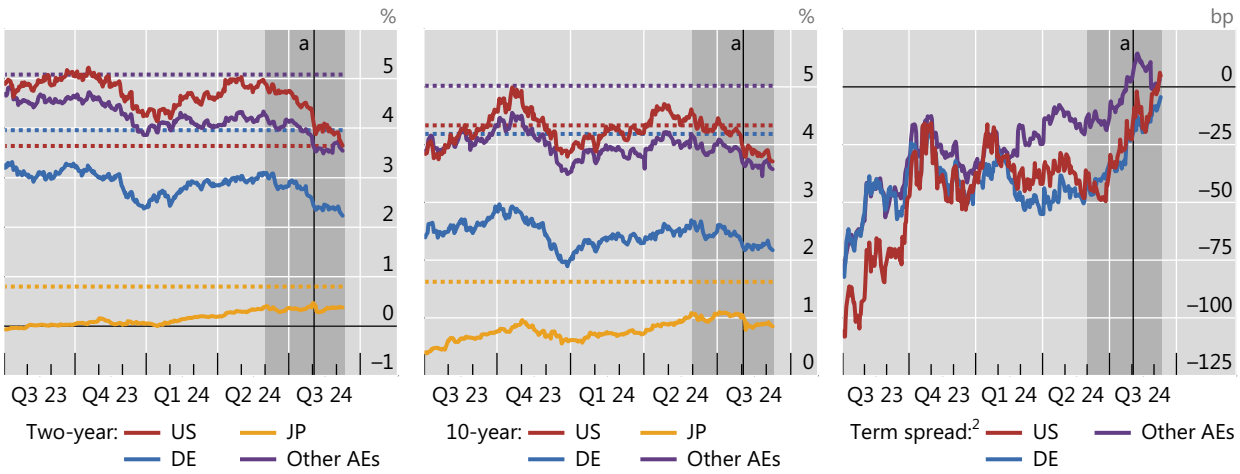
- *The unwinding of leveraged positions, including carry trades, amplified short-lived bouts of extreme equity market volatility and exchange rate movements in early August.*
- *Equity markets underwent some drawdowns but overall managed to pull ahead fairly unscathed. Credit markets were even less affected, amid an overall environment of loose financing conditions.*
- *Markets remained hypersensitive to macro news, especially news that lowered the odds of a soft landing. Bond yields declined on any signs of slowdown, particularly at the short end.*

Global bond markets price in easier monetary policy

Global bond markets moved in tune with expectations of an easier policy stance. Inflation continued its course towards targets, while macroeconomic readings indicated that growth momentum might be faltering. Hence, fixed income markets started pricing in earlier and larger rate cuts in most advanced economies, causing a rather synchronised decline in short-term yields globally (Graph 1.A). This macro backdrop also exerted downward pressure on long-term yields, albeit a more moderate one (Graph 1.B). As a result, the negative term spreads in advanced economies continued to narrow, even turning positive in some economies (Graph 1.C).

A major reassessment of policy expectations occurred in early August. Investors coalesced around somewhat negative labour market readings, interpreted as worrisome given the Federal Reserve's cautious approach to rate cuts. Fears that the

Policy expectations set the tone for global bond markets[1] Graph 1



The shaded area indicates 1 June 2024–6 September 2024 (period under review). The dotted horizontal lines in panel A and B indicate the January 2007–June 2008 average.

[a] Release of disappointing employment readings in the US (2 August 2024).

[1] Other AEs based on simple average of AU, CA and GB. [2] 10-year minus two-year.

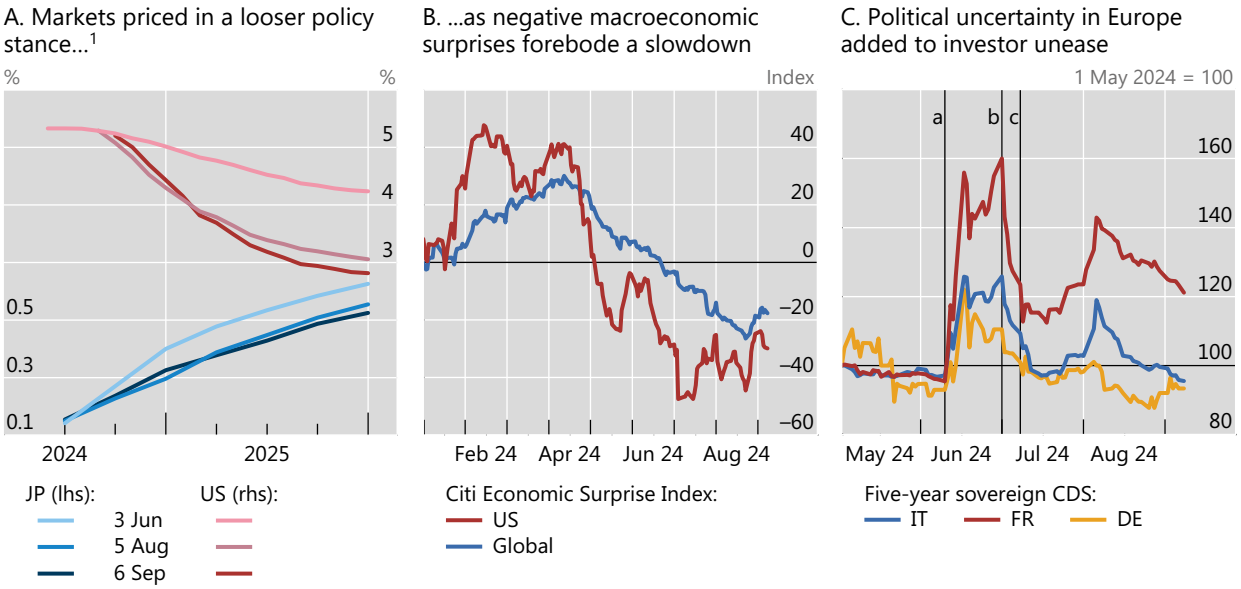
Sources: Bloomberg; BIS.

odds of a sharp downturn were rising ignited the early August turbulence and led investors to price in a faster pace of rate cuts (Graph 2.A). A sharp decline in yields followed, including at the long end, possibly exacerbated by the unwinding of short positions and flight-to-safety flows.[2] The macroeconomic releases of the following days, however, painted a rosier picture and, together with central bank communication, they briefly nudged up policy rate expectations. That said, these expectations eventually settled at a lower level at the end of the review period.

Overall, yield movements were increasingly driven by market participants' greater focus on growth-related news (Box A). This reflected inflation being seemingly on track towards targets and more prominent negative surprises about activity (Graph 2.B). Policy expectations were shaped by the evolving odds of a full-fledged recession versus a soft landing. Expectations of a more synchronous policy cycle ahead also led to more correlated movements in short- and long-term yields across core bond markets, in marked contrast to the divergence that had characterised the previous months. In turn, this likely contributed to halting the US dollar's appreciation trend, which had persisted since the initial policy rate lift-off in the United States.

Changing monetary policy expectations drove fluctuations in long-term yields

Graph 2



[a] European Parliament elections (9 June 2024). [b] First round of French elections (30 June 2024). [c] Second round of French elections (7 July 2024)

[1] Futures curve of policy rates.

Sources: Bloomberg; Macrobond; S&P Global Market Intelligence; BIS.

[2] In line with this, various estimates of term premia in the United States point to a sharp decline in correspondence with the early August spike in volatility.

Box A

Markets' increasing response to labour market conditions in the United States

*Dora Xia and Sonya Zhu*①

Macroeconomic news triggers the repricing of financial assets, partly due to revised expectations of monetary policy.② The extent to which asset prices respond to macroeconomic news depends on the perceived importance of the economic variable for central banks' monetary policy decisions. This box examines the influence of two key economic indicators in the United States – non-farm payrolls and core consumer price index (CPI) inflation – on the yield of US Treasury bonds with two years to maturity (a yield curve segment that is fairly sensitive to shifts in policy expectations). We find that macroeconomic news has had a growing impact on asset prices in recent years, indicating that the Federal Reserve is becoming more data dependent. This was already the case amid the post-pandemic inflation surge, when inflation-related news came into the spotlight. In the more recent period, financial markets have shown an increasing sensitivity to labour market news.

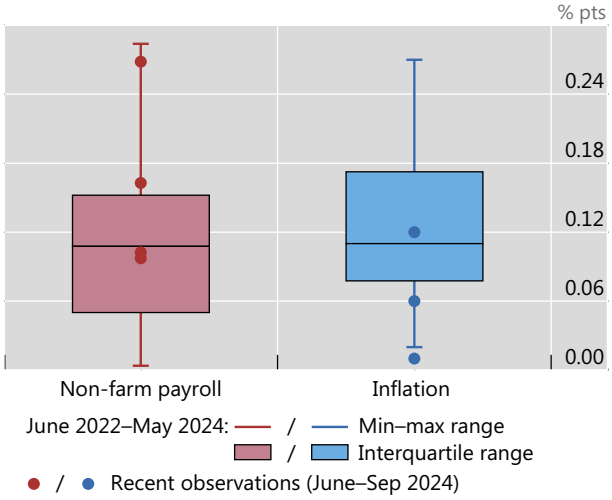
Recent labour market news has elicited large responses in asset prices despite the moderate size of the economic surprise. For instance, on 2 August, when the July non-farm payroll report was released, the two-year US Treasury yield declined by 26 basis points, representing a more than four standard deviation change for that month. More broadly, during the latest three job report release days, the absolute change in the two-year US Treasury yield was close to, or higher than, the median observed in the past two years (Graph A1.A, red dots). Meanwhile, the size of the data surprise, defined as the difference between the actual data and the median forecast by analysts polled by Bloomberg, was only close to or below the median.

The substantial movements in the two-year yield on recent job release days align with a trend of rising sensitivity of asset prices to labour market news. To illustrate this, we estimate the time-varying sensitivity of the two-year yield to the non-farm payroll surprise using rolling regressions with 24 months of data. Specifically, we employ a weighted least squares regression approach with higher weights assigned to more recent observations.③ Our estimates reveal that this sensitivity has been rapidly increasing since 2023 (Graph A1.B, red line). In fact, the magnitude of the latest estimate is near its two-decade peak.④

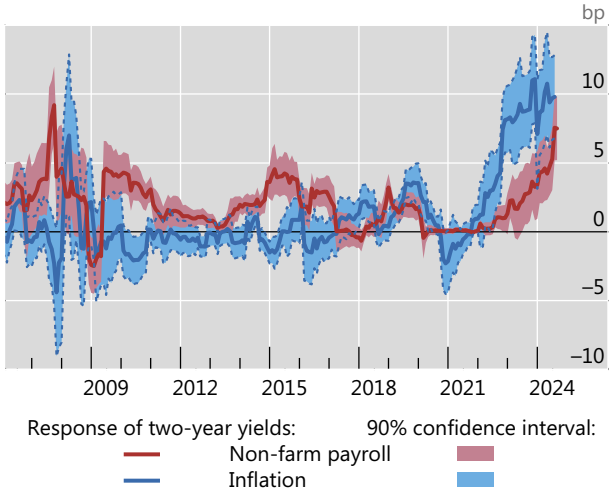
The response of US two-year Treasury yields to economic surprises

Graph A1

A. Recent absolute change in two-year Treasury yields[1]



B. Response to a median surprise[2]



[1] Absolute change on days with either non-farm payroll or core CPI inflation data release. [2] Non-farm payroll and inflation surprises are the difference between the actual release and the Bloomberg median forecast. Panel B shows the coefficients estimated from regressing two-year yield changes on these surprises using a 24-month rolling window. The sample period spans from January 2004 to September 2024.

Sources: Bloomberg; authors' calculations.

The two-year yield has also exhibited high sensitivity to inflation surprises (Graph A1.B, blue line). Amid heightened inflation pressures, the sensitivity of two-year Treasury yields to core CPI inflation surprises surged during 2022. As inflation decelerated from post-pandemic peaks, the increase became more gradual and has currently plateaued at an elevated level.⑤ And as the magnitude of inflation surprises has diminished, the corresponding changes in the two-year yield have been limited in recent months (Graph A1.A, blue dots).

What explains the increasing importance of labour market surprises in recent months? The jury is still out. One possibility is that, with inflation seemingly on track towards the target, markets anticipate that the Federal Reserve will place a greater emphasis on labour market news when making policy decisions. Indeed, in a recent assessment of the economic outlook, the Federal Market Open Committee chair acknowledged diminishing upside risks to inflation and highlighted increasing downside risks to employment.⑥ Communication of this type could prompt market participants to update their perceptions about the central bank's reaction function and place more weight on employment conditions. The perceived evolution in the monetary policy reaction function could be an important driver of the increasing sensitivity of asset prices to labour market news.⑦

① The views expressed are those of the authors and do not necessarily reflect the views of the BIS. ② See, for example, J Faust, J Rogers, S-Y Wang and J Wright, "The high-frequency response of exchange rates and interest rates to macroeconomic announcements", *Journal of Monetary Economics*, vol 54, no 4, May 2007, pp 1051–68. ③ We weight observations with an exponential decay function, with 0.85 being the decay constant. ④ Labour market news has been found to be the most important data release in terms of influencing asset prices and trading activity. See M Fleming and E Remolona, "What moves the bond market?", *Economic Policy Review*, vol 3, no 4, December 1997, pp 31–50. ⑤ Also documented in Z Arnaut and M Bauer, "Monetary policy and financial conditions", *FRBSF Economic Letter,* no 07, 4 March 2024. ⑥ See J Powell, "Review and outlook", speech at the Federal Reserve Bank of Kansas City Jackson Hole Economic Symposium: Reassessing the Effectiveness and Transmission of Monetary Policy, 23 August 2024. ⑦ See M Bauer, C Pflueger and A Sunderam, "Perceptions about monetary policy", *Federal Reserve Bank of San Francisco Working Papers*, no 31, 2023.

In Japan, policy expectations not only reflected the gradual tightening phase under way but also reacted to evolving central bank communication. As the Bank of Japan embarked on a monetary tightening in the spring for the first time in almost two decades, investors started pricing in higher policy rates ahead. Tighter funding conditions in Japanese yen were one of the triggers of the early August turbulence. As a result, in its aftermath, the Bank of Japan adjusted its communication to telegraph a cautious approach to further rate hikes. This led to an immediate downward shift in anticipated policy rates (Graph 2.A), as investors adjusted their expectations.

European fixed income markets were less affected by a reassessment of the policy path but experienced jitters for different reasons. The jitters came on the back of political developments and uncertainty related to elections in the United Kingdom, France and Germany. Notably, French credit default swap (CDS) spreads widened following the first round of parliamentary elections in June, with the associated geopolitical uncertainty affecting other euro area countries more broadly (Graph 2.C). Italian CDS spreads also widened, albeit less than the French ones. The CDS on German bunds, typically viewed as a safe asset in the euro area, ticked up unusually not only following the French elections but also after the elections in Saxony and Thuringia in early September. This possibly reflects increasing challenges in the political sphere. CDS spreads eventually narrowed for Italian and German bonds but remained wider for French bonds.

De-leveraging and carry trade unwinding amplify volatility

Risky assets, already vulnerable given seeping concerns about stretched valuations, were those most shaken in July and early August. Still, flare-ups of volatility subsided quickly each time, equity markets largely recovered the losses, and credit spreads re-compressed. In the end, markets eventually reverted to the risk-on mode as investors became increasingly convinced of policy easing ahead.

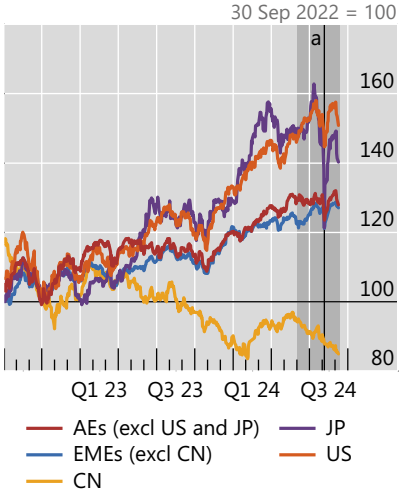
Throughout July, equities were highly responsive to any signs casting doubts on the sustainability of earnings, especially in segments that had previously seen a surge in valuations (Box B). Indeed, these lofty valuations were the first to suffer in the light of indications of possibly fading growth momentum. Those of tech stocks, mostly those of the so-called "Magnificent 7",[3] began to drop rapidly in July (Graphs 3.A and 3.B). By contrast, the "rest" of the S&P 500 index was left relatively unscathed, and small caps were even boosted by some investment rotation.

A larger bout of volatility followed in the first days of August. US equities resumed losses. Once again, the Magnificent 7, but this time also the riskier small caps (Graph 3.B), saw the largest drops. The trigger was investors' outsize reaction to a somewhat disappointing US labour market release on Friday 2 August. On the following Monday, the epicentre of the turbulence shifted to Japan, with the yen appreciating further and the TOPIX index posting double-digit losses. The sell-off broadened, with the TOPIX banks index suffering the worst one-day loss in its 40-year history (Graph 3.C). The Nikkei implied volatility spiked to crises-like highs (Graph 4.A). The volatility spike appeared to spill over to the VIX, which briefly exceeded 60 in pre-market trading before closing under 40, still an elevated level.

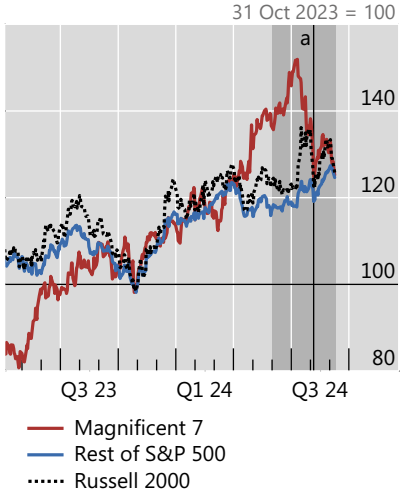
Global equity markets fell but quickly rebounded

Graph 3

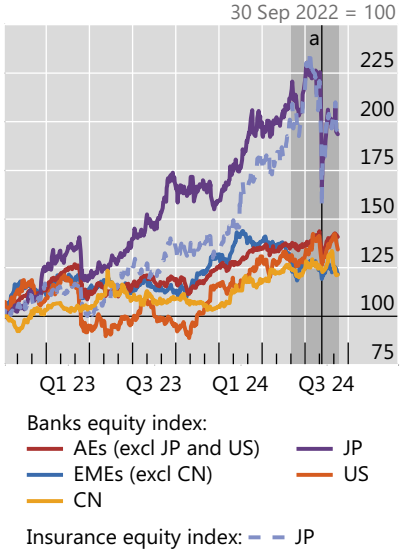
A. Stocks held up amid volatility…[1]



B. …but with some rotation out of tech stocks…



C. …and financial stocks in Japan



The shaded area indicates 1 June 2024–6 September 2024 (period under review).

[a] Turbulence in the Japanese equity market (5 August 2024).

[1] Country group aggregates on based GDP-weighted averages.

Sources: IMF; Bloomberg; LSEG Datastream; LSEG Workspace; BIS.

[3] The Magnificent 7 companies are Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia and Tesla.

Box B

The valuations of tech stocks: dotcom redux?

*Marco Lombardi and Gabor Pinter*①

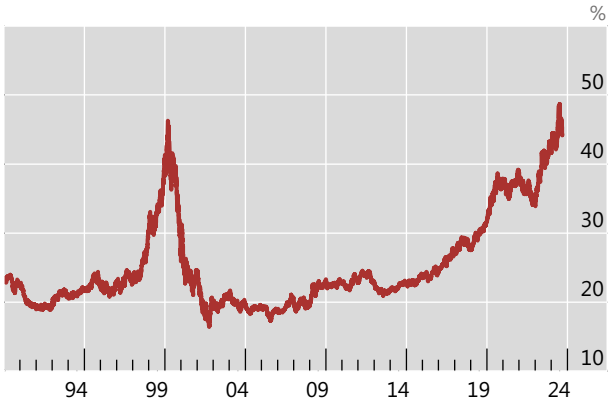
Over the past few years, equity prices have risen steadily, driven largely by the "Magnificent 7" (M7) tech giants. While their earnings growth has been strong, the rapid rise in their stock prices raises concerns about whether these valuations are driven by excessive optimism about future earnings, potentially echoing the dotcom bubble of the late 1990s.

The parallel with the dotcom bubble might seem fitting, as both periods saw a surge in the tech sector's share of the S&P 500 market capitalisation (Graph B1.A). In 2000, at the cusp of the dotcom bubble, the share of tech firms in the S&P 500 index reached 47%, doubling from 23% in less than two years. By end-August 2024, the share of tech firms had reached 49%, but the increase was more gradual, taking nearly a decade to double. These patterns reflect the overall dynamics of equity prices, with the S&P 500 tripling in real terms from 1995 to 1999, compared with a more gradual tripling over the past decade.

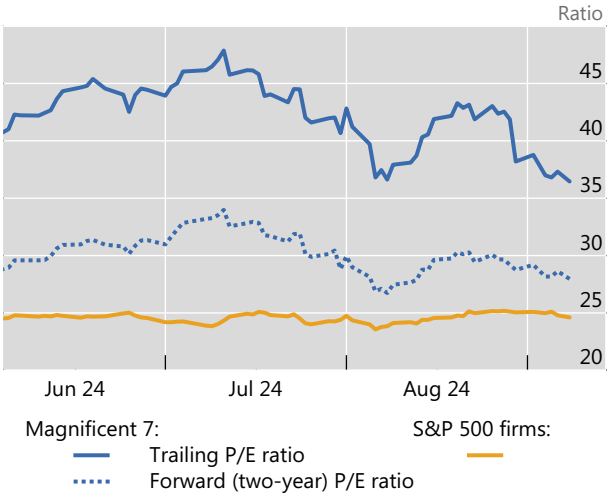
Similarities with the dotcom boom?

Graph B1

A. Rising share of tech[1] market cap in the S&P 500 index



B. Valuations of M7 higher than rest of the market, reflecting high expected earnings growth[2]



[1] Telecommunications and IT. [2] For Magnificent 7 (M7) price-to-earnings (P/E) ratios, market capitalisation weighted average. M7 companies are Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia and Tesla. For the rest of S&P 500 firms P/E ratio, median.

Sources: LSEG Datastream; LSEG Workspace; authors' calculations.

A common way to relate price dynamics to fundamentals is to look at price-to-earnings (P/E) ratios. They reflect how much investors are willing to pay for each dollar of earnings.② P/E ratios can be calculated in a backward-looking (trailing) way, typically based on the past year's realised earnings, or in a forward-looking way, based on analysts' earnings forecasts. Trailing P/E ratios are grounded in actual results but may fail to react swiftly to changes in the outlook. Forward P/E ratios instead reflect expectations of growth, but they risk being biased by waves of over-optimism (or pessimism).

Since July, M7 stocks fell by around 25% and have not yet recovered. As a result, their valuations, as measured by the trailing P/E ratio, have not returned to levels seen at the beginning of June (Graph B1.B, blue line). However, these valuations remain over 45% higher than the median S&P 500 firm. This lingering optimism is also reflected in forward P/E ratios, which are, on average, 30% lower than their trailing counterpart.

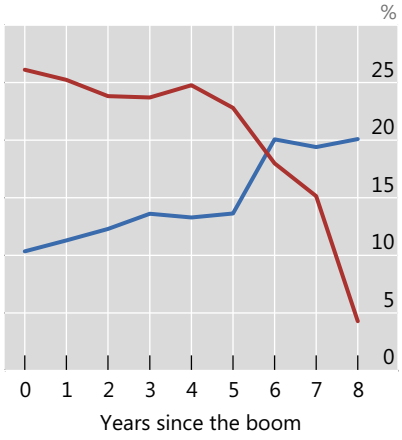
The rising profitability of tech firms in the current bull market has helped propel their valuations, while during the dotcom bubble (1993 to 2001), the average return on assets (ROA) of tech firms steadily declined (Graph B2.A). To be sure, profitability levels also differed initially: in the early 1990s, profit margins of certain tech firms were sizeable, arguably thanks to still fairly immature markets and little competition. By 2015, the tech industry was more mature, with lower but growing profitability.

Despite the increasing profitability of the M7, their valuations may still be stretched. If markets are overly optimistic about future earnings, they may eventually be disappointed. One way to assess, ex post, whether forward-looking P/E ratios accurately reflect expectations is to compare forecasted and realised earnings.③ If earnings expectations are unbiased, the forecast and realised earnings would be aligned. For the M7, realised earnings actually tended to exceed analysts' predictions from 2011 to 2019; this is reflected in a slope steeper than one (Graph B2.B, red dots). This contrasts with the rest of the S&P 500, which shows a flatter slope and hence an optimistic bias in earnings expectations (Graph B2.C, purple dots).④ In recent years, however, the relationship between realised and forecasted earnings has changed for the M7: realised earnings during 2020–24 no longer exceeded expectations as much as before, and forecast errors also started to become more dispersed. This reflects both early signs of increased optimistic bias and higher uncertainty around M7 earnings (Graph B2.B, blue dots).

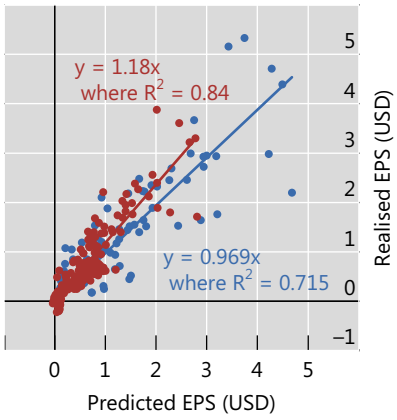
Profitability and the accuracy of earnings expectations

Graph B2

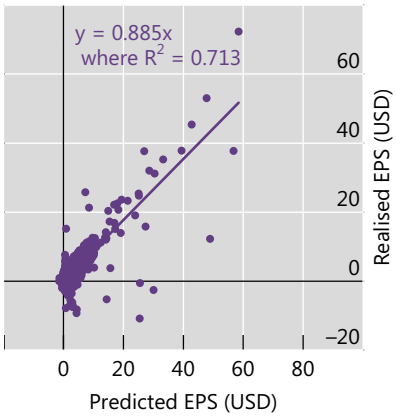
A. Tech firms' ROA declined during dotcom and rose in recent years



B. M7 earnings exceeded forecasts in the past, but recent years show more dispersion in outcomes[2]



C. Realised earnings of the rest of S&P 500 do not meet expectations[2]



Average ROA:[1] 1993–2001, 2015–23 | Magnificent 7: 2011–19, 2020–24 | Rest of S&P 500: 2011–24

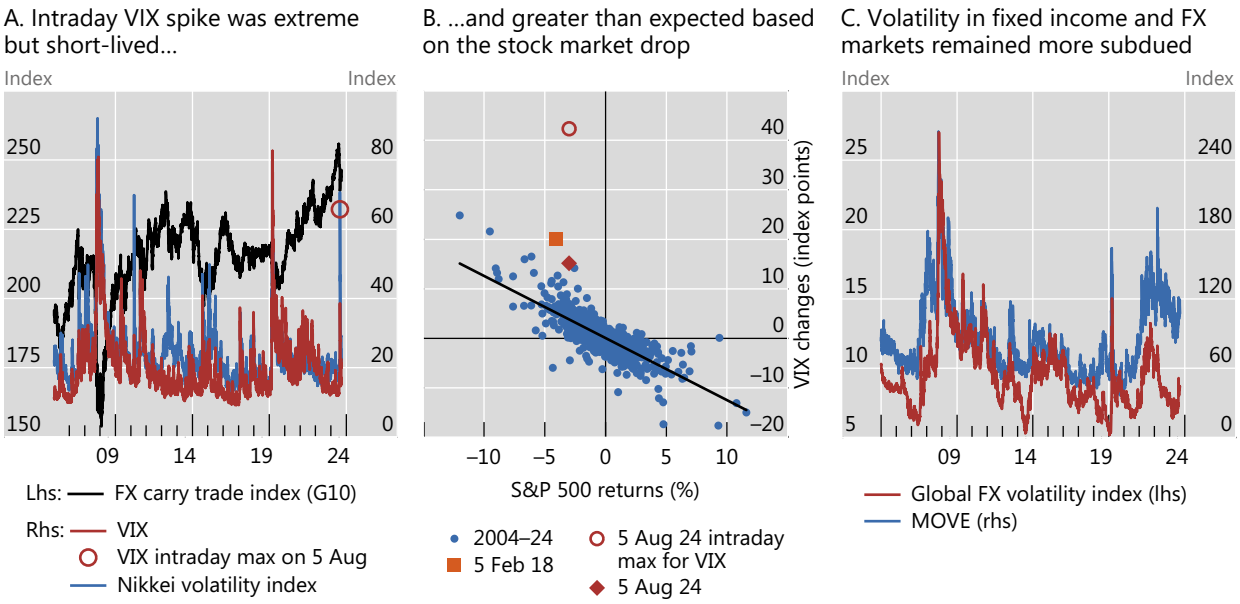
[1] Market capitalisation weighted average of selected firms. For 1993–2001, Adobe, Amazon, Apple, Cisco, Micro, Microsoft and Qualcomm; for 2015–23, Magnificent 7 (Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia and Tesla). [2] Predicted EPS is eight-quarters-ahead average forecasts of earnings per share (EPS) and realised EPS is the realised outcome.

Sources: LSEG Datastream; LSEG Workspace; authors' calculations.

To sum up, until 2019, the M7's realised earnings tended to exceed expectations. But with loftier valuations, the likelihood of disappointments has been increasing. A reassuring aspect of the current M7 boom, compared with the dotcom bubble, is that price increases and the build-up of optimistic expectations have been more gradual and more rooted in rising profitability. That said, the streak of past positive surprises has been fuelling increasingly optimistic expectations, which may have become harder and harder to meet.

① The views expressed are those of the authors and do not necessarily reflect the views of the BIS. ② P/E ratios mechanically rise when the growth of stock prices outpaces that of earnings, indicating optimism about future earnings growth. Higher P/E ratios may also reflect lower future discount rates, which this box does not address. See J Cochrane, "Discount rates", *Journal of Finance*, vol 66, no 4, August 2011, pp 1047–108. ③ The literature documented the tendency for earnings expectations to be overly optimistic. See R La Porta, "Expectations and the cross-section of stock returns", *Journal of Finance*, vol 51, no 5, December 1996, pp 1715–42. ④ P Bordalo, N Gennaioli, R La Porta and A Shleifer, "Diagnostic expectations and stock returns", *Journal of Finance*, vol 74, no 6, December 2019, pp 2839–74.

The outsize rise in equity market volatility pointed at amplifiers[1] Graph 4



[1] See technical annex for details.

Sources: Bloomberg; BIS.

The large equity market drops, the extreme volatility spike and the apparent international spillovers pointed to amplification factors.[4] The US news by itself could not be taken as an unequivocal sign of a deteriorating outlook, let alone a looming global recession, and did not warrant such a market reaction. Indeed, the jump in the VIX far exceeded what would have been expected based on the historical relationship with S&P 500 returns (Graph 4.B). The spike in the VIX appears to have been amplified by purchases of equity index options by traders exposed to volatility. For example, various structured products, including those funded in yen, were reportedly being hedged using equity options. And some specialised funds established short VIX positions while purchasing options on individual S&P 500 company stocks; these positions had to be reversed.[5] More broadly, the spike in volatility coincided with strong deleveraging pressures and margin calls in a number of other asset classes, especially speculative ones such as crypto.

The risk-off episode saw large international spillovers. In fact, Japanese financial indices had already begun turning south in early July (Graphs 3.A and 3.C), when the yen's appreciation trend had reversed amid rumours of Bank of Japan FX interventions. This had altered the incentives for many leveraged speculators. Likewise, the equity market volatility spikes in late July and August went hand in hand with signs of an unwinding of currency carry trades. This is confirmed by data on speculative yen short positions in currency futures. Various hedge fund strategies, which had become crowded and more exposed to carry trades for at least a year, faced pressures and contributed to cross-asset spillovers (Box C).

[4] For a detailed discussion of the market turbulence and carry trade unwind, see M Aquilina, M Lombardi, A Schrimpf and V Sushko, "The market turbulence and carry trade unwind of August 2024", *BIS Bulletin*, no 90, August 2024.

[5] See also K Todorov and G Vilkov, "What could explain the recent drop in VIX?", *BIS Quarterly Review*, March 2024, pp 6–7. Other possible drivers include the aforementioned spillovers of the equity market volatility in Japan as well as a momentum reversal.

Box C

Hedge fund exposure to the carry trade

*Frank Packer, Andreas Schrimpf, Vladyslav Sushko, Nicholas Zarra*①

The unwinding of carry trades on 5 August coincided with a widespread sell-off across global asset classes, particularly those with more concentrated hedge fund positions. Carry trades are leveraged cross-currency positions exploiting interest rate differentials and low volatility. Since many funds actively trade across asset classes, gaining an understanding of their exposure to the carry trade can provide some evidence about spillover mechanisms. We find that the hedge fund sector had become increasingly exposed to the markets that were at the epicentre of the 5 August turbulence. Though our data do not cover early August and thus cannot be used to directly assess the episode, they allow us to shed light on how vulnerabilities were building up.

We focus on the sensitivity of the returns of various hedge fund strategies to the returns on currency carry trades. This is a useful, albeit indirect, indicator of the portfolio strategy of the fund. The higher the sensitivity, the higher the likelihood that the fund is actually engaged in carry trades. And even if the fund is not engaged in a carry trade itself but some related strategy that shares similar risk characteristics, a higher sensitivity implies a higher exposure to losses should carry trade returns suddenly evaporate.

We estimate the shifting sensitivities of various hedge fund strategies to the performance of a long-short carry trade portfolio. We proxy the latter with returns to the S&P Risk Premia FX Carry G10 Index. For the performance of different hedge fund strategies, we draw on the Credit Suisse Hedge Fund Indices. Derived from a comprehensive sample of over 9,000 distinct funds, these indices report the monthly performance of hedge funds grouped by various trading strategies and are calculated as the asset-weighted averages of the returns of constituent funds.② The sensitivities (betas) of hedge fund returns to carry trade returns are obtained using a rolling regression on monthly data and controlling for the overall "market beta". Our findings are as follows.

First, ahead of the August turbulence, hedge fund returns on the whole had become more sensitive to the proxies for returns on currency carry trades. Following the pandemic and the rapid yen depreciation that started in early 2022, the sensitivity of the aggregate index of hedge fund returns to carry trade returns had turned positive and continued to increase through this July (Graph C1.A, red line). This is consistent with a pre-turbulence build-up in hedge fund exposure to the risks of a reversal in carry trade returns.

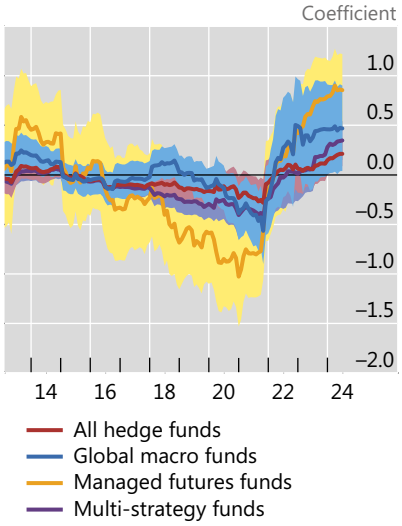
Second, returns to hedge fund strategies most prone to engage in carry trades exhibited the greatest increase in sensitivity to carry trade returns. The returns of global macro and managed futures funds, both traditionally recognised as key players in carry trades, exhibited the most significant shifts in sensitivity from 2022 onwards (Graph C1.A, blue and yellow lines). This supports the notion that the increased sensitivity estimated by our methodology indeed reflected an increase in carry trades in the hedge fund community.

Third, at the same time, hedge funds with greater potential for spillovers across instruments outside of currency markets also became increasingly sensitive to the carry trade. The sensitivity to carry returns of managed futures funds, which often pursue momentum-based trading strategies and are active across a variety of derivatives markets such as equity options and VIX futures, exceeded that of global macro funds from 2023.

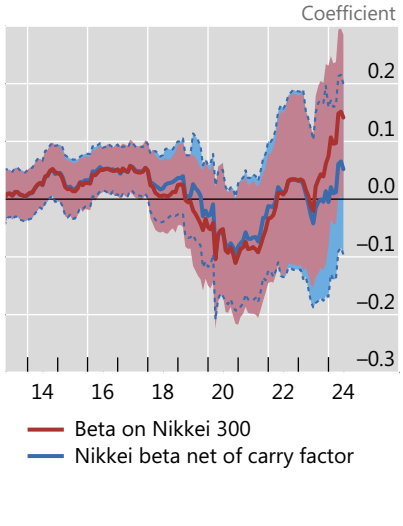
Fourth, hedge funds employing some of the most diversified strategies, and hence in theory less subject to the vagaries of any single strategy, increased their sensitivity to the very markets that were subsequently disrupted. We find that so-called multi-strategy funds did not just become significantly more exposed to the risks associated with FX carry trades (Graph C1.A, purple line), they also appear to have significantly increased their exposure to Japanese equities. Accordingly, the sensitivity of multi-strategy funds' returns to the Nikkei 300 index returns surged over the past year (Graph C1.B, red line), even when controlling for carry trade returns (Graph C1.B, blue line). Moreover, one popular strategy pursued by multi-strategy funds over the period profited from the discrepancy in option prices on an equity index compared with its constituents. Some specialised funds reportedly found it profitable to establish VIX short positions while purchasing options on individual S&P 500 company stocks.③ Our results thus suggest that the shadow of the carry trade risk factor was cast on seemingly distinct long-short equity volatility strategies.

Hedge funds' sensitivity to carry trade returns and their "crowdedness" Graph C1

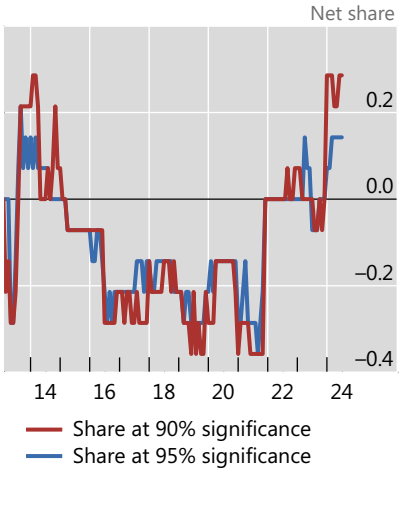
A. Hedge fund strategies exhibited a rising exposure to the carry trade[1]



B. Multi-strategy hedge funds have become more exposed to the Nikkei[1]



C. Hedge fund crowdedness in FX carry trades has risen[2]



[1] Time varying betas, 36-month rolling window. All strategies controlling for market beta when calculating sensitivity to the carry trade and Nikkei index. See Credit Suisse for documentation on the calculation of hedge fund indices.S&P Risk Premia Carry G10 Index used for return to the carry trade. Shaded areas show 90% confidence intervals. [2] Number of hedge fund strategies with returns exhibiting statistically significant positive coefficients on the carry factor minus the number with statistically significant negative coefficients. Estimates of crowdedness broadly follow the methodology of M Pojarliev and R Levich, "Detecting crowded trades in currency funds", *Financial Analysts Journal*, vol 67, no 1, 2011, pp 26–39.

Sources: Bloomberg; Fama/French Data Library; authors' calculations.

Fifth, the finding that the hedge fund sector may have been crowding into a common exposure to the carry trade is supported by other measures as well. In particular, in the lead-up to the recent volatility episode, the number of distinct hedge fund strategy classes positively exposed to the carry trade had exceeded the number with negative exposure. Specifically, the (net) number of strategies with statistically significant positive carry trade exposure turned positive and increased as a share of all strategy classes (Graph C1.C).

Crowdedness, combined with high leverage, set the stage for the amplification of stress and cross-asset spillovers. According to the SEC Private Fund Statistics, multi-strategy hedge funds entered the episode with high leverage. Their leverage ratio was 4:1 by traditional measures and 14:1 when accounting for synthetic leverage via derivatives.④ A jump in common risk management metrics at the fund level, notably value at risk, likely compelled these funds to reduce exposure, not just in a single affected asset class but across a broader range of assets. And when multiple strategies are effectively heavily exposed to the same risk factor, such as that underlying carry trade returns, such crowdedness can amplify the tail risk as funds scramble to exit similar positions at the same time.⑤ During the August event, no major fund failures were reported, as hedge funds appeared to have buffers to meet margin calls and had other positions that were "in the money."

① The views expressed are those of the authors and do not necessarily reflect the views of the BIS. ② The index measures the performance of a long-short carry strategy consisting of G10 currencies (USD, EUR, GBP, JPY, AUD, NZD, CAD, CHF, NOK, SEK). The strategy maintains long exposure in the three currencies with the highest carry rankings and short exposure in those with the lowest carry rankings, while keeping the FX risk unhedged. ③ See, for example, J Lee, "A hedge-fund volatility trade risks getting crushed by the crowd", *Bloomberg*, 24 May 2024. ④ Synthetic leverage refers to the ratio of the total exposure in a derivative contract to the costs of putting on the position. A common measure is the ratio of gross notional value to the initial margin. ⑤ See, for example, G Brown, P Howard and C Lundblad, "Crowded trades and tail risk", *Review of Financial Studies*, vol 35, no 7, July 2022, pp 3231–71.

All in all, the August turbulence proved short-lived. Possibly, less-constrained and cash-rich investors took advantage of the sell-off, while larger and more slow-moving positions funded in the yen, proxied with BIS statistics (Box D), may have been only partially shed. In less than a week, prices recovered lost ground and investors were once again eyeing a soft landing. And, despite the sizeable shock to leveraged currency positions, the impact on FX market volatility was not on par with any past episodes of market turmoil (Graph 4.C).

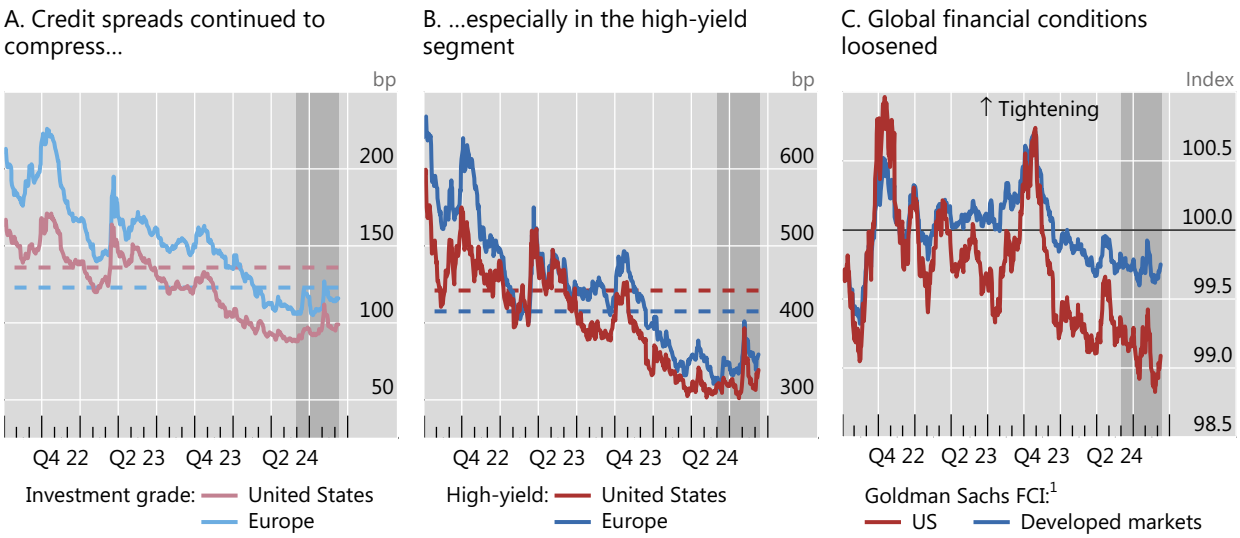
Yet another volatility flare-up, albeit on a much smaller scale, occurred at the beginning of September. Again, the repricing was triggered by disappointing macro releases, painting a gloomier outlook for the US economy. This underscores just how hypersensitive markets have become to growth-related news surprises and the associated revisions to expectations of the policy stance ahead.

In contrast to equity markets, volatility in credit markets remained subdued and conditions generally benign. Credit spreads on both investment grade and high-yield corporate bonds did widen somewhat in both the United States and Europe, but from quite compressed levels, and remained tight by historical standards (Graphs 5.A and 5.B). At the same time, broad measures of financial conditions remained in easy territory in advanced economies (Graph 5.C).

Relatively benign borrowing conditions and tight credit spreads encouraged firms to tap primary bond markets. Not least, issuance in the junk segment rose to pre-pandemic levels (Graph 6.A). In parallel, the tightening cycle of bank lending standards appeared to be nearing an end (Graph 6.B). Corporate default rates continued to decline, underpinning a broader easing of borrowing conditions (Graph 6.C). That said, in some segments of the US consumer credit market, such as credit cards and auto loans, delinquency rates rose further, raising questions about late cycle risks.

Credit markets pulled ahead

Graph 5

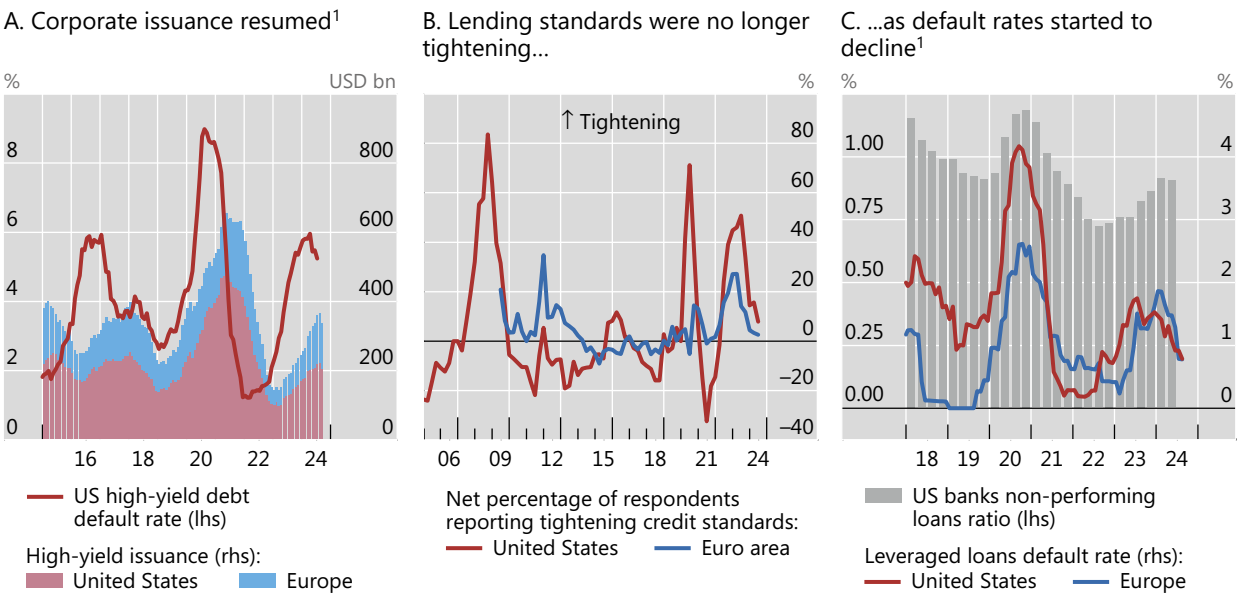


The shaded area indicates 1 June 2024–6 September 2024 (period under review). The horizontal dotted lines indicate 2005–current medians.

[1] A value of 100 indicates average conditions. A higher (lower) value indicates tighter (looser) conditions.

Sources: Goldman Sachs Global Investment Research; ICE Data Indices; BIS.

Corporate issuance resumed and bank lending no longer tightened Graph 6



[1] See technical annex for details.

Sources: Board of Governors of the Federal Reserve System; BankRegData; Dealogic; LSEG Datastream; Moody's; PitchBook | LCD; BIS.

EMEs withstand spillovers but face macro headwinds

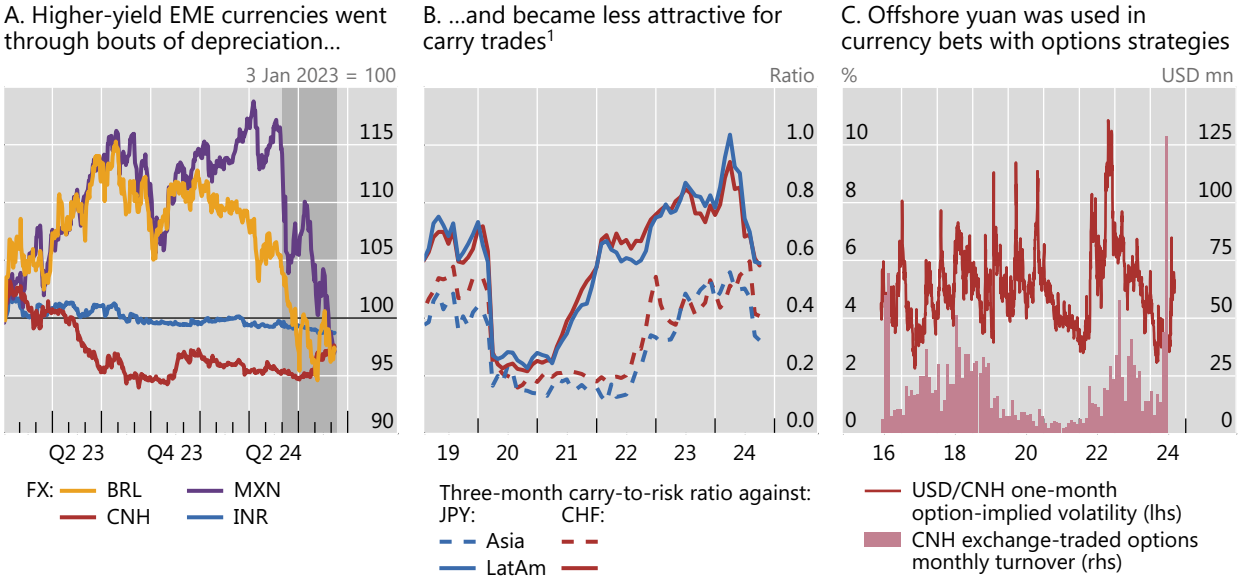
EME financial markets were also tested by the bouts of volatility and carry trade unwinding. A number of higher-yielding EME currencies depreciated, especially in Latin America, and the contagion reverberated through Asian currency and equity markets. Overall, EME financial markets managed to withstand the turbulence. At the same time, a weakening growth outlook and political uncertainty in some countries also gave rise to headwinds, prompting some central banks to ease their policy stance. This was also facilitated by an easier policy stance expected in major advanced economies. Chinese financial markets remained depressed, continuing to reflect domestic macroeconomic and financial woes.

Investment currencies popular with carry traders, such as the Mexican peso and Brazilian real, underwent bouts of depreciation amid de-risking episodes in late July and early August (Graph 7.A). The peso also fell steeply in June amid political uncertainties (see below). On a risk-adjusted basis, with a narrowing interest rate differential and a rise in volatility, Latin American currencies largely lost their appeal to currency speculators, as can be gleaned by falling carry-to-risk ratios (Graph 7.B).

In contrast with Latin American currencies, some emerging market Asian currencies appreciated noticeably during the August event. Most notably, the appreciation of the offshore yuan (CNH) was similar to that exhibited by the more traditional carry-trade funding currencies (eg the yen and the Swiss franc). For speculators, CNH had become a popular currency to short vis-à-vis higher-yielding regional currencies such as the Indonesia rupia and the New Taiwan dollar. As many Asian EME currencies have limited convertibility and are traded using non-deliverable instruments, the associated speculative bets mainly involved instruments such as currency options: CNH options-trading volumes ballooned in the run-up to the carry unwind (Graph 7.C).

EME currency markets were hit by bouts of carry trade unwinding

Graph 7



The shaded area indicates 1 June 2024–6 September 2024 (period under review).

[1] See technical annex for details.

Sources: Bloomberg; JPMorgan Chase; LSEG Datastream; Macrobond; BIS.

EME equity markets were also tested by volatility spillovers originating from advanced economies. Asian markets were particularly exposed to the Japanese equities-led contagion on 5 August. The MSCI AC Asia Pacific Index saw its worst drop since 2023 (Graph 8.A). Stock indices of tech-heavy Asian economies were most affected, with the Taiex of Chinese Taipei seeing the biggest drop in over 30 years and Korean Kospi experiencing the worst decline since the 2008 Great Financial Crisis.

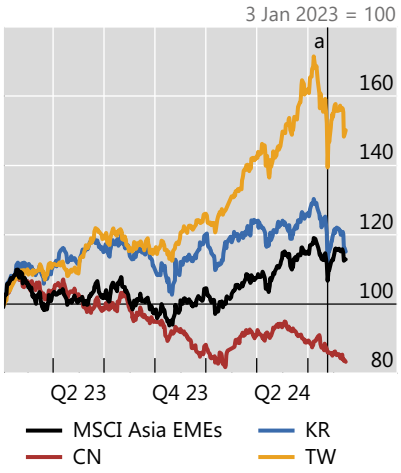
On top of the spillovers of the early August turbulence, EME financial market developments reflected ongoing macroeconomic challenges. Key sources of tensions were the mounting risks of a global slowdown. Slowing domestic growth also weighed on financial markets in some economies, such as China and Mexico. And in some countries, macroeconomic challenges were compounded by domestic political woes. For instance, the Mexican peso depreciated in June, following the surprisingly large victory margin of the ruling party, and further in August, with the scale of the announced potential constitutional and legal reforms. The Thai baht, in turn, dropped amid fiscal woes ignited by a change in government.

An easier expected policy stance in major advanced economies facilitated a turn towards policy easing across EMEs. Falling US government bond yields relative to local currency yields, as evidenced by the rise in five-year yield spreads (Graph 8.B), led to receding risks of depreciation and capital outflows. In countries where disinflation had progressed, central banks had already entered an easing cycle or were eyeing it. As a notable exception, investors increasingly expected the Central Bank of Brazil to hike rates, amid robust output and a challenging "last mile" in the fight against inflation.

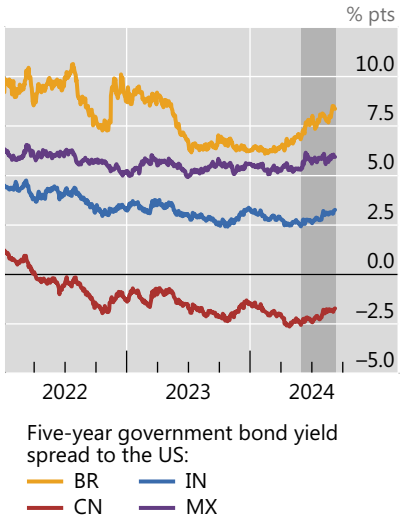
EMEs faced headwinds from the equity markets and idiosyncratic macro risk

Graph 8

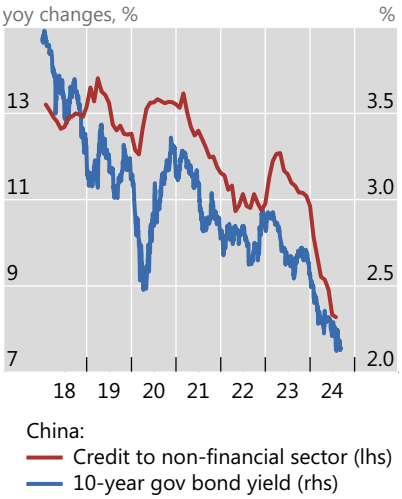
A. The turbulence reverberated through some Asian equity markets



B. EME bonds turned more attractive as US yields fell



C. Bond yields in China continued to fall



The shaded area indicates 1 June 2024–6 September 2024 (period under review).

[a] Turbulence in the Japanese equity market (5 August 2024).

Sources: Bloomberg; LSEG Datastream; Macrobond; BIS.

Investors were left with some overall question marks regarding the economic situation of China. Mainland Chinese markets did not move in tune with other EMEs and continued to face domestic macroeconomic and financial challenges. Government bond yields in China reached record lows and remained under downward pressure due to a slowing economy, falling prices and the associated policy easing. Furthermore, private savings had been increasingly channelled into Chinese government bonds, amid the shrinking set of attractive investment alternatives with faltering credit growth and a lacklustre stock market. Against this backdrop, Chinese authorities reportedly intervened in the bond market to try to put a floor under falling yields, as the latter approached 2% in August (Graph 8.C).

Box D

Sizing up carry trades in BIS statistics

*Patrick McGuire and Goetz von Peter*①

Tracking the size of carry trades and the entities involved is notoriously difficult. While BIS statistics record total amounts of yen borrowed from banks or via foreign exchange (FX) derivatives, they do not reveal specific uses – the carry trade being just one of many. This box explains how these statistics can provide some rough indicators of carry trade activity. The figures should be interpreted with care given data gaps and the assumptions used.

A carry trade is a leveraged cross-currency position designed to take advantage of interest rate differentials and low volatility. The strategy involves borrowing funds at a low interest rate in one currency (the funding currency) and buying a higher-yielding asset in another (the target currency). In recent years, low interest rates for the Japanese yen relative to other currencies have made the yen a funding currency of choice (Box C). The use of leverage makes these positions sensitive to changes in exchange rates, interest rates and volatility.

There are several ways to implement a carry trade, each with different implications for what can be seen in international statistics. The textbook case involves borrowing the funding currency, selling it spot and investing the proceeds in an asset denominated in the target currency. This is recorded as debt (eg bank loans) owed in the funding currency. The more common approach used by hedge funds and other speculators relies on derivatives – eg FX forwards, swaps and options – to establish an open forward payment obligation in the funding currency. An outright forward position to deliver yen at maturity is a bet on yen depreciation. Borrowing yen in an FX swap to sell yen spot is an attractive alternative, given the depth of FX swap markets. Since the use of derivatives requires no on-balance sheet borrowing of the funding currency, it is difficult to trace the trade in the statistics.

Despite these limitations, the BIS international banking statistics (IBS) and over-the-counter (OTC) derivatives statistics shed some indirect light on carry trade activity. This is because they provide a currency breakdown of banks' on-balance sheet positions and of outstanding amounts in FX derivatives markets, respectively. Consider on- and off-balance sheet yen borrowing in turn.

The IBS show a sustained rise in on-balance sheet yen borrowing over the past few years, an increase that may – but need not – be linked to carry trades. Banks' yen-denominated claims – which include loans, holdings of debt securities and derivatives with a positive market value – on non-banks resident outside of Japan reached $880 billion, or ¥133 trillion, in Q1 2024 (up from ¥110 trillion in Q4 2021). The bulk of these claims are on borrowers in the Cayman Islands, mainly non-bank financial institutions (NBFIs). Special purpose vehicles located there issue debt securities purchased mainly by banks located in Japan. Such financing structures, however, have been in place for decades (Dixon (2001))② and have shown modest growth of late, so that they may not be related to speculative carry trade positions. Banks' yen-denominated *loans* to non-banks outside of Japan have grown noticeably, in particular since mid-2021. Outstanding amounts rose from $228 billion (¥25 trillion) in Q2 2021 to $271 billion (¥41 trillion) in the most recent data for Q1 2024. (The depreciation of the yen between then and Q2 2024 would put that value at roughly $250 billion.) These loans were mainly to borrowers located in the United Kingdom, the Cayman Islands and the United States. Without more detailed data, however, it remains unclear whether this relates to carry trades.

What about information gleaned from the BIS derivatives statistics, the instrument more likely to be involved in carry trades? These statistics show that the notional value of outstanding FX swaps, forwards and currency swaps with the yen on one side has grown to $14.2 trillion (¥1,994 trillion) by end-2023, up 27% in yen terms since end-2021 (Graph D1.A).③ FX swaps and outright forwards drove this growth (red shaded area). The bulk of these are used for hedging and liquidity management, but they can also be used for speculative purposes (Borio et al (2017, 2022)).④ While nearly half of the outstanding FX swaps and outright forwards are with "non-dealer financial institutions" (red line), which includes non-reporting banks and NBFIs, the share specifically related to speculative activity is likely to be much lower. For example, using counterparty turnover data, Aquilina et al (2024)⑤ estimate hedge fund FX forward positions to have been about $160 billion.

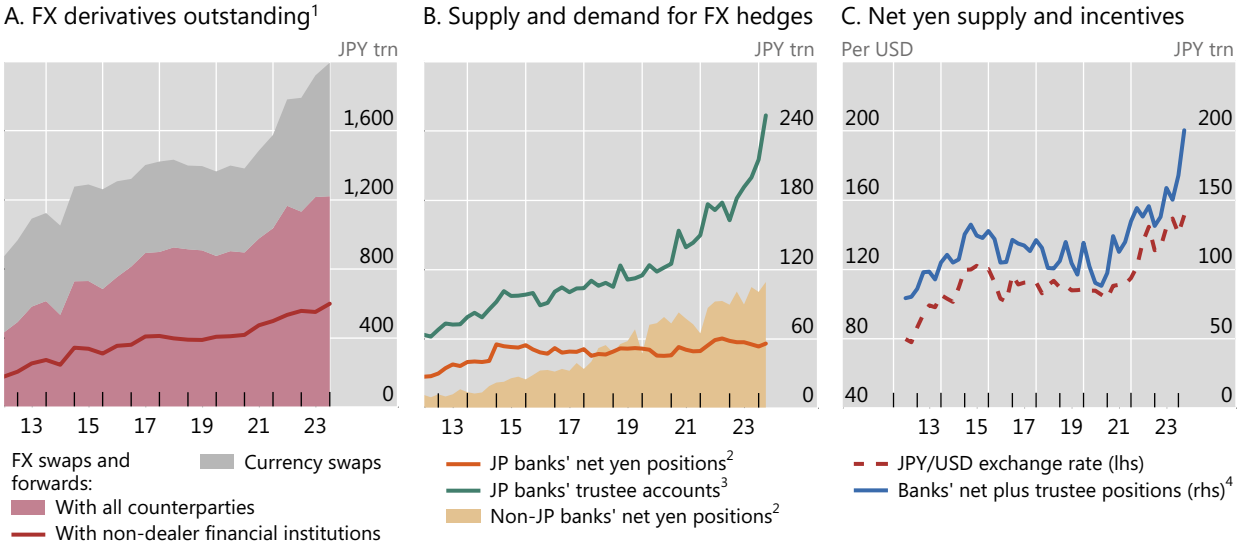
An alternative approach to assessing carry trades via FX derivatives is based on the IBS, which provide an

indirect and incomplete view of positioning in the markets for FX derivatives. These statistics track banks' net on-balance sheet positions in major currencies, which in turn reveal their net positions in FX derivatives under the assumption that they do not run large open currency positions. This is a reasonable assumption because of supervisory guidance (BCBS (1980, 2020)).⑥ If so, any open on-balance sheet position must be offset by a corresponding off-balance sheet position. For example, a bank with a yen funding base can exchange yen for dollars via an FX swap to purchase a dollar asset; the offsetting on- and off-balance sheet positions shield the bank from exchange rate movements for the duration of the FX swap since the exchange rate at which it is unwound is set in advance. Currency mismatches in banks' on-balance sheet positions are thus indicative of their (unobserved) net positions in FX derivatives.

To a large extent, banks from different currency areas offset each other's FX derivatives positions. For example, Japanese banks are natural suppliers of yen via FX derivatives (Graph D1.B, orange line): they have a domestic yen deposit base but hold portfolios of foreign currency assets and use FX swaps to hedge the currency risk. Non-Japanese banks in turn absorb much of this supply by providing dollars and other currencies in exchange for yen via FX derivatives. They do so to hedge their own yen-denominated asset portfolios and, since the Great Financial Crisis, to take advantage of the cross-currency basis trade (Kloks et al (2023)).⑦,⑧ Their net yen assets, and hence their estimated net yen borrowing via FX derivatives, has grown threefold since 2017, surpassing the net supply of yen from Japanese banks (shaded area minus orange line).

Off-balance sheet positions in Japanese yen

Graph D1



[1] Outstanding FX swaps, outright forwards and currency swaps with the yen on one side (notional value), corrected for inter-dealer double-counting. Non-dealer financial institutions include non-reporting banks and non-bank financial institutions. [2] See Kloks et al (2023) for derivation. [3] Foreign currency holdings in trustee accounts managed by Japanese banks on behalf of third parties, assuming that 80% of the total is hedged for currency risk. [4] The difference between the estimated supply of yen (green line plus orange line in Graph D1.B) and the observed bank demand for yen (tan shaded area).

Sources: Bank of Japan; Bloomberg; JPMorgan Chase; LSEG Datastream; BIS international banking statistics; BIS OTC derivatives statistics; BIS Triennial Central Bank Survey; authors' calculations.

Non-banks also use FX derivatives, but here the picture provided by the IBS is far less complete. These statistics capture only the assets in "trustee accounts" managed by Japanese banks on behalf of third-party investors (ie not on Japanese banks' balance sheets); they do not capture those of other non-banks around the world. Even so, assets in these trustee accounts, which totalled $2.7 trillion at end-Q1 2024, imply a supply of yen in FX derivatives when they are hedged for currency risk. More than three quarters of the total amount is denominated in currencies other than the yen, and the bulk is likely to be in debt instruments. Assuming 80% of these holdings are hedged for currency risk, an estimate of the supply of yen via FX derivatives reached $1.7 trillion (¥254 trillion) at end-Q1 2024 (Graph D1.B, green line). If only 60% were hedged, the amount would fall

to near $1.3 trillion (¥190 trillion). Other institutional investors in Japan that hold foreign currency asset portfolios on a (partially) hedged basis would add to the supply of yen in FX derivatives, as would corporates outside of Japan that issue yen-denominated bonds on a hedged basis. Unfortunately, these positions are not observable in BIS statistics.

Combining the observable elements – the trustee positions and banks' own use of FX derivatives – yields a time-varying, albeit incomplete, measure of the net supply of yen available for other players in the FX derivatives market. The blue line in Graph D1.C is the difference between the estimated supply of yen (green line plus orange line in Graph D1.B) and the observed bank demand for yen (tan shaded area). Market clearing requires that other, unobserved non-bank market participants absorb this supply. These could include institutional investors outside Japan that hold yen-denominated assets on a hedged basis as well as speculative investors seeking to engage in carry trades by borrowing yen. If the latter transaction involves a subsequent spot sale of yen, to bet on yen depreciation, it can put downward pressure on the currency.

The co-movement between the measure of net yen supply and the USD-JPY exchange rate suggests that speculative investors may indeed have been involved (Graph D1.C). The measure rose by ¥66 trillion between end-2021 and Q1 2024, or $435 billion at Q1 2024 exchange rates, coinciding with a significant depreciation of the yen (red-dashed line) and rising incentives for engaging in carry trades (see main text).⑨

The IBS alone reveal little more than an indirect picture of the global dealer banks that sit between the various types of non-banks with positions in FX derivatives. Better data on the users of FX derivatives and their positioning in these markets are needed for a more complete picture. To this end, the BIS is working with the Committee on the Global Financial System to enhance the OTC derivatives statistics. Such data would complement other market indicators and flow data (see Box C) in the monitoring of carry trades.

① The views expressed are those of the authors and do not necessarily reflect the views of the BIS. ② See L Dixon, "Financial flows via offshore financial centres as part of the international financial system", Bank of England, *Financial Stability Review*, no 10, June 2001, pp 105–116. ③ The figures expressed in Graph D1.A are reported semiannually in US dollars and have been converted to yen using end-of-period exchange rates. ④ See C Borio, R McCauley and P McGuire, "FX swaps and forwards: missing global debt?", *BIS Quarterly Review*, September 2017, pp 37–54; and C Borio, R McCauley and P McGuire, "Dollar debt in FX swaps and forwards: huge, missing and growing", *BIS Quarterly Reivew*, December 2022, pp 67–73. ⑤ See M Aquilina, M Lombardi, A Schrimpf and V Sushko, "The market turbulence and carry trade unwind of August 2024", *BIS Bulletin,* no 90, August 2024. ⑥ See Basel Committee on Banking Supervision (BCBS), *Supervision of banks' foreign exchange positions*, August 1980; BCBS, "Definitions and application of market risk (MAR 11)", *Basel Framework,* March 2020; and BCBS, "Simplified standardised approach" (MAR 40), *Basel Framework,* July 2024. ⑦ See P Kloks, P McGuire, A Ranaldo and V Sushko, "Bank positions in FX swaps: insights from CLS", *BIS Quarterly Review*, September 2023, pp 17–31. ⑧ This trade is an FX swap of US dollars for yen, typically with Japanese investors that hold dollar portfolios. Non-Japanese banks may then park the yen proceeds from the FX swap in safe yen assets (eg reserves at the Bank of Japan or Japanese government bonds), leaving them with a hedged position (Kloks et al (2023)). ⑨ Allowing the assumed hedge ratio of 80% for the trustee holdings (Graph D1.B, green line) to fall by a full 10 percentage points between end-2021 and Q1 2024 does not materially change this relationship.

Technical annex

Graph 4.A: FX carry trade index (G10) = Bloomberg Cumulative FX Carry Trade Index for Managed G10 Currencies. Nikkei volatility index = The Nikkei Stock Average Volatility Index (Nikkei 225 VI), which is calculated by using prices of Nikkei 225 futures and Nikkei 225 options on the Osaka Securities Exchange.

Graph 4.B: 5 February 2018 is a known episode when the jump in the VIX was amplified by the covering of leveraged and inverse volatility trades.

Graph 4.C: Global FX volatility index = JPMorgan Global FX Volatility Index.

Graph 6.A: US high-yield debt default rate based on Moody's 12-month rolling US speculative grade default rates. High-yield issuance based on a 12-month rolling sum.

Graph 6.C: Twelve-month rolling leveraged loan default rates based, respectively, on Morningstar LSTA US Leveraged Loan Index (LLI) and Morningstar European Leveraged Loan Index (ELLI).

Graph 7.B: For JPY, Asia = CNY, HKD, IDR, INR, MYR, PHP, SGD and THB; while LatAm = ARS, BRL and MXN. For CHF, Asia = HKD, IDR, SGD and THB; while LatAm = BRL and MXN.