V. Foreign exchange markets

Highlights

Foreign exchange markets experienced a substantial increase in volatility in August 2007 as a consequence of significant dislocations in other financial markets. This marked an important change in the factors driving market developments. Prior to August, historically low volatility and large interest rate differentials had underpinned cross-border capital flows that put downward pressure on funding currencies, such as the yen and the Swiss franc, and supported high-yielding currencies, such as the Australian and New Zealand dollars. Subsequently, as a result of the heightened volatility, leveraged cross-currency carry trades were unwound, which led to some reversal of the previous exchange rate trends for the currencies involved.

In addition, there was a substantial reassessment of expected monetary policy actions as the dimensions of the problems in financial markets became more apparent. In this environment, factors such as expected growth differentials, which have an important bearing on the future path of monetary policy, became more of a focal point for market sentiment than the prevailing level of interest rates. Heightened expectations of a recession and worsening credit market conditions in the United States intensified the depreciating trend in the US dollar in the early part of 2008, with the dollar reaching a 12-year low against the yen as well as all-time lows against the euro and the Swiss franc. Deteriorating growth prospects for the United Kingdom towards the end of 2007 also led to a significant depreciation of sterling. In contrast, a number of other currencies were buoyed by expectations of continued strong economic growth. For some emerging market economies, such as China and Singapore, appreciation pressures stemmed from strong domestic demand and limited direct exposure to the turmoil in global financial markets. In other cases, such as Australia and Brazil, currency strength was underpinned by robust commodity exports and improvements in the terms of trade.

Notwithstanding some significant exchange rate movements, foreign exchange spot markets generally continued to function smoothly throughout the period of higher volatility. At the same time, there were signs of strain in some foreign exchange swap and cross-currency swap markets, which are more closely related to credit markets and cross-border funding. This suggests that while certain longer-term developments, such as the broadening of the investor base and improved risk management, are likely to have made foreign exchange markets more robust, the close relationship between certain segments of foreign exchange markets and other financial markets can leave the former susceptible to shocks emanating from the latter.

Developments in foreign exchange markets

The dislocations in credit and money markets that unfolded over the course of July and August 2007 led to significant changes in the exchange rate trends that had prevailed in much of 2006 and in the first half of 2007. These changes were accompanied by a sharp pickup in volatility in many currency pairs.

The US dollar and sterling depreciated after mid-2007 ...

After June 2007, the steady depreciation of the US dollar quickened. During 2006 and the first six months of 2007, the US dollar had depreciated against the euro at an annualised rate of 9% and appreciated marginally against the yen (Graph V.1). Between the beginning of July 2007 and the end of April 2008, the annualised rate of depreciation increased to around 20% against both currencies. In nominal effective terms, the rate of depreciation more than doubled (Graph V.2). Similarly, sterling depreciated by almost 15% in effective terms between July 2007 and April 2008. Other currencies, such as the Russian rouble, depreciated steadily in nominal effective terms over this period.

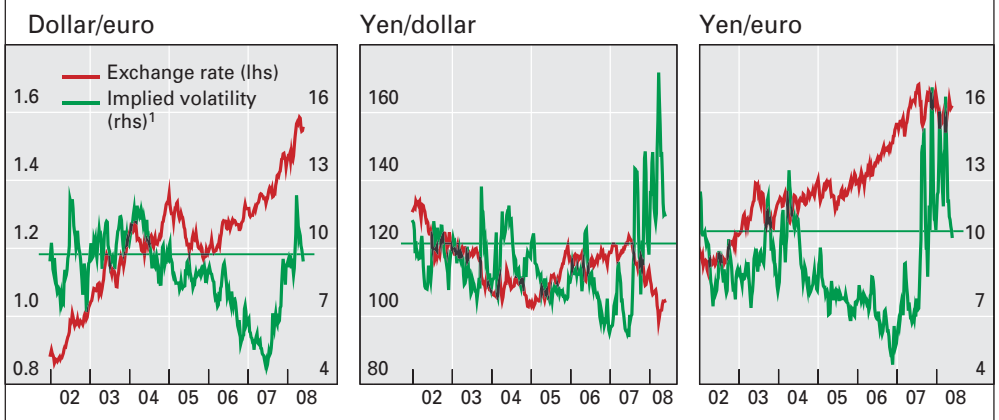
... while the euro, yen and Swiss franc appreciated

In contrast, a number of other currencies appreciated in effective terms in the second half of 2007 and into 2008. Most notably, the annualised rate of appreciation of the euro more than doubled after August 2007 (Graph V.2). Mid-2007 also marked a turning point for the yen and the Swiss franc. Having depreciated in 2006 and the first half of 2007, these currencies appreciated over the 10 months to April 2008 by 15% and 9%, respectively. Several Asian currencies, including the renminbi, Singapore dollar, New Taiwan dollar and Thai baht, also rose markedly in the first four months of 2008.

Other currencies fluctuated considerably

Some currencies experienced sizeable fluctuations between mid-2007 and April 2008. A few, such as the Australian dollar and the Brazilian real, depreciated sharply in mid-August 2007 in the wake of the problems in international money markets, only to recover lost ground over the following couple of months (Graph V.2). Others, such as the New Zealand dollar, made only modest gains following sharp falls in August. Finally, some currencies that had proved to be relatively resilient in August, including the Canadian dollar, Indian rupee, Korean won and South African rand, depreciated more substantially between November 2007 and April 2008.

Exchange rates and implied volatilities of the dollar, euro and yen

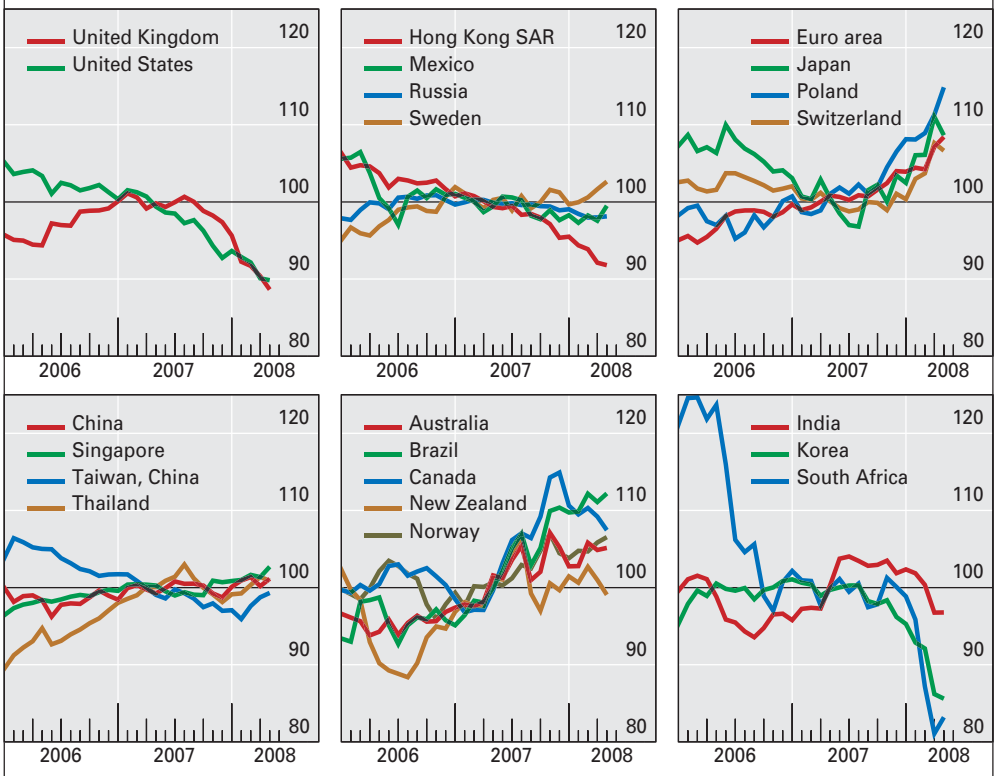


[1] One-month, in per cent. The horizontal line refers to the January 1999–April 2008 average.

Sources: Bloomberg; national data. Graph V.1

Nominal effective exchange rates[1]

Monthly averages, January–June 2007 = 100



[1] Based on the BIS "broad" basket covering 52 economies.

Source: BIS. Graph V.2

Some currencies departed significantly from their historical averages

From a longer-term perspective, many currencies are currently at levels that are significantly different from their long-term averages in real effective terms (Graph V.3). In April 2008, the euro and New Zealand dollar were over 10% higher than their long-term averages, while the yen, Hong Kong dollar, Swedish krona and US dollar were more than 10% below theirs. In general, more structural estimates from the IMF of where real exchange rates stand relative to medium-term equilibrium levels provide a broadly similar picture. Notable exceptions are currencies such as the Australian and Canadian dollars, which are likely to be less overvalued than suggested by Graph V.3 due to the positive effects of strong terms of trade on equilibrium exchange rates, and the US dollar, whose depreciation is qualitatively consistent with the large and persistent US current account deficit.

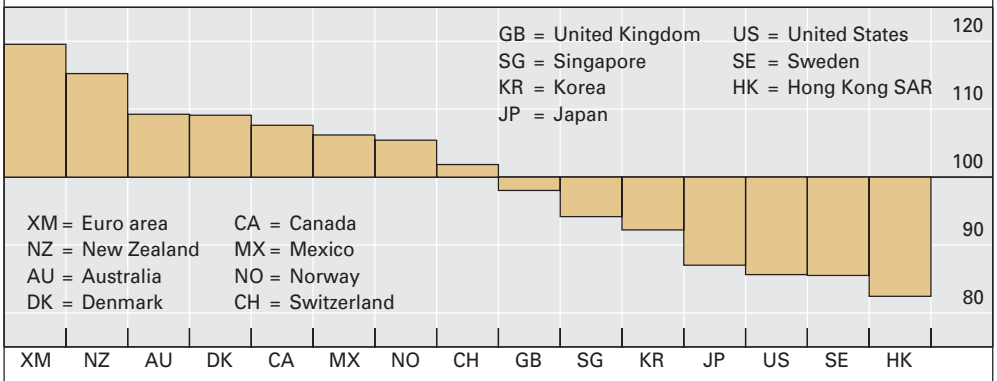
Conditions in foreign exchange markets

Volatility increased sharply ...

Volatility in foreign exchange markets started to pick up in July 2007, having trended down to historical lows in the first half of the year. Implied volatility rose sharply on three occasions – in mid-August and late November 2007 and in mid-March 2008 – and also experienced a more muted increase at the end of January 2008 (Graph V.4). These peaks coincided with, but were less pronounced than, the peaks in volatility in other financial markets. In contrast to previous experience, the implied volatility of major advanced industrial

Real effective exchange rates in a long-term perspective[1]

April 2008; January 1973–April 2008 = 100



[1] In terms of relative consumer prices. Based on the BIS "narrow" basket covering 27 economies.

Source: BIS. Graph V.3

country exchange rates consistently exceeded that of emerging market exchange rates from the beginning of August 2007 onwards.

... in some currency pairs more than others

Implied volatility peaked in March 2008 for a number of currency pairs. For the US dollar/euro exchange rate, implied volatility reached a level comparable to the episode of heightened foreign exchange market volatility in September 2001, while volatilities for the dollar/yen and euro/yen were higher than at any point since 1999 (Graph V.1). Other currencies that experienced particularly sharp increases in implied volatility against the US dollar include the Brazilian real, the South African rand and the Australian, Canadian and New Zealand dollars. The peaks for these last three currency pairs are comparable to those seen in October 1998, during the period of volatility associated with the collapse of LTCM and the Russian default.

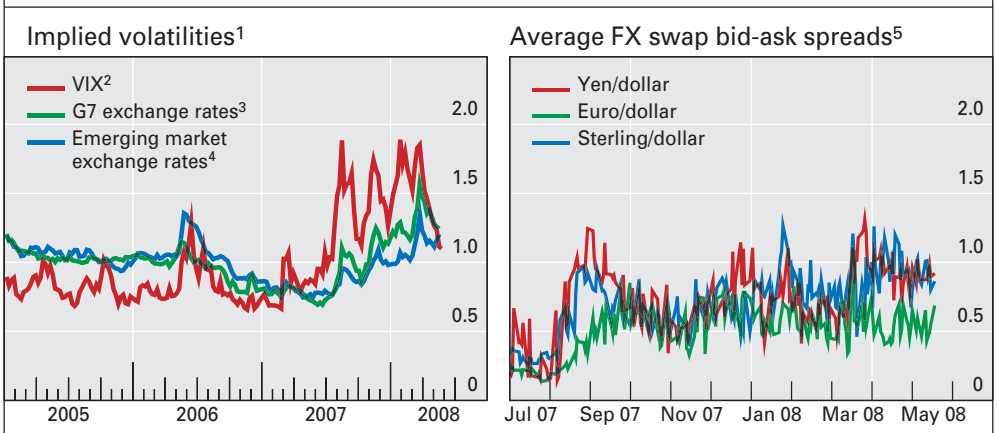
Turnover in foreign exchange spot markets increased

The pickup in volatility was accompanied by higher turnover in the foreign exchange spot market. Turnover of spot transactions executed on the electronic broking platform EBS, which accounts for over 60% of the spot interbank market, peaked at $456 billion on 16 August 2007. This compares with an average daily turnover of $182 billion in 2007. Data on foreign exchange settlement values from CLS Bank (CLS), through which final settlement of a large share of all foreign exchange transactions is executed, also show a distinct peak in August 2007, particularly for the yen and the Australian and New Zealand dollars – currencies prominent in carry trades. The increase in turnover does not appear to have been evenly distributed across currency pairs, however. Data from EBS, for example, are dominated by a disproportionately large increase in turnover in the dollar/yen and euro/yen during the week beginning 13 August.

FX swap markets experienced some problems ...

Sustained high levels of turnover and the absence of any significant widening of bid-ask spreads suggest that liquidity in the spot market for major currency pairs was not impaired by the dislocations in other financial markets. There were, however, more apparent distortions in the foreign exchange swap markets. Bid-ask spreads in these markets widened noticeably at times of heightened volatility, and US interest rates derived from foreign exchange

Implied volatilities and bid-ask spreads



[1] The level of volatility divided by the average over the whole period shown; weekly averages. [2] The Chicago Board Options Exchange Volatility Index (VIX) is a measure of market expectations of near-term volatility conveyed by S&P 500 stock index option prices. [3] JPMorgan benchmark index for the level of G7 currencies' implied volatility. [4] JPMorgan benchmark index for the level of emerging market currencies' implied volatility. [5] For three-month foreign exchange forward discount rates; in pips. A pip is the smallest price change that a given FX rate can make. For most currency pairs, including the ones in this graph, one pip corresponds to the change of the fourth decimal place. Pip values can differ depending on the currency pairs, following the difference between the base currency and the terms currency. The data refer to the hourly closing bid and ask quotes from Bloomberg.

Sources: Bloomberg; JPMorgan Chase. Graph V.4

swap prices deviated significantly from actual US dollar Libor (Graph V.4; see Chapter VI). Settlement data from CLS suggest that foreign exchange swap activity in some currency pairs, such as sterling and the New Zealand dollar against the US dollar, fell steadily over the second half of 2007. For most other currency pairs, foreign exchange swap activity was roughly stable in the period under review. These developments are consistent with available turnover data for the United Kingdom and the United States.

... as did cross-currency swap markets ...

Similarly, tensions also became apparent in the market for cross-currency swaps. These instruments are similar to foreign exchange swaps but are more liquid at maturities longer than one year and involve the swapping of interest payments as well as principal in different currencies. They are important for institutions that want to hedge longer-term offshore funding. Cross-currency swap prices for a number of currency pairs moved sharply during certain periods of heightened volatility. Prices for the euro/dollar and sterling/dollar pairs at the one-year tenor and above, for example, swung abruptly into negative territory from the end of August 2007 onwards, indicating a sharp increase in demand for longer-term US dollar funding.

... consistent with a pickup in demand for US dollar funds

The fact that foreign exchange swap and cross-currency swap markets experienced some spillover from the financial market turmoil is not entirely surprising given that transactions in these instruments are closely linked to the money market and are subject to counterparty risk. Indeed, the tensions observed in these two markets were consistent with a pickup in demand for US dollar funding. This may have been attributable in part to efforts by non-US financial institutions to obtain US dollar liquidity by swapping into US dollars from other currencies. Thus, the tensions largely reflected the rapid

deterioration in money market conditions associated with the global credit market turmoil.

Determinants of exchange rate movements

Against the backdrop of increased financial market volatility and heightened uncertainty surrounding the global economic outlook, the main forces driving exchange rate dynamics shifted. In particular, the role of prevailing interest rate differentials diminished as uncertainty regarding exchange rate trends undermined the attractiveness of carry trades, and attention moved towards expected growth differentials as well as more structural factors, such as current account positions. While exchange rate policies continued to shape the behaviour of some emerging market currencies, developments in commodity prices and specific trends in capital flows also exerted a considerable influence on exchange rates.

Interest rate and growth differentials

Carry trades were attractive in the first half of 2007 …

In the early part of 2007, the persistence of historically low volatility sustained the focus on prevailing interest rate differentials and carry trades as a major driver of exchange rate developments. In this environment, funding currencies such as the yen and the Swiss franc experienced downward pressure, while high-yielding currencies such as the Australian and New Zealand dollars appreciated. Because the term "carry trade" has been used very loosely in popular discussion, it is important to stress that it refers strictly to *leveraged* trades that exploit large interest rate differentials across currencies and low exchange rate volatility by betting on the failure of uncovered interest parity. In practice, carry trades are typically implemented through a combination of foreign exchange spot and swap transactions to obtain a "synthetic" forward position that is long the high-yielding currency and short the low-yielding currency. This is done synthetically, rather than through an outright forward position, largely for liquidity reasons. Importantly, such trades are leveraged because they do not involve any cash outlay up front.

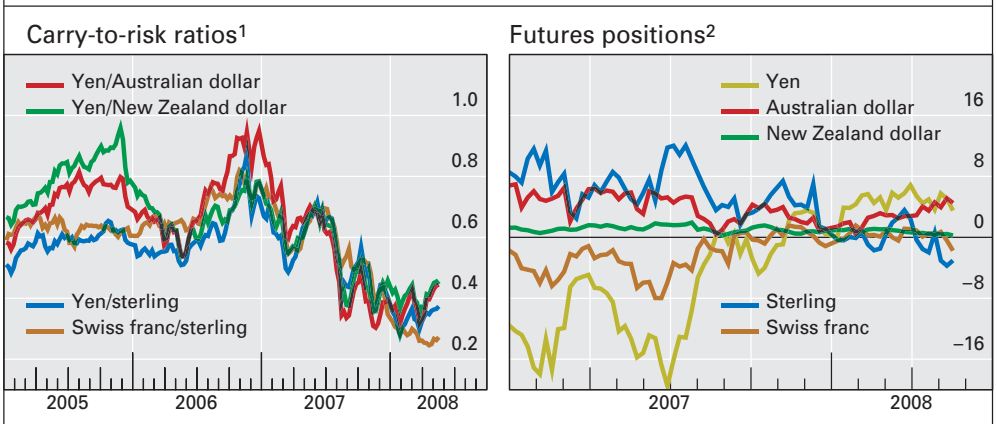
… but became less so thereafter …

The abrupt dislocations in major financial markets that started in August, and intensified in November, severely curtailed the viability of carry trades. As the broad-based repricing of risk and precipitous drop in risk appetite led to dramatic price falls across a large spectrum of financial assets, exchange rate volatility increased and several currencies involved in carry trades experienced a sharp reversal of previous trends. These developments are consistent with changes in simple indicators of the attractiveness of carry trades such as the carry-to-risk ratio, which measures interest rate differentials adjusted for the expected risk implied by currency options. These indicators fell substantially from July onwards for the currency pairs most associated with carry trades, largely reflecting the upward spike in implied volatilities documented in the previous section (Graph V.5).

… and were largely unwound

While there are no direct data on the size of carry trades, because for the most part they involve off-balance sheet exposures, indirect evidence suggests that substantial unwinding of these strategies took place in the second half of

Carry-to-risk ratios and FX futures positions



[1] Defined as the three-month interest rate differential divided by the implied volatility derived from three-month at-the-money exchange rate options. [2] Net non-commercial long positions on the Chicago Mercantile Exchange; derived using average exchange rates in January 2007; in billions of US dollars.

Sources: Bloomberg; Datastream; JPMorgan Chase. Graph V.5

2007. For example, non-commercial open positions in foreign exchange futures on the Chicago Mercantile Exchange indicate that there was an abrupt reduction in net open positions of the main carry trade currencies over this period (Graph V.5). Notably, net speculative positions on the yen actually turned long at the end of 2007. Despite some large swings in exchange rates in mid-August, the unwinding of carry trades did not lead to major dislocations in foreign exchange spot markets as some had feared. Indeed, while the yen did appreciate substantially starting in the latter half of 2007, the Australian dollar, which had been a prime target currency, continued to appreciate despite an initial sharp depreciation (Graph V.2).

Market focus shifted towards growth prospects ...

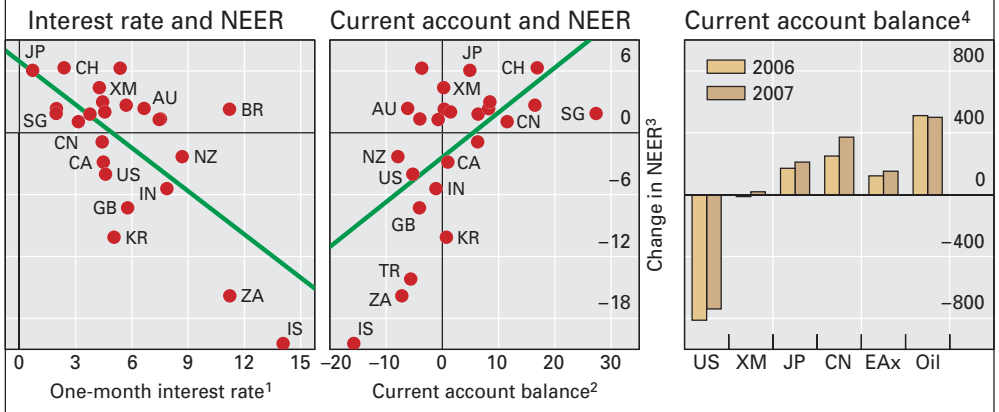
As carry trades became less attractive, prevailing interest rate differentials became less of a focal point for market participants. Indeed, the best performing major currencies in the first three months of 2008 in nominal effective terms were the two lowest-yielding currencies, namely the yen and Swiss franc (Graph V.6). Attention shifted instead to other factors, such as growth differentials, that provide information about the future path of monetary policy, which became increasingly uncertain. Notably, despite the extraordinary monetary easing that took place in the United States in January 2008, the US dollar initially displayed surprising resilience and only came under renewed downward pressure as market sentiment regarding prospects for economic growth dimmed markedly in February. The rapid depreciation of sterling towards the end of 2007, and again in March 2008, was also associated with downward reassessments of economic growth.

Current account positions

... and current account positions

Greater risk aversion also prompted a renewed focus on current account balances. Among the major economies, the United States and the United Kingdom, both of which have sizeable current account deficits, experienced a substantial weakening of their currencies in the early part of 2008. In addition, several small, high-deficit countries such as Hungary, Iceland, South Africa and

Exchange rates, interest rates and current account



AU = Australia; BR = Brazil; CA = Canada; CH = Switzerland; CN = China; GB = United Kingdom; IN = India; IS = Iceland; JP = Japan; KR = Korea; NZ = New Zealand; SG = Singapore; TR = Turkey; US = United States; XM = euro area; ZA = South Africa. The other economies shown in the first two panels are: Denmark, Hungary, Mexico, Norway, Poland, Sweden, Taiwan (China) and Thailand. EAx = emerging Asia excl China; Oil = oil-exporting economies.

[1] On 2 January 2008; in per cent. [2] 2007, as a percentage of GDP. [3] Percentage change in the nominal effective exchange rate (NEER) from December 2007 to April 2008. [4] In billions of US dollars.

Sources: IMF; national data; BIS. Graph V.6

Turkey faced significant downward pressure on their currencies as the financial market turmoil intensified at the end of 2007 (Graph V.6). This suggests that investors may have been more reluctant to fund the external borrowing of countries deemed to be vulnerable to capital flow reversals in an environment of higher volatility and lower risk appetite. Given that many of these countries also had high interest rates, the downward pressure on their currencies may, to some extent, have reflected an unwinding of carry trade positions. From a broader perspective, developments in the major currencies during the period under review – particularly the depreciation of the US dollar and appreciation of the yen – are consistent with a narrowing, or at least a stabilisation, of global imbalances (Graph V.6).

Exchange rate policy

Reserve accumulation gathered pace ...

Exchange rate intervention by central banks continued to exert an important influence over a number of currencies. Official foreign exchange reserves expanded by over $1.3 trillion in 2007, a markedly faster pace than in the previous year (Table V.1). The bulk of the increase continued to be concentrated in Asia, in particular China, but the rate of accumulation more than doubled in Latin America, driven primarily by a very sharp rise in Brazilian reserves. Russia, along with several other oil-exporting countries, also continued to register large increases in reserves. Current account surpluses and sustained capital inflows were again the key forces driving reserve accumulation in emerging market economies, with countries in Latin America, in particular, experiencing a substantial influx of capital in the second half of 2007 (see Chapter III). Despite this growth in reserves, the exchange rates of those countries that undertook some of the most sizeable intervention, namely China and Brazil, still appreciated notably (Graph V.2).

Annual changes in official foreign exchange reserves

In billions of US dollars

	2002	2003	2004	2005	2006	2007	*Memo: Amounts outstanding (Dec 2007)*
	At current exchange rates						
Total	358.6	617.1	723.1	426.2	862.0	1,356.0	*6,392.8*
Advanced industrial economies	117.4	216.2	198.0	–23.1	102.1	97.5	*1,501.2*
United States	4.8	5.9	3.0	–4.9	3.1	4.9	*45.8*
Euro area	8.0	–27.6	–7.0	–14.0	16.9	19.4	*203.5*
Japan	63.7	201.3	171.5	4.5	46.1	73.4	*948.4*
Asia	173.9	264.1	363.7	250.2	396.0	694.9	*2,912.6*
China	74.2	116.8	206.7	208.9	247.5	461.9	*1,528.3*
Hong Kong SAR	0.7	6.5	5.2	0.7	8.9	19.5	*152.6*
India	21.7	30.6	27.5	5.9	39.2	96.4	*266.6*
Indonesia	3.7	4.0	–0.0	–1.8	7.9	13.9	*54.7*
Korea	18.3	33.7	43.7	11.8	28.4	23.4	*261.8*
Malaysia	3.8	10.4	22.1	4.5	12.3	18.9	*100.6*
Philippines	–0.2	0.3	–0.5	2.8	4.1	10.2	*30.1*
Singapore	6.4	13.9	16.4	3.9	20.1	26.7	*162.5*
Taiwan, China	39.4	45.0	35.1	11.6	12.9	4.2	*270.3*
Thailand	5.7	2.9	7.5	2.0	14.6	20.0	*85.1*
Latin America[1]	4.2	30.6	21.1	25.4	53.7	126.7	*397.2*
Argentina	–4.1	2.7	4.9	4.7	7.7	13.8	*44.2*
Brazil	1.6	11.7	3.6	0.8	31.9	94.3	*179.4*
Chile	0.8	0.4	0.3	1.2	2.5	–2.5	*16.7*
Mexico	5.5	7.8	5.0	10.2	2.4	10.9	*86.3*
Venezuela	–0.8	7.5	2.3	5.6	5.5	–5.2	*23.7*
CEE[2]	24.2	21.1	21.4	15.3	26.0	42.2	*223.6*
Middle East[3]	0.7	5.7	12.8	17.0	26.2	34.5	*135.9*
Russia	11.5	29.1	47.6	54.9	119.6	168.7	*464.0*
Memo:							
Net oil exporters[4]	*27.7*	*67.0*	*100.0*	*114.8*	*216.2*	*255.2*	*958.8*

[1] Countries shown plus Colombia and Peru. [2] Central and eastern Europe: Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. [3] Kuwait, Libya, Qatar and Saudi Arabia. For Saudi Arabia, excluding investment in foreign securities. [4] Algeria, Angola, Kazakhstan, Mexico, Nigeria, Norway, Russia, Venezuela and the Middle East.

Sources: IMF; Datastream; national data. Table V.1

... but at more apparent financial and economic costs

With the US dollar depreciating considerably, the costs associated with an exchange rate regime tied closely to that currency became more apparent. This fuelled speculation about a possible change in the exchange rate policies pursued by a number of countries. Particular attention was focused on the Gulf states, where the persistent decline in the US dollar, and the associated loosening of monetary conditions that this entailed, reinforced the effects of large gains in these countries' terms of trade and contributed to rising inflation. In May 2007, Kuwait abandoned its US dollar peg, which had been in place since 2003, and moved to tracking a basket of currencies. By the end of April 2008, the Kuwaiti dinar had appreciated by 8% against the US dollar but remained relatively stable in nominal effective terms. Subsequent speculation

focused on Saudi Arabia, the United Arab Emirates and Qatar as the most likely candidates to follow suit (Graph V.7). There were strong price pressures in these economies, and high-ranking officials in the latter two countries made statements indicating that a possible adjustment to the exchange rate regime was under study. At the same time, China recorded its highest rate of inflation in over 11 years and the renminbi posted fresh highs against the US dollar, encouraging speculation that China might be sanctioning a faster rate of appreciation of its currency (Graph V.7). Sharp reductions in US interest rates and the accelerated depreciation of the US dollar also increased the financial costs of reserve accumulation. This contributed further to the perception that central banks might face pressure to curtail intervention activity.

Potential shifts in reserve composition remained in focus

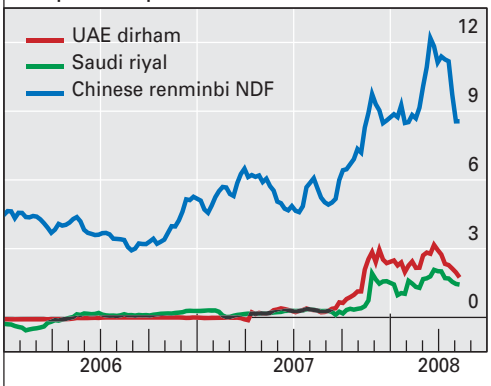
Against this backdrop, market analysts also highlighted the possibility of major reallocations of official foreign reserves away from the US dollar. While net official inflows into the United States are small relative to net private inflows, they can be significant because of their potential to act as an anchor for private sector expectations (Graph V.7). Thus, news about prospective shifts in official flows and stocks can sometimes move markets. That said, the currency composition of foreign reserves tends to move gradually. IMF data on the composition of foreign reserves show that in the fourth quarter of 2007 the US dollar remained the dominant currency choice, accounting for roughly 64% of total allocated reserves, a share essentially unchanged from that recorded a year earlier.

Exchange rate policies were changed in some countries

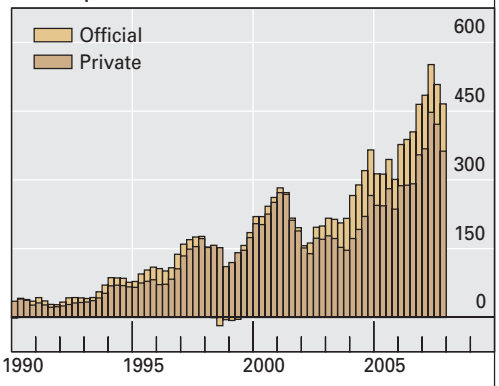
Other notable developments in exchange rate policy were not directly related to US dollar weakness. In Hungary, the central bank abandoned the forint's trading band against the euro in favour of a free float in February 2008. After an initial spike reflecting the surprise nature of the move, the exchange rate fell back somewhat before a subsequent rally left it roughly unchanged against the euro at end-April 2008 compared to the start of the year. In Thailand, the central bank in March 2008 lifted capital controls that had been

Managed exchange rates and capital flows to the United States

Implied expected revaluation[1]



Net capital inflows to the United States[2]



[1] Against the US dollar. Calculated as the percentage difference between the spot and 12-month forward rates (for China, non-deliverable forward (NDF) rate); weekly averages. [2] Four-quarter moving averages, in billions of US dollars.

Sources: Bloomberg; national data. Graph V.7

in place since December 2006, citing more orderly market conditions and difficulties in enforcing the controls.

Trends in capital flows

The trend towards international diversification has been strong ...

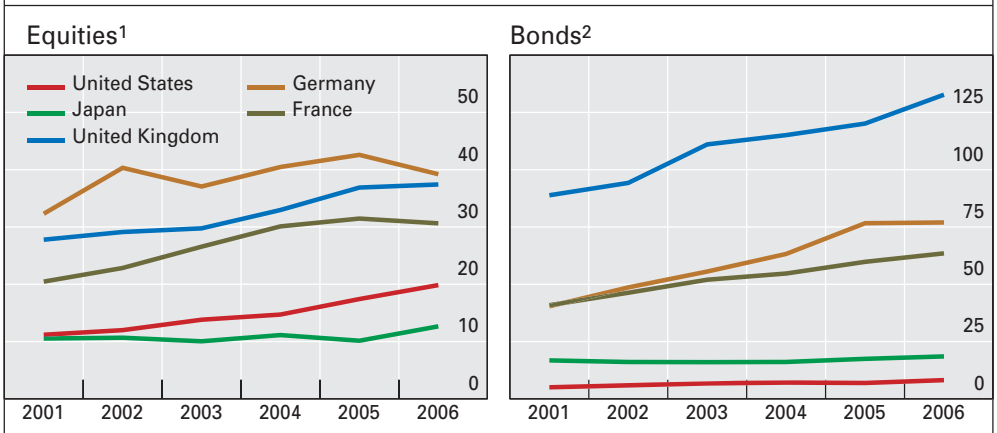
The trend towards increased international diversification of assets has underpinned sizeable shifts in the pattern of capital flows across countries over the past five years or so. Easier access to international investment opportunities and greater emphasis on returns by investors in many countries have contributed to a reduction in the extent to which domestic investors overweight domestic assets in their portfolios, also known as "home bias". These forces continued to exert a significant influence on exchange rates in the period under review.

... particularly in Japan and the United States

While a precise estimate of the degree of home bias across countries is hampered by a lack of data, proximate indications can be obtained by examining trends in investor behaviour. The IMF's Coordinated Portfolio Investment Survey (CPIS) provides useful information about the evolution of the international allocation of portfolio investments for a large number of countries. It indicates that, for major market economies, the shares of foreign equities and bonds relative to total equity and bond portfolios have been on an upward trend since 2001 (Graph V.8). With respect to equity investments, the shift towards greater allocation to foreign assets by residents of Japan and the United States appears to have accelerated in recent years. More timely data indicate that this trend continued into 2007, with the proportion of mutual funds in Japan and the United States that invest in foreign assets remaining on a firm upward path until mid-2007 (Graph V.9). Since the beginning of the disruptions to financial markets, these shares appear to have stabilised rather than reversed.

Portfolio share of foreign equity and bond holdings

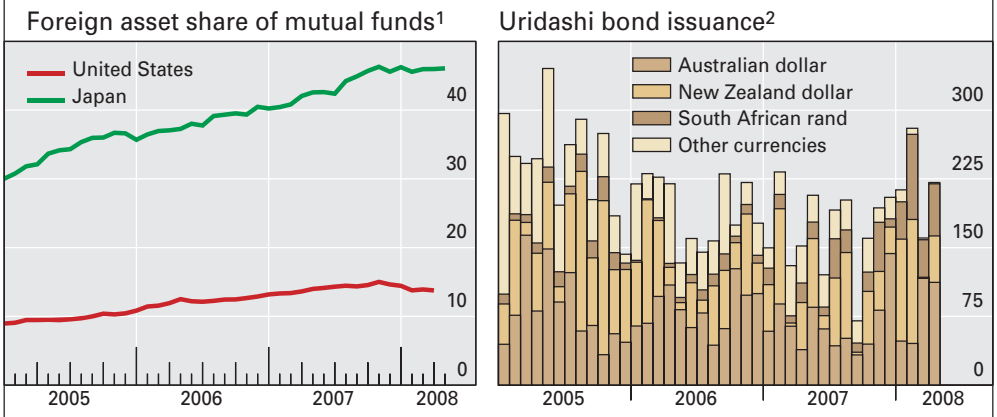
In per cent



[1] Total foreign equity held by country *i* divided by country *i*'s total equity portfolio, where the total equity portfolio is equal to the stock market capitalisation plus foreign equity held by country *i* minus country *i*'s equity held by foreigners. [2] Total foreign debt held by country *i* divided by country *i*'s total debt portfolio, where the total debt portfolio is equal to domestic debt outstanding plus foreign debt assets held by country *i* minus country *i*'s debt held by foreigners.

Sources: IMF; Bloomberg; World Federation of Exchanges; BIS. Graph V.8

Foreign assets of mutual funds and uridashi bonds



[1] Share of foreign assets in total mutual fund assets; in per cent. [2] Derived using exchange rates on 2 January 2006. Debt issued outside Japan and registered under Japanese securities laws for sale to Japanese investors; in billions of yen.

Sources: Bloomberg; Investment Company Institute (ICI); The Investment Trusts Association. Graph V.9

Foreign currency bonds have also been popular in Japan

In Japan, the purchase of foreign currency bonds by retail investors is another striking example of this diversification trend. Issuance of these securities, also known as uridashi bonds, has been driven by strong demand among Japanese retail investors, especially for bonds denominated in high-yielding currencies such as the Australian and New Zealand dollars (Graph V.9). Such investments continued to generate sustained capital outflows from Japan in 2007, with a notable pickup in South African rand-denominated uridashi bonds in the latter half of the year and into the early part of 2008.

Historically, the degree of home bias has been high in Japan and the United States

The pronounced expansion in the share of foreign asset holdings in Japan and the United States may be partly a reflection of the fact that, historically, the degree of home bias in these two countries has been relatively large. In the case of the United States, the disproportionate focus on domestic assets in the past may have been related to the exceptional depth and breadth of local financial markets, which allowed significant diversification opportunities without recourse to foreign assets. With respect to Japan, the fact that the decline in home bias has taken place in conjunction with regulatory changes such as the privatisation of the postal savings system, greater availability of alternative investment vehicles and changes in demographic trends suggests that foreign asset diversification was inhibited in part by structural factors. More cyclical forces, such as the sustained appreciating trend of the yen in the 1980s and 1990s, which made overseas investment less profitable, are also likely to have played a role. Indeed, the pickup in international diversification has coincided with a period of prolonged yen weakness since 2004, as well as exceptionally low domestic interest rates.

The diversification trend has had a significant impact on exchange rates

The trend towards increased international diversification has had a significant effect on exchange rate movements. At the margin, the pickup in outward investment by domestic residents is likely to have put downward pressure on the respective national currencies. With respect to the US dollar,

however, the outsize weight of the United States in global financial markets makes it likely that a reduction in home bias in other countries has been associated with a disproportionately large increase in foreign investment in US assets that counterbalanced increased outward investment by US residents, leaving the net effect on the US dollar ambiguous.

Commodity prices

Strong commodity prices supported some currencies

The sharp run-up in commodity prices was a major driver of currency movements for a number of countries in the period under review. Large improvements in the terms of trade helped to support the currencies of diversified commodity exporters such as Australia and Brazil. This was particularly evident in the case of the Australian dollar, which remained strong despite the substantial unwinding of carry trades that took place in the second half of 2007. High oil prices also generally supported the currencies of energy-exporting nations such as Canada and Norway, although the former experienced some weakness towards the end of 2007 as its economic outlook dimmed. While the Russian rouble reached its highest level in over nine years against the US dollar in March 2008, it fell steadily in nominal effective terms throughout 2007.

Resilience of the foreign exchange market – a longer-term perspective

As noted above, the impact of the extraordinary global financial market turbulence during the period under review was not uniform across different segments of the foreign exchange market. From a longer-term perspective, there have been a number of notable developments that potentially have a bearing on the resilience of foreign exchange markets. They include higher turnover, greater diversity in foreign exchange market activity and improvements in the risk management infrastructure.

Higher turnover and greater diversity of participants

Turnover has grown considerably

Turnover in the foreign exchange market has continued to expand rapidly in recent years. Between 2001 and 2007, foreign exchange turnover across all instruments increased on average by 18% per annum, to an average daily level of $3.5 trillion (Table V.2). Spot transactions increased steadily at an annual rate of 17% over the same period, while the market for foreign exchange swaps saw tremendous growth, with turnover almost doubling between 2004 and 2007.

Currency composition has become more diverse

At the same time, the currency composition of foreign exchange turnover has become more diversified. The most recent Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity shows that the US dollar continues to be the dominant currency in foreign exchange markets, being on one side of around 86% of all foreign exchange transactions in April 2007. However, the share of the three most traded currencies – the US dollar, euro and yen – fell between 2001 and 2007. Currencies that experienced significant increases in their share of turnover over this period include the Australian, Hong Kong and New Zealand dollars and the Norwegian krone. More broadly,

Global foreign exchange market turnover[1]

Daily averages in April, in billions of US dollars

	1992	1995	1998	2001	2004	2007
Spot transactions	394	494	568	387	631	1,005
Outright forwards	58	97	128	131	209	362
Foreign exchange swaps	324	546	734	656	954	1,714
Currency swaps	…	…	10	7	21	32
Foreign exchange options	…	…	87	60	117	212
Other foreign exchange derivatives	…	…	0	0	2	0
Estimated gaps in reporting	44	53	53	30	90	151
Total	820	1,190	1,580	1,270	2,025	3,475
Memo: Turnover at April 2007 exchange rates	*880*	*1,150*	*1,750*	*1,510*	*2,110*	*3,475*

[1] Adjusted for local and cross-border double-counting.

Source: BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in 2007. Table V.2

the share of emerging market currencies, notably the renminbi and the Indian rupee, also rose over the same period.

Financial customers have become increasingly important …

There have also been notable changes in the composition of participants in foreign exchange markets. Data from the triennial survey show a marked increase in the presence of non-reporting financial institutions, a category which includes such entities as hedge funds, insurance companies and pension funds (Table V.3). Between 2004 and 2007, the growth in this segment of the market accounted for more than half of the rise in aggregate foreign exchange turnover and almost half of that in spot transactions.

… for both cyclical …

There are cyclical and structural explanations for this relatively rapid growth in turnover with non-reporting financial institutions. On the cyclical side, investor activity was encouraged up to 2007 by low volatility and exchange rate trends, which generated attractive risk-adjusted returns in foreign exchange markets over much of the past six-year period. The international diversification of household portfolios discussed above is also likely to have been a contributing factor, not just in terms of the initial diversifying purchase but possibly also with regard to the hedging of foreign exchange risk on an ongoing basis. In addition, there have been at least three significant structural changes resulting not only in higher turnover, but also in greater diversity of the participants that make up this segment.

… and structural reasons, including: growth in prime brokerage;

First, there has been substantial growth in the prime brokerage business. A prime broker, typically a large bank, provides its customers with a range of services, including the ability to trade with counterparties – subject to credit limits and collateralisation – in the prime broker's name. This has enabled customers, typically small financial institutions such as hedge funds, to use the prime broker's credit rating and thereby access liquidity at lower cost than would otherwise have been possible. In return for accepting the customer's credit risk, prime brokers receive fee-based income and have more opportunities to sell other products. Prime brokerage grew rapidly in the late 1990s and early 2000s and the industry has become more competitive, with

Reported foreign exchange market turnover by counterparty[1]

Daily averages in April, in billions of US dollars

	1998	2001	2004	2007
Spot transactions with:				
Reporting dealers	347	218	310	426
Other financial institutions	121	111	213	394
Non-financial customers	99	58	108	184
Aggregate turnover with:				
Reporting dealers	614	503	707	966
Other financial institutions	178	235	421	945
Non-financial customers	166	115	169	409

[1] Adjusted for local and cross-border double-counting. Excludes estimated gaps in reporting. Due to incomplete counterparty breakdown, the components listed in this table do not always add to the totals published in the triennial survey.

Source: BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in 2007. Table V.3

fees falling substantially. From the perspective of market depth, the growth in this business has enabled hedge funds to participate more actively in foreign exchange markets, although the recent financial market turbulence may have curtailed the extent to which prime brokers make credit available to these institutions.

algorithmic trading;

Second, there has been a rapid expansion in the use of automated trading, also known as algorithmic trading. Spurred by the emergence of electronic trading systems, this has allowed some financial institutions, notably hedge funds, to take advantage of new trading strategies, such as high-frequency trades. At the same time, many financial institutions have also been able to use algorithmic trading strategies to increase efficiency. For example, small spot trades can be diverted to "auto-trading engines", freeing up human traders to spend more time on complex trades, while hedging trades can be automated to improve risk management. Estimates of the significance of algorithmic trading range from over 20% for spot transactions, which are relatively straightforward, to negligible for foreign exchange options, which are less homogeneous. Most market commentary indicates that algorithmic trading has been growing rapidly since 2005.

and demand from retail investors

Third, the presence of retail investors has increased markedly, particularly in the past five years or so. Some estimates suggest that retail foreign exchange turnover has been growing by around 30% per annum, and now accounts for about 2% of aggregate turnover and about 10% of spot transactions outside the interbank market. Although there is significant retail foreign exchange trading in the United States, much of the growth in this segment in recent years has come from Asia, particularly Japan. The main related innovation stems from retail aggregators, which provide sophisticated web-based interfaces that enable their customers to trade foreign exchange on a margin basis. Retail aggregators typically quote prices with relatively tight spreads over wholesale rates: in the case of the US dollar/euro rate, spreads can be as low as 2 pips. Many retail aggregators outsource liquidity provision

to a large wholesale foreign exchange bank in an arrangement known as "white labelling". As with algorithmic trading, advances in technology have played a central role in enabling the development of this new market segment.

Improved risk management

Settlement risk has been of particular concern ...

Another key development in recent years has resulted from efforts to improve the management of settlement risk in foreign exchange markets. In 1996, a survey of settlement risk in foreign exchange transactions carried out by the Committee on Payment and Settlement Systems (CPSS) hosted by the BIS had confirmed that some financial institutions faced foreign exchange settlement exposures that were extremely large relative to capital. Given the extent of the exposures and the size of the foreign exchange markets, this situation was deemed to pose a significant risk to the global financial system. In response, the G10 central banks set out a strategy to reduce foreign exchange settlement risk calling for actions by individual banks, industry groups and central banks.

... leading to the creation of CLS ...

An important outcome of this strategy was the creation of CLS in 2002 by major private sector participants in foreign exchange markets. CLS provides its members with a payment-versus-payment settlement service which, by ensuring that the two currencies associated with a given foreign exchange transaction achieve final settlement at the same time, eliminates the principal risk that arises when one leg of the trade settles prior to the second leg, as often occurs in traditional correspondent banking settlement. The value of foreign exchange transactions settled through CLS has risen steadily over time. A further survey conducted by the CPSS in April 2006 indicated that CLS was being used to settle roughly 55% of foreign exchange obligations, and that 550 institutions had used CLS to settle trades in 15 currencies, either directly as members of CLS or indirectly as third parties. The CPSS estimates that settlement exposures would have been up to three times higher than reported if other methods such as traditional correspondent banking had been used.

... and other ongoing efforts

While this represents a major reduction in risk, substantial exposures remain. Roughly 32% of foreign exchange related obligations settle through traditional correspondent banking arrangements, with half of this value being at risk overnight, not just intraday. Moreover, there is a potential risk of backsliding, particularly in the face of changing trading patterns and cost pressures, such as those arising from lower-value tickets resulting from algorithmic trading. In the light of this assessment, the CPSS has recommended a number of steps – direct action by individual institutions, new services and education efforts from industry groups, and overall support from central banks – to enable institutions to reduce and/or better control their foreign exchange settlement exposures.

Implications for market resilience

Foreign exchange markets are likely to have become more resilient over time ...

The trends highlighted above have arguably contributed to the resilience observed in the foreign exchange market to date, particularly in the spot market. The continued expansion in turnover, to the extent that it is structural, is likely to have added further to market liquidity, strengthening the market's

ability to absorb large individual trades smoothly without a significant impact on prices. At the same time, the increased diversity of participants, and the associated heterogeneity of opinion that this might be expected to engender, may have contributed to greater market depth. Finally, the reduction of credit exposures generated in the course of the clearing and settlement of interbank foreign exchange contracts is likely to have helped preserve market participants' willingness to enter into transactions, and thus to have provided further depth to the market.

... but risks remain

These developments notwithstanding, there are reasons to maintain vigilance in monitoring developments in foreign exchange markets and to sustain the impetus for better risk management practices. First, the fact that the epicentre of the present turmoil was not the foreign exchange market, and that those market segments most closely related to the turmoil have experienced some disruptions, obviously calls for a degree of caution. Second, the increased market depth arising from the entrance of new players, such as highly leveraged institutions, as well as from the expansion of certain trading techniques, particularly algorithmic trading, may not be without attendant risks. It is possible, for instance, that a spike in risk aversion could lead a majority of market participants to pull back at the same time, thus reducing market liquidity and depth, especially in the context of leveraged trades. As such, part of the observed increase in turnover may constitute "fair weather liquidity" that contributes to market depth in good times but disappears under stress. Finally, while the migration towards CLS has been smooth so far, the system has yet to be fully tested by settlement problems emanating from a major institution in the foreign exchange market.