

Evidence of carry trade activity¹

Interest rate differentials have been a driving force behind exchange rate movements in recent years. This has focused market attention on the role of currency carry trade positions, and on the possibility that a sudden unwinding might adversely affect financial stability. However, carry trades are notoriously difficult to track in the available data. This special feature first outlines the investor base and trading strategies used in carry trades, and then explores various sources of data to gauge activity.

JEL classification: F31, F32, G15.

Low exchange rate volatility and persistent interest rate differentials have underpinned significant cross-currency positioning in recent years. These positions have often taken the form of currency carry trades, or leveraged cross-currency trading strategies. To the extent that this carry trade activity has been, and may continue to be, an important driver of exchange rate developments, it is useful to gauge what the available data can say about its significance.

The effect of carry trade activity on exchange rates is typically asymmetric, and can be significant. The build-up of these positions generally contributes to a steady strengthening of target currencies (associated with high interest rates) and a weakening of funding currencies (associated with low interest rates), against the predictions of the uncovered interest parity (UIP) hypothesis (Burnside et al (2006, 2007)). However, when changes in interest rate expectations or volatility lead to a sudden unwinding of carry trades, there is a tendency for target currencies to depreciate and funding currencies to appreciate sharply (IMF (1998), Béranger et al (1999), Cairns et al (2007), Gagnon and Chaboud (2007)).

Perhaps the best known example is the sharp appreciation of the yen against the US dollar between 6 and 8 October 1998, following a prolonged period of depreciation. This was the sharpest move in major foreign exchange

¹ The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS. The authors thank Clara García and Jhuvesh Sobrun for excellent assistance with the data and graphs, and acknowledge that the discussion on risk reversals has benefited from access to unpublished work by William Melick and San Sau Fung.

rates since 1974 and was accompanied by a significant spike in volatility: one-month implied volatility reached 40% and bid-ask spreads widened markedly. Market analysts explained the move in terms of a sudden, massive reversal of carry trade positions, despite the lack of an apparent trigger.²

This special feature examines the extent to which any recent build-up of carry trade positions can be traced in various sources of data. The first section discusses different measures of the attractiveness of carry trades, the strategies used and the participating investors. The second assesses the extent to which capital flows through banks and foreign exchange market activity can be linked to the strategies and currency pairs identified in the first section. The key sources of data reviewed are the BIS international banking statistics, which can help track the magnitude and direction of capital flows (by currency) intermediated by the international banking system, and various statistics on foreign exchange trading.

What is a carry trade?

A currency carry trade is usually defined as 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). Ex ante, the strategy is only profitable as long as the gains from interest rate differentials are not expected to be overwhelmed by exchange rate movements in the short to medium term; that is, UIP is not expected to hold. The use of leverage makes these positions particularly sensitive to changes in exchange rates or interest differentials.

Profitability

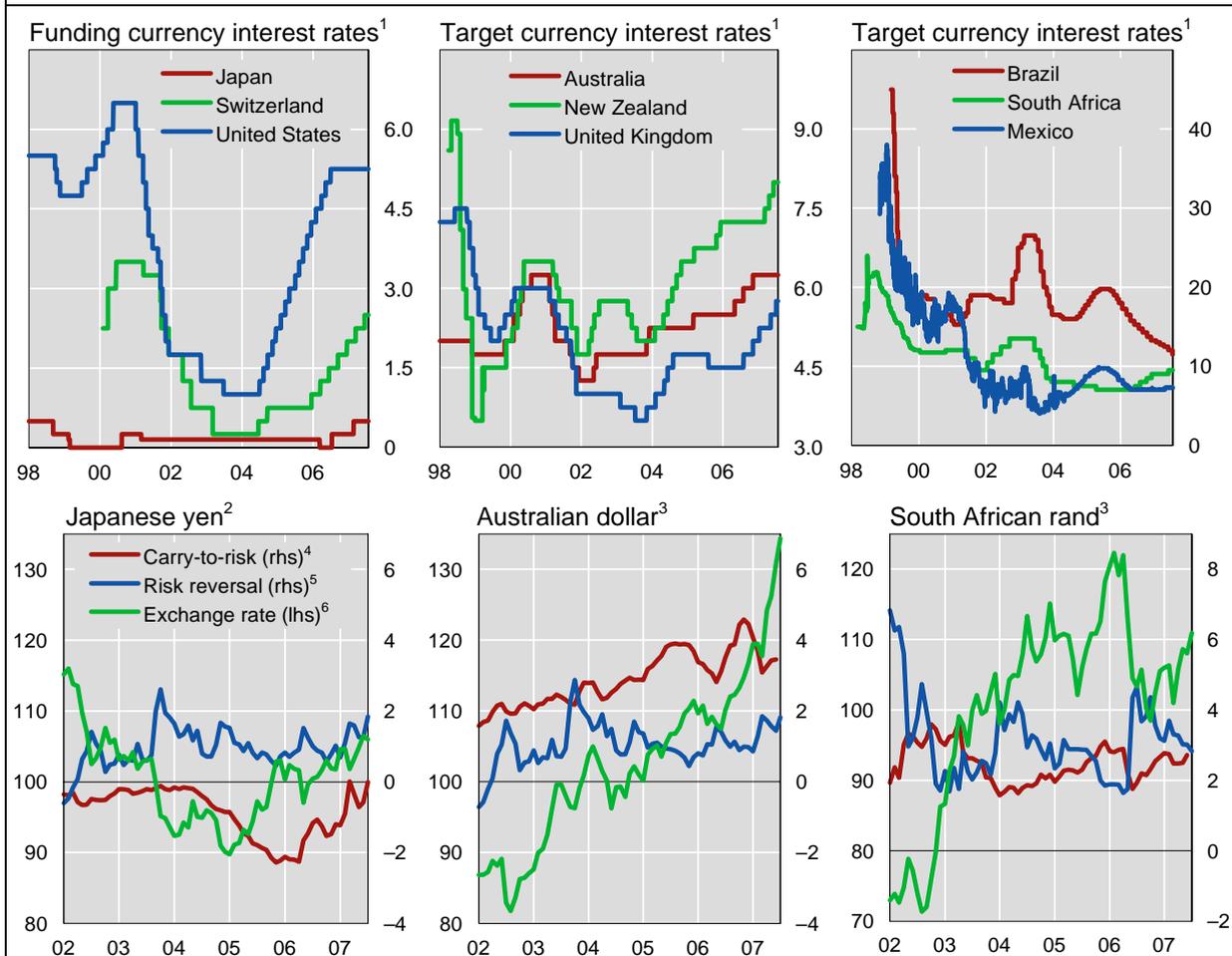
Over the past five years, official interest rates have been lowest in Japan and Switzerland, and the yen and the Swiss franc are the most commonly cited funding currencies (Graph 1). The Australian dollar, the New Zealand dollar and sterling have appreciated steadily and have been cited as popular target currencies, although a number of other currencies are often used as well (eg the Brazilian real and the South African rand). Since 2004, with the normalisation of policy rates from historically low levels, the US dollar has moved from being a funding currency to a potential target.

The carry-to-risk ratio is a popular ex ante measure of the attractiveness of carry trades. It adjusts the interest rate differential by the risk of future exchange rate movements, where this risk is proxied by the expected volatility (implied by foreign exchange options) of the relevant currency pair. By this measure, carry trade positions that were short yen and long target currencies such as the Australian dollar were increasingly promising from 2002 to 2005

Carry-to-risk ratio
tracks
attractiveness

² See McCauley and von Kleist (1998), Béranger et al (1999), Lyons (2002), Fan and Lyons (2003) and Cai et al (2001). Other episodes include the depreciation of the Icelandic króna in February 2006 and volatility spikes mostly in emerging market currencies in December 2005 and May–June 2006 (BIS (2007)).

Interest rates, exchange rates and carry trade attractiveness



¹ Central bank target interest rates, in per cent; for the Japanese yen, BOJ target rate; for the Swiss franc, Libor target rate; for the US dollar, federal funds rate; for the Australian dollar and the New Zealand dollar, cash rate; for the pound sterling, base rate; for the Brazilian real, Selic rate; for the South African rand, repo rate; for the Mexican peso, official overnight closing bank rate. ² Against the US dollar. ³ Against the Japanese yen. ⁴ Defined as the three-month interest rate differential divided by the implied volatility derived from three-month at-the-money exchange rate options; quintuple scale (eg the number 2 represents a ratio of 0.4). ⁵ A positive value indicates a willingness to pay more to hedge against a yen appreciation. ⁶ 2002–06 = 100.

Sources: Bloomberg; JPMorgan Chase; national data; BIS calculations.

Graph 1

(Graph 1, bottom centre panel). These positions have remained so on average, despite two bouts of higher volatility which led to significant, albeit temporary, declines in the attractiveness of some target currencies (eg the South African rand).³ Over the longer term, however, the attractiveness of carry trades relative to other investments is less clear (Burnside et al (2006)).

Risk reversals – or the price difference between two equivalently out-of-the-money options – potentially provide an alternative market indicator of perceived risks in carry trades. If the risk associated with carry trade returns is

³ A similar story is apparent from measures of realised carry trade profitability, such as the Sharpe ratio, which is calculated by adding ex post returns from exchange rate movements to those from interest differentials, subtracting the risk-free rate to obtain excess returns and normalising by historical rather than implied volatility. The inclusion of realised exchange rate movements increases the volatility of this ratio relative to the carry-to-risk ratio. A third measure, the carry return index (available on Bloomberg), cumulates the returns from interest rate differentials and exchange rate movements, but does not adjust by any measure of risk.

not generalised uncertainty about future values of the exchange rates, as the carry-to-risk measure implicitly assumes, but rather directional uncertainty, this will be more effectively captured by risk reversals calculated from out-of-the-money options. A strong correlation between the two measures is apparent in Graph 1. In addition, Gagnon and Chaboud (2007) argue that movements in risk reversals tend to post-date large exchange rate movements in periods of high volatility.

Directional uncertainty may also be important

Strategies and participants

There are a variety of ways to implement carry trades, each with different implications for what can be traced in different data sources. The simplest approach, which is particularly relevant for investing in emerging market assets, involves exchanging borrowed funds into the target currency in the spot market. The target currency can be held in some short-term asset (such as a bank deposit or short-term government paper) until maturity. Another approach relies on derivative contracts, including foreign exchange futures, forwards and interest rate swaps as well as more complex options. In addition, these strategies are likely to generate hedging activity, which might lead to more trades in the cash or derivatives markets.

Carry trades are implemented in spot and derivatives markets ...

These strategies can be implemented with varying degrees of complexity. For example, sophisticated algorithms can be used to decide when to open and close carry trade positions, as opposed to a simple buy and hold strategy. This allows investors to exploit high-frequency movements in exchange rates or interest rate expectations. While this way of implementing carry trades appears to be of secondary importance, it seems to have become more popular in recent years, in line with the growing success of algorithmic trading in foreign exchange markets.

... with different levels of complexity ...

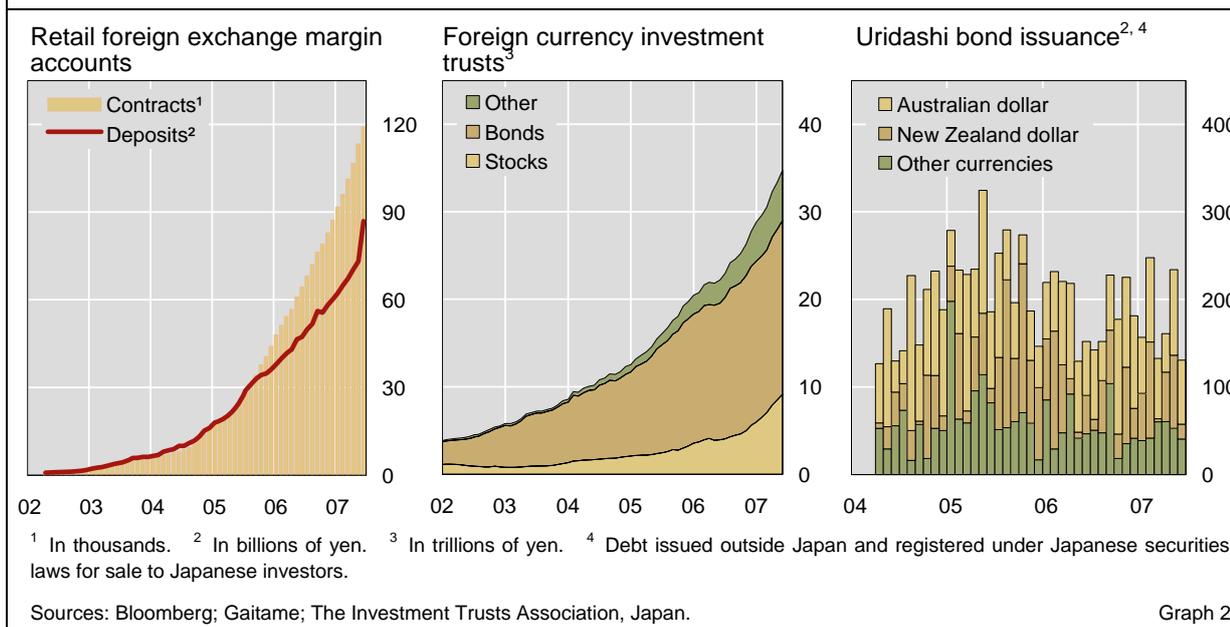
Traditionally, carry trades are used by large financial institutions, such as hedge funds and commodity trading advisors (CTAs) (Galati and Melvin (2004)). More recently, there has been an increase in the presence of retail investors using margin accounts to take leveraged positions across currencies. For example, data from Gaitame, one provider of foreign exchange margin trading facilities for Japanese retail investors, indicate that the number of accounts it manages increased from less than 2,000 at the beginning of 2003 to almost 120,000 in June 2007, with deposits worth almost 90 billion yen (\$0.7 billion) (Graph 2, left-hand panel). Although the size of these investors in aggregate is still relatively small and the degree of leverage is not likely to be as significant as it is for large financial institutions, their activities have been cited in market commentary as a factor influencing the yen exchange rate over the past year.

... by financial institutions and retail investors

It is useful to distinguish the leveraged carry trades discussed above from two other investment strategies which are also designed to exploit interest rate differentials. One such strategy involves domestic retail investors trying to diversify their portfolio by purchasing higher-yielding assets denominated in a foreign currency. An example that has attracted much attention is the foreign currency investments made by Japanese households through investment trust funds, which increased on average by 1.2 trillion yen per month in the first six

Capital flows from portfolio diversification have grown

Portfolio diversification by Japanese households



months of 2007, pushing the stock of such investments to 35 trillion yen (Graph 2, centre panel). Strong demand by these investors in recent years has also supported the issuance of foreign currency denominated bonds targeted at Japanese retail investors (Graph 2, right-hand panel). A second strategy involves households borrowing in lower-yielding foreign currencies to finance purchases of domestic assets. For example, Swiss franc-denominated mortgages have become popular in some central and eastern European countries. However, unlike the leveraged carry trades of larger institutions, these types of foreign currency exposures are less likely to be unwound quickly in the event of market turbulence.

Tracking activity

While a precise tracking of carry trade positions is difficult, there are a number of data sources that provide information on one or more dimensions of carry trade activity. The BIS international banking statistics are a potentially rich source of information since they include a currency breakdown of banks' international assets and liabilities. In addition, data on foreign exchange trading can be useful, since carry trade activity leaves footprints in the data on futures positions and over-the-counter (OTC) transactions in the spot, swap or forward markets.⁴

Currency flows in the international banking system

The effect of carry trade activity on banks' balance sheets will depend on the structure of the trade and the role of the bank in the transaction. Banks can

⁴ Data on hedge fund returns are another potential source of information. McGuire and Upper (2007) apply style analysis regressions to these data, and find that proxies for carry trade returns are statistically significant determinants of hedge fund performance.

serve as primary market intermediaries, providing loans in the funding currencies and taking deposits in the target currencies used by carry trade investors. At the same time, banks may themselves (via their proprietary trading desks) take outright carry trade positions, possibly generating a rise in liabilities denominated in the funding currencies and in assets denominated in the target currencies. Finally, banks may serve as counterparties in derivatives transactions with carry trade investors, which may or may not appear on balance sheet.

The BIS international banking statistics can help to highlight activity which may be linked to carry trades, and to investigate more broadly the flow of capital through the international banking system denominated in the main carry trade funding and target currencies.⁵ Although they are one of the few sources of bilateral capital flow data available *by currency* on a globally consistent basis, these statistics are far from ideal for tracking carry trade activity. First, banks report only their on-balance sheet positions. Thus, at best, the statistics will capture carry trade activity executed in the cash markets, or possibly secondary ripples in the cash markets caused by underlying activity in the derivatives markets. Leveraged accounts may rely on instruments like forwards, which do not appear on balance sheet. Second, the data do not explicitly distinguish between carry trade positions and other positions, which can reflect other corporate, household or interbank lending and borrowing. Finally, as discussed above, the balance sheet implications of carry trades will depend on the type of trade and the role of the bank in the transaction; only the overall net effect of the on-balance sheet components will be evident in the BIS data, making it difficult to explicitly identify activity.

BIS data track
currency flows
through banks

Subject to these caveats, these statistics provide some evidence consistent with a rising role of the yen and the Swiss franc as funding currencies. Global claims denominated in these currencies have, in absolute terms, been on the rise in recent years, although they remain a small (and declining) portion of reporting banks' total claims. Total yen-denominated claims reached \$1.05 trillion in the first quarter of 2007, just shy of their most recent peak in the fourth quarter of 2005 (Graph 4, top left-hand panel). In contrast, Swiss franc-denominated claims have grown more steadily in recent years, reaching \$678 billion in the first quarter of 2007 (Graph 5, top left-hand panel).

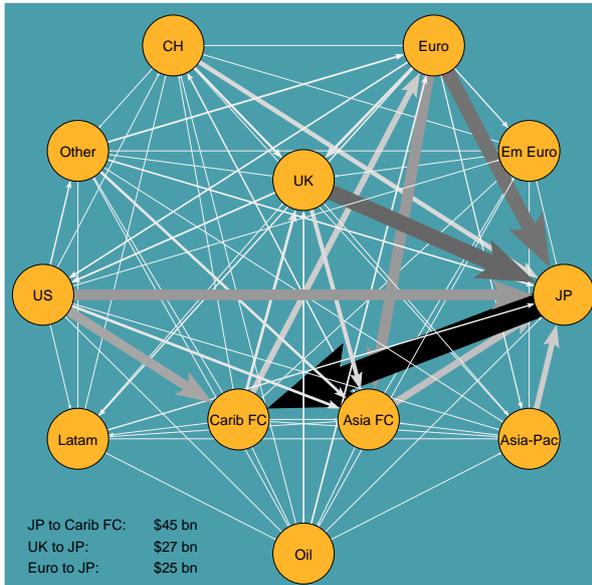
Lending in the
funding currencies
has grown

A better understanding of how these currencies are passed between banks and on to non-bank borrowers can help to shed light on the particular market segments where carry trade activity is likely to be evident. Graph 3 represents the global banking system as a network of interconnected nodes, each representing a financial hub or country grouping. The arrows that connect the nodes provide information about the direction and size of the net

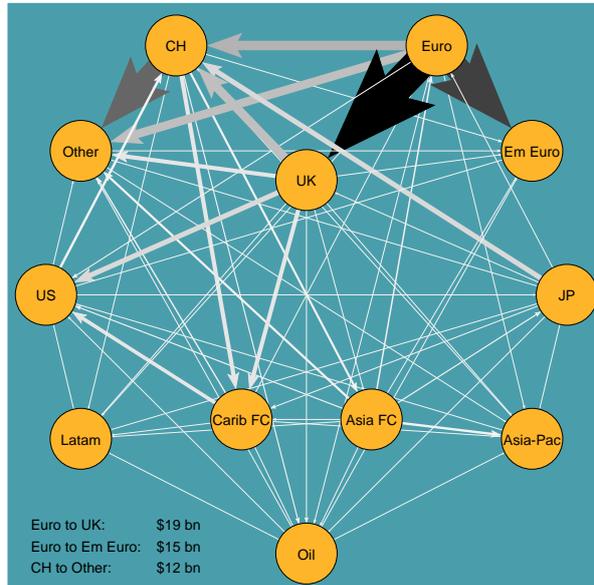
⁵ The data include reporting banks' cross-border positions (assets and liabilities) in all currencies, and positions vis-à-vis residents in foreign currencies. Positions are broken down by instrument (loans or securities), sector (bank or non-bank) and residency of the counterparty. For a complete description, see BIS (2003a,b).

Cumulative net flows through the banking system: 2002 Q2–2007 Q1

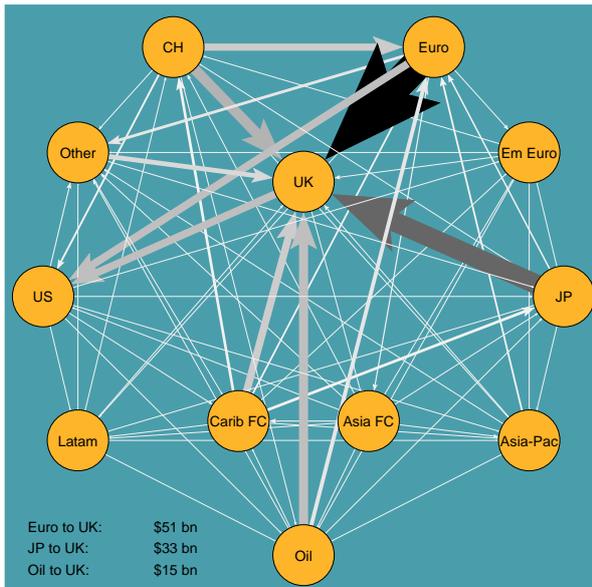
Japanese yen



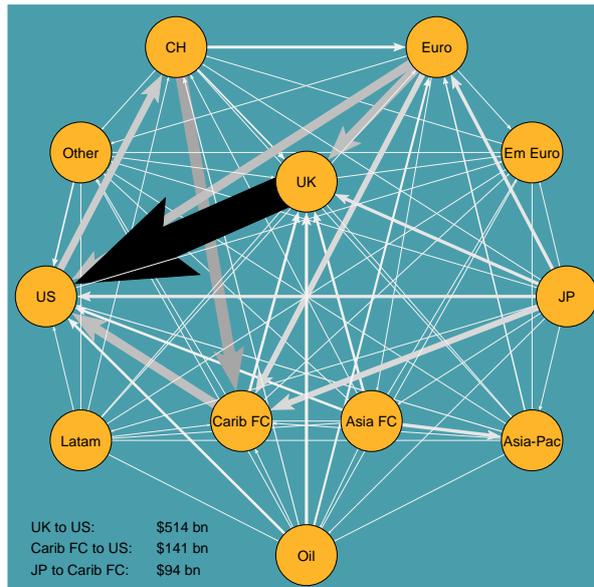
Swiss franc



Pound sterling



US dollar



Asia FC = Asian financial centres (Hong Kong SAR, Macao SAR and Singapore); Asia-Pac = China, India, Indonesia, Korea, Malaysia, Pakistan, the Philippines, Taiwan (China) and Thailand; Carib FC = Caribbean financial centres (Aruba, the Bahamas, Bermuda, the Cayman Islands, the Netherlands Antilles and Panama); CH = Switzerland; Em Euro = emerging Europe (Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Turkey and Ukraine); Euro = euro area member states excluding Slovenia; JP = Japan; Latam = Argentina, Brazil, Chile, Colombia, Mexico and Peru; Oil = OPEC member states (excluding Indonesia) plus Russia; Other = Australia, Canada, Denmark, New Zealand, Norway and Sweden; UK = the United Kingdom, Guernsey, the Isle of Man and Jersey; US = the United States.

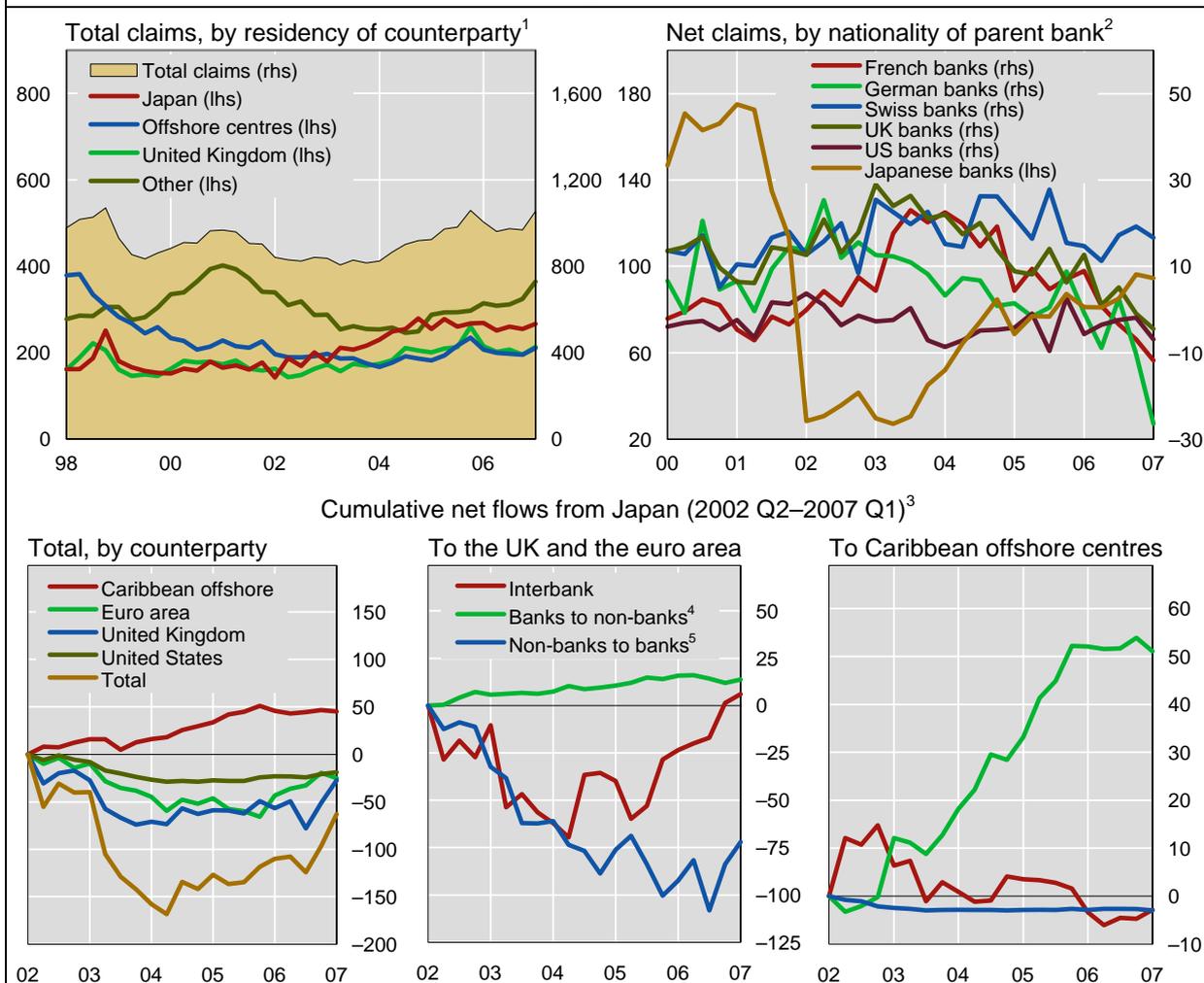
The thickness of an arrow is proportional to the amount of cumulative net bank flows between countries/groups. Net flows between A and B equal the sum of: (1) net claims (assets minus liabilities) of banks in A on non-banks in B; (2) net claims of banks in B on non-banks in A; and (3) net interbank flows between A and B. Some groups include countries which do not report data. The thickness of the arrows is scaled by the overall flows cumulated over the respective period, and thus is not directly comparable across panels. All figures at constant end-2007 Q1 exchange rates.

Source: BIS.

Graph 3

BIS reporting banks' Japanese yen-denominated positions

In billions of US dollars, at constant end-2007 Q1 exchange rates



¹ BIS reporting banks' cross-border claims and claims on residents, by residency of counterparty. Excludes domestic claims on residents booked by banks in Japan, the United States and other non-reporting countries. ² Net cross-border claims (assets minus liabilities) booked by offices in all reporting countries, by nationality of parent bank. Excludes domestic claims on residents booked by offices in Japan and the United States, and cross-border and domestic claims booked by offices in Hong Kong SAR, Singapore and other non-reporting countries. ³ See the note in Graph 3 for the definition of cumulative net flows. Positive values indicate a flow from Japan. ⁴ Cumulative net flows from banks in Japan to non-banks in the vis-à-vis region. ⁵ Cumulative net flows from non-banks in Japan to banks in the vis-à-vis region.

Source: BIS.

Graph 4

flows of capital intermediated by banks, cumulated over the most recent five-year period (2002 Q2–2007 Q1).⁶

Offshore financial centres, which host a significant number of hedge funds and other speculative traders, are an obvious place to look for activity related to carry trades. As shown in Graph 3, the largest net flows of yen over this five-year period were from Japan to the Caribbean financial centres (\$45 billion),

Lending to offshore centres can reflect carry trades

⁶ The concept of net flow used here summarises changes in positions reported by banks located in both countries, and changes on both the asset and the liability side of their balance sheets. See McGuire and Tarashev (2006). Some values used in the analysis are based on estimated data, since some reporting countries, including the United States, Hong Kong SAR and Singapore, do not provide a detailed currency breakdown of banks' cross-border positions.

primarily the Cayman Islands (McCauley and von Kleist (1998)). These seemed to reflect purchases (by banks in Japan) of yen-denominated debt securities issued by non-banks in these centres (Graph 4, bottom right-hand panel). While these flows could, in principle, reflect yen funding for carry trades placed by hedge funds or other non-bank financial entities, it is impossible to distinguish them from other types of activity, for example purchases of securities issued by special purpose vehicles. In any event, these yen flows were relatively small; US dollar-denominated cumulative net flows from Japan to these financial centres totalled \$94 billion over the same period.

Yen inflow to Japan reflecting purchases of securities ...

The other large yen flows depicted in Graph 3 were actually net flows *into* Japan, although these masked large *outflows* via the interbank market. To see this, it is useful to analyse separately the three components of the total net flow figure. Overall, an estimated \$63 billion flowed to residents of Japan between 2002 Q2 and 2007 Q1 (Graph 4, bottom left-hand panel). This was driven primarily by greater investment (\$86 billion) in Japanese equity and debt securities by banks in the United Kingdom and the euro area. Yet, since mid-2004, an estimated \$76 billion has been channelled *from* Japan through the interbank market to banks in these areas (Graph 4, bottom centre panel).

... overshadows outflows via the interbank market

Whether these interbank transfers were explicitly related to carry trade activity is difficult to determine. However, a partial reconstruction of banks' global balance sheet positions indicates a rise in European banks' yen liabilities, which outpaced their yen claims, possibly providing clues about the positioning of their counterparties. This can be seen in the top right-hand panel of Graph 4, which depicts global net yen claims (excluding inter-office positions) broken down by the *nationality* of the banking system.⁷ UK, German and French banks' net claims (booked by only those offices located in countries which report data to the BIS) have all trended downwards as their liabilities in yen have grown. One interpretation is that banks have sold borrowed yen in the swap market to square forward purchases of yen from leveraged counterparties that were shorting the currency.

Swiss franc lending to the United Kingdom picks up ...

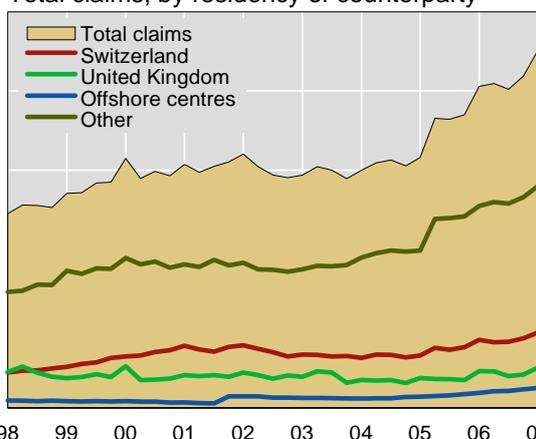
The growth in total Swiss franc-denominated claims is also consistent with the anecdotal evidence suggesting increased use of the franc as a funding currency (Graph 5, top left-hand panel). As with the yen, greater borrowing in Swiss francs by residents of major financial centres would be consistent with carry trade activity. As shown in Graph 3 (top right-hand panel), the largest cumulative net flows of Swiss francs over the 2002 Q2–2007 Q1 period, at \$19 billion, were from the euro area to the United Kingdom, the result of a surge in interbank lending since end-2003. Banks in the United Kingdom, in turn, passed much of this on to resident and non-resident non-bank borrowers (Graph 5, bottom centre panel). Swiss franc-denominated net claims on the Cayman Islands have grown as well, although the level remains quite low (Graph 5, bottom left-hand panel).

⁷ These figures, based on the *nationality* breakdown of the BIS banking statistics, should be interpreted with caution since they do not fully capture banks' global yen positions (see Graph 4, footnote 2).

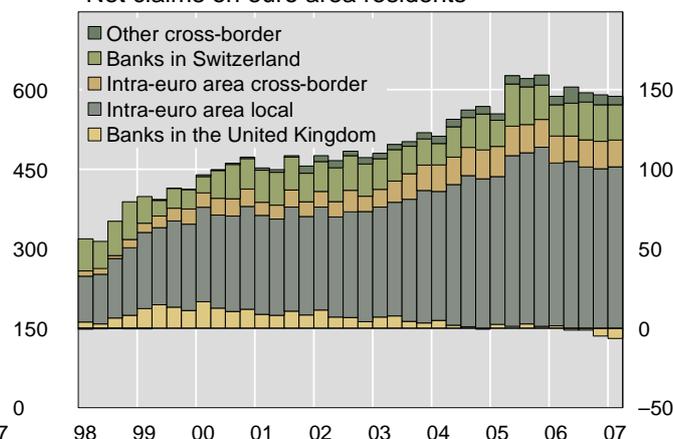
BIS reporting banks' Swiss franc-denominated positions

In billions of US dollars, at constant end-2007 Q1 exchange rates

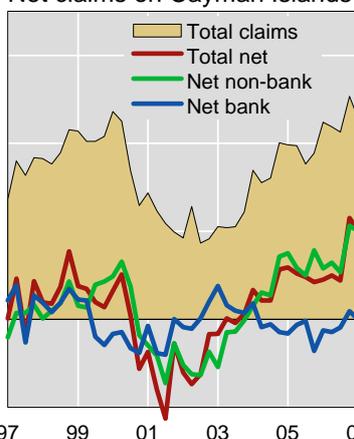
Total claims, by residency of counterparty¹



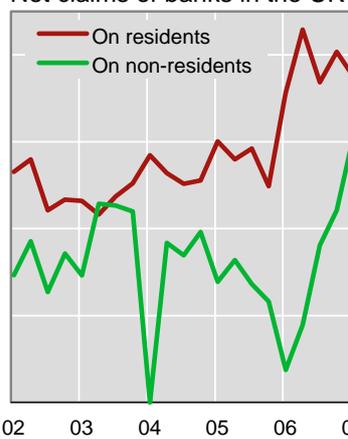
Net claims on euro area residents



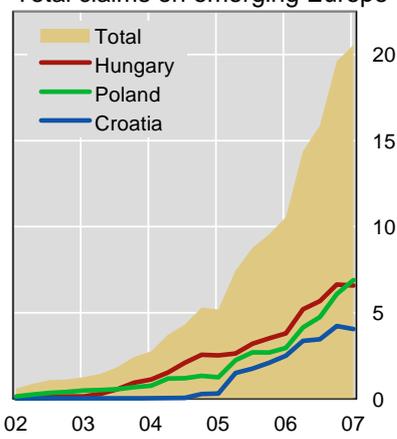
Net claims on Cayman Islands



Net claims of banks in the UK



Total claims on emerging Europe²



¹ BIS reporting banks' cross-border claims and claims on residents, by residency of counterparty. Excludes domestic claims on residents booked by banks in Switzerland, the United States and other non-reporting countries. ² Reported by banks in the euro area.

Source: BIS.

Graph 5

At the same time, the bulk of global lending in Swiss francs takes place *within* the euro area, and thus will not appear in the linkages in Graph 3. Indeed, gross claims on residents of the euro area accounted for roughly half of the global stock of Swiss franc claims in recent years (Graph 5, top right-hand panel). These claims are booked primarily by banks located in Austria and Germany, and may in part reflect mortgage lending to residents in these countries.

The growing popularity of Swiss franc-denominated mortgages in some eastern European countries also contributed to the rise in global Swiss franc claims. Between 2002 Q2 and 2007 Q1, an estimated total of \$15 billion was transferred from banks in the euro area to the region (Graph 3, top right-hand panel), primarily to banks in Hungary, Poland and Croatia (Graph 5, bottom right-hand panel). In part, these cross-border interbank transfers have been used by domestic banks to hedge their Swiss franc-denominated mortgages.

... as does lending to emerging Europe

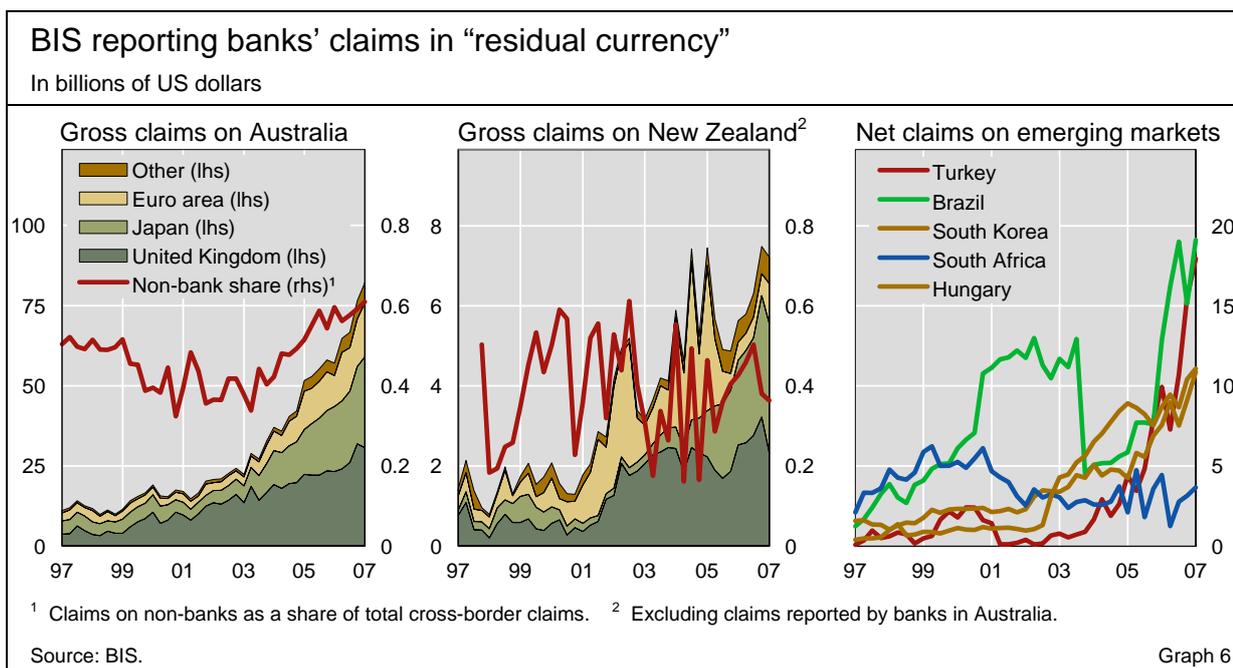
Tracking activity in target currencies difficult

Typically, mortgage loans in these countries are in domestic currency, but can be indexed to the Swiss franc or other foreign currency interest rates.

Tracking activity in potential target currencies is even more difficult because the BIS international banking statistics offer a less complete picture of activity in many of these currencies. Banks' on-balance sheet claims in sterling, for which information is available, have grown noticeably over the last five years, reaching \$2.2 trillion in the first quarter of 2007, or 7.3% of total gross claims in all currencies (up from 6% in 2002 Q2). Banks around the reporting area, particularly those in the euro area and Japan, channelled a total of \$127 billion to the United Kingdom over this period (Graph 3, bottom left-hand panel). These banks built up sterling positions on the asset side of their balance sheet, primarily by investing in debt securities issued by non-banks in the United Kingdom. However, as with the yen flows to the Caribbean, it is not possible to link this build-up explicitly to carry trades. Net sterling claims on these non-banks booked by banks in Japan almost tripled (to \$58 billion) between 2002 Q2 and 2007 Q1, while those booked by banks in the euro area more than quadrupled (to \$80 billion).

For many other target currencies, information is considerably less complete. For example, while it is impossible to calculate the total global positions in Norwegian kroner, the domestic currency positions reported by banks in Norway can be indicative, since greater liabilities reported by these banks could reflect carry trades placed by investors elsewhere. Banks in Norway have seen a sharp rise in their domestic currency liabilities to non-residents, from \$6 billion in early 2002 to \$40 billion in the first quarter of 2007. This outpaced greater cross-border claims by these banks, leading to a drop in their domestic currency cross-border net claims.

For other target currencies, reporting banks' cross-border positions in "residual currencies" can provide some information. This is because, in many cases, the residual currency is likely to be the domestic currency used in the



borrowing country. Thus, cross-border claims could in principle reflect investments in assets denominated in these potential target currencies, and thus be linked to banks' on-balance sheet carry trade activity. For example, BIS reporting banks' claims on residents of Australia in residual currencies have more than doubled in the past three years, to \$82 billion (Graph 6, left-hand panel). Elsewhere, reporting banks' net claims on residents of South Africa have changed little since 2004, but have grown to more than \$15 billion vis-à-vis residents of Brazil (Graph 6, right-hand panel).

Evidence from foreign exchange markets

Carry trades will involve foreign exchange transactions at some point. If the trades require simultaneous short forward positions in the funding currency and long positions in the target currency, data on the size of net open positions by currency on futures exchanges would be relevant. Alternatively, if borrowed funds are exchanged into the target currency on the spot market, foreign exchange turnover data would be informative. Activity in other instruments, such as foreign exchange swaps, may also increase if they are used by intermediating institutions for hedging foreign exchange exposures.

Data on the net open positions of non-commercial traders in different currency futures traded on the Chicago Mercantile Exchange have been the most widely used measure of carry trade activity in the futures market.⁸ However, these data should be interpreted with caution for several reasons. First, while non-commercial traders are generally associated with speculative activity, it is possible that some commercial traders also take speculative positions. Second, the trades identified as speculative may not result from carry trades. Finally, a comparison with statistics from the BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity shows that only a very small proportion of foreign exchange market activity is executed through exchanges.⁹

Data from futures markets ...

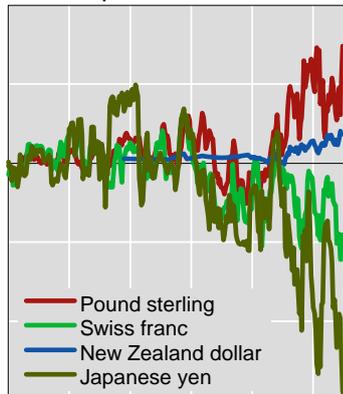
Subject to these caveats, however, the changes in net open futures positions are consistent with a build-up of carry trades over the past two years. The net long non-commercial open positions in sterling and the Australian and New Zealand dollars, and net short open positions in yen and Swiss francs, have increased significantly, particularly since the beginning of 2006 (Graph 7). Since then, the correlations between these net open positions and carry-to-risk ratios (against the yen for target currencies and against sterling for funding currencies) have generally been quite significant. For example, the correlation for Australian dollar positions is 0.55, and is 0.61 for sterling positions. In

⁸ By volume, the Chicago Mercantile Exchange is the most significant exchange for foreign exchange futures. Other exchanges with non-trivial volumes of futures trading include the Bolsa de Mercadorias e Futuros, the Budapest Stock Exchange, the Tokyo International Financial Futures Exchange, Euronext London and the New York Board of Trade.

⁹ That said, there is some evidence that arbitrage forces ensure that developments in the futures market reflect foreign exchange market activity. Furthermore, a large share of OTC turnover reflects traders' risk management activity (Klitgaard and Weir (2004)). Hence, activity in futures markets might have a significant impact on currency movements.

Foreign exchange market activity

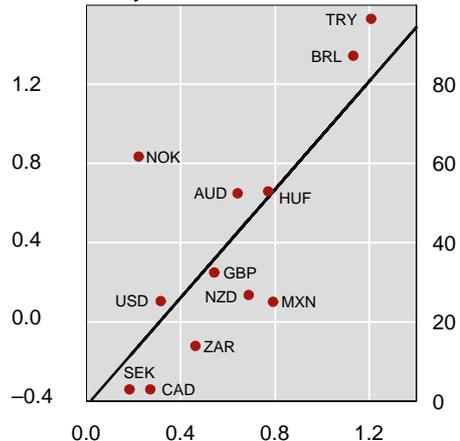
Futures positions^{1, 2}



Australian dollar



Carry-to-risk ratio and turnover⁵



¹ Net non-commercial long positions on the Chicago Mercantile Exchange; derived using average exchange rates of January 2007. ² In billions of US dollars. ³ Defined as the three-month interest rate differential against Japan divided by the implied volatility of the Australian dollar/yen exchange rate. ⁴ In tens of billions of US dollars. ⁵ The horizontal axis refers to the average carry-to-risk ratio for the period April 2004–April 2006. The vertical axis refers to the percentage change of the foreign exchange turnover for the period April 2004–April 2006.

Sources: CFTC; JPMorgan Chase; national data; BIS calculations.

Graph 7

contrast, the correlations for the yen and Swiss franc are -0.34 and -0.16 respectively, and appear to have become less significant over time.

Most foreign exchange trading is done over the counter in the form of spot and swap transactions. Unfortunately, the most consistent and comprehensive data, which provide significant detail along dimensions such as the currencies being traded and the nature of the counterparties, are only available at low frequencies.¹⁰ Higher-frequency data on turnover, available from some central banks, are useful for answering questions about the dynamics of foreign exchange markets, but generally contain less detail. A limitation of all these data is that they do not identify the nature of the trades or the counterparties involved, and thus provide only indirect evidence of carry trade activity.

Overall, turnover data from OTC markets support the conclusions reached using futures data. The snapshot of activity in OTC foreign exchange markets provided by the 2004 triennial survey indicated that while foreign exchange turnover had increased across all currencies since 2001, growth was stronger for currencies associated with high policy interest rates (Galati and Melvin (2004)). This positive relationship appears to have continued to hold between 2004 and 2006 for currencies where data are available (Graph 7).

For currencies where turnover data are available monthly, the strength of correlations between foreign exchange turnover and the carry-to-risk ratio varies, but is sufficiently high to suggest that turnover is related to the implementation of carry trade strategies. The highest correlation exists for the

¹⁰ The BIS triennial survey (BIS (2005)) collects separate data on transactions between banks, between banks and non-financial customers, and between banks and financial customers (eg hedge funds, CTAs, pension funds and insurance companies). Similar data for some large financial centres (Canada, Singapore, the United Kingdom and the United States) are also collected semiannually.

... and turnover in other foreign exchange markets ...

... indicate that carry trades have been important since 2004

Norwegian krone (0.79), followed by the Australian dollar (0.53), the South African rand (0.36), the Mexican peso (0.28) and the New Zealand dollar (0.24). It is also worth noting that the size of the correlation may be mitigated to some extent by the fact that turnover can increase at times of higher volatility, particularly in periods when the exchange rate falls sharply and activity may be generated by the unwinding of carry trade positions (Graph 7).

Conclusion

This feature employed several datasets, including the BIS international banking statistics and data on turnover in foreign exchange markets, in search of evidence on the importance of global carry trade activity. Although it is difficult to draw concrete conclusions based on these data alone, taken together they do shed light on specific market segments where carry trade activity is likely to be evident. The growth in carry trades funded in yen and Swiss francs has probably contributed to increased activity in these currencies in the international banking markets, and to turnover patterns in the derivatives and foreign exchange markets which roughly correlate with the attractiveness of these trades. That said, the available data do not allow for a more refined measurement of the size of carry trade positions.

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