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Dollar appreciation in 2008: safe haven, carry trades, dollar shortage and overhedging[1]

This feature argues that a combination of factors caused the surprising US dollar appreciation in the second half of 2008. Both the global flight to safety into US Treasury bills and the reversal of carry trades amidst the crisis were sources of dollar strength. In addition, the surge in dollar funding costs in the interbank and FX swap markets provided price incentives for corporates to draw on non-dollar funding to pay down existing dollar debt. Finally, dollar asset writedowns left European banks and institutional investors outside the United States with overhedged dollar books. The squaring of their positions, which required dollar purchases, also boosted the currency.

JEL classification: F3, G2.

The US dollar's appreciation in late 2008, as sharp as any in the period since generalised floating began in 1973, surprised many observers. After all, the most frequent global macroeconomic stress scenario before the eruption of the current crisis highlighted the risk of a sharp depreciation of the currency. Some ascribe the dollar's rise to technical factors (Bénassy-Quéré et al (2009)).

This feature argues that a combination of factors contributed to this surprising development. We first discuss the concept of safe haven and suggest that the US dollar benefited from the global flight to safety into US Treasury bills in late 2008. Then we present evidence that the dollar profited from the reversal of carry trades – the currencies that fell the most during the rise of equity volatility to its all-time peak in October 2008 offered the highest yields in the preceding six months. We then explain how a dollar shortage developed in the international banking market (despite years of US current account deficits) and resulted in high dollar interest rates that supported the currency. Finally, we argue that dollar asset declines left European banks and institutional investors outside the United States overhedged and that their squaring of their positions may have also boosted the dollar. As European banks wrote down the value of holdings of dollar securities, they had to purchase dollars in the spot market to retire the corresponding hedges or

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liabilities. Similarly, European pension funds bought the dollar as they experienced losses on dollar securities hedged into the euro.

Safe haven

For some economists, the term "safe haven" indicates an asset with low risk and high liquidity, like the 10-year German government bund, which non-residents bought during the LTCM/Russian crisis (Upper (2000)). A complementary formulation is that a safe haven asset is what investors buy in uncertain times like the turn of the year 2000, as Kaul and Sapp (2006) assume the dollar was. Others have defined a safe haven as a hedge asset, one with a return unrelated (or negatively related) to that of the reference portfolio. A more restricted version is a rainy day asset, ie one that performs well when the reference portfolio suffers significant losses (Ranaldo and Söderlind (2007)).

Taking refuge in a safe haven needs to be distinguished from another reaction to uncertainty, which has been called homing (Aderhold et al (1988)). After the stock market crash of 1987, for instance, investors tended to sell foreign equities. Since major stock markets had all fallen by similar degrees, this was interpreted as a decrease in the weight on foreign equities. Thus, for a time the crash's trauma heightened investors' bias to their home market.

Net securities flows in the US balance of payments

In billions of US dollars, annual rate

	Pre-crisis	Phase 1	Phase 2	Phase 3
	2006–Q2 2007	Q3 2007–Q2 2008	Q3 2008–Q4 2008	Q1 2009–Q2 2009
Securities, total by private investors	368.8	–36.0	358.4	–244.6
Foreign purchases of US securities	765.0	189.9	60.0	12.7
Treasury	–19.7	73.2	323.1	62.0
Coupon securities	–22.9	–10.3	49.9	73.5
Bills	2.1	83.5	273.0	–11.6
Agencies	20.9	–107.4	–183.0	–98.8
Corporate bonds	572.8	82.5	–78.5	–34.3
Equities	191.0	141.6	–1.6	83.8
US purchases of foreign securities	–396.1	–225.9	298.4	–257.2
Bonds	–247.7	–113.3	200.7	–179.1
Equities	–148.5	–112.6	97.7	–78.1
Memo:				
Foreign official assets in United States	*494.7*	*614.3*	*199.1*	*391.8*
Of which: Treasury bonds	*194.2*	*172.1*	*103.9*	*275.9*
Of which: Treasury bills	*–27.2*	*66.4*	*486.9*	*207.7*
US official assets abroad	*5.0*	*–62.1*	*–1,048.7*	*875.9*

Source: Bureau of Economic Analysis. Table 1

Flight to US T-bills amidst the turmoil

The recent financial crisis led to homing in global bond markets, but also to safe haven demand for US Treasury securities, especially bills (Table 1). With the intensification of the crisis after the Lehman Brothers bankruptcy, US investors sought to de-risk their portfolios by selling foreign bonds and stocks in the latter half of 2008. For their part, private foreign investors turned to selling US corporate bonds, including asset-backed securities, and accelerated their sale of agency mortgage-backed bonds and debentures.

In contrast to this homing, however, was the flight to quality by private foreign investors into Treasury securities. On these rainy days, the safe haven of Treasuries gained in value as equities plunged and credit spreads widened to record levels. While government bonds performed well in France, Germany, Japan, the Netherlands, Switzerland and the United Kingdom, the attraction of Treasury bills kept global investors from staging a general retreat from US securities. To the extent that global investors sold other currencies against the dollar to take refuge in Treasuries, safe haven flows strengthened the dollar.

Unwinding of carry trades

A second source of pressure for dollar appreciation was the unwinding of carry trades. In a carry trade, an investor holds a high-yielding ("target") currency asset financed with a low-yielding ("funding") currency liability. A classic carry trade would be to buy an Australian dollar bond yielding 5% with Swiss francs borrowed at 1%. The profit from such trades over extended periods stands in stark contradiction to one of the major theorems of international finance: interest rate parity holds that what investors gain on an interest rate differential they lose over some horizon to currency depreciation. Strictly speaking, this definition of carry trade is used for leveraged investors, but it has also been loosely applied to unleveraged investors, such as the Japanese housewife ("Mrs Watanabe") investing in Australian dollars rather than in low-yielding yen.

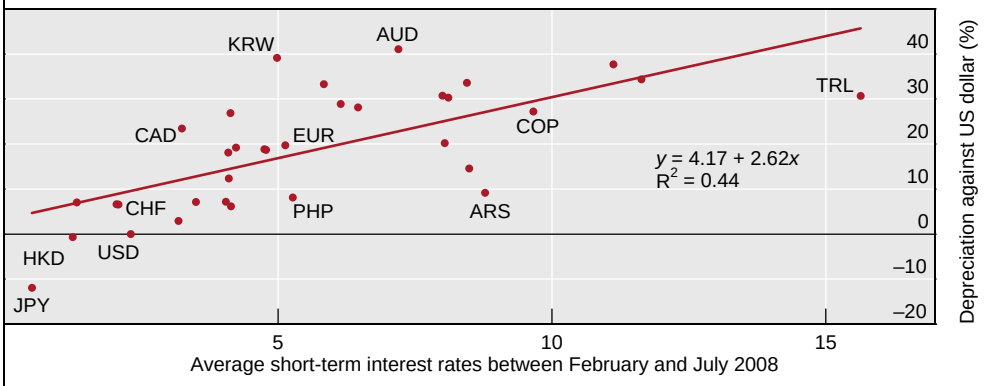
A safe haven currency can serve as the funding currency in carry trades. For example, Jordan (2009) emphasises structural features of Switzerland to explain why the franc serves as a safe haven: the country's political, institutional, social and financial stability, low inflation, confidence in the central bank, comfortable official foreign reserves, high savings and net foreign asset position. For a funding currency in carry trades, however, such structural features matter less than low yields. Japan and Switzerland may have much in common, but it is primarily low yields that have recommended the yen and franc as funding currencies.

Low yields ...

This distinction has a bearing on what one could have expected the effect of the sharp rise in market volatility in August 2008. The euro, the yen, and the dollar would all have been plausible candidates as safe haven currencies. However, previous episodes of extreme financial market volatility suggested that currencies would perform inversely to their prior yields, consistent with the unwinding of carry trades (Cairns et al (2007), Fender and Hördahl (2007), McCauley (2008)). When financial markets become very volatile, modest day-by-day yield differentials captured by carry trades pale in comparison to

Unwinding of carry trades with rising volatility

21 August–28 October 2008



Sources: IMF, *International Financial Statistics*; Bloomberg; BIS calculations. Graph 1

possible daily losses. It is understandable that investors would reduce such positions when the relationship of return to risk deteriorates. As a result, the target currencies that had offered the most lucrative yields would suffer the greatest depreciation, and the funding currencies would appreciate. The expectation based on the pattern of previous volatility spikes and on money market yields (in ascending order: yen, dollar, euro) was that the dollar would lose ground against the yen, but (unlike in previous episodes) gain ground against the euro. This proved to be the case. Declines in dollar interest rates by mid-2008 had already recommended the dollar to carry traders as a funding currency alongside the yen.

… make the dollar and yen funding currencies …

When equity volatility (as measured by the VIX index) rose from a local trough of 19 on 22 August 2008 to a then all-time high of 80 on 27 October, the higher a currency's yield in the previous six months (February–July 2008), the greater its depreciation against the dollar was (Graph 1).[2] Target currencies, ranging from the Brazilian real and Turkish lira to the Australian dollar, were hard hit as investors sold them against the dollar or yen. Compared to the more moderate previous spikes in the VIX, the extent of currency depreciation associated with 1 percentage point increases in yields was larger (ie the least squares line was steeper). In particular, along the least squares line, a target currency yielding 1% more depreciated by 2.6% more: 2.6 years of yield advantage ("carry") was taken back in this brief tumult. This is stark evidence of the "fat tail" of negative returns in the distribution of carry trade returns (Gyntelberg and Remolona (2007)).

… which appreciate when markets become volatile

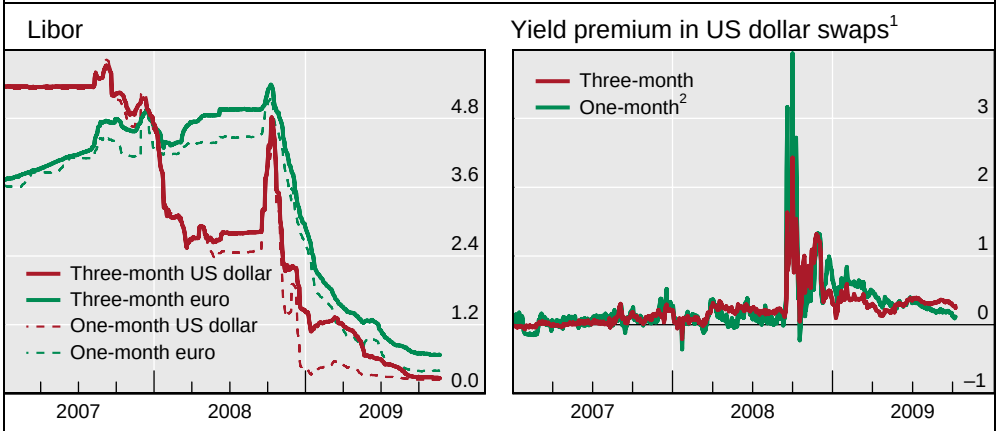
Dollar shortage

While the US dollar went into September 2008 with low money market yields, the subsequent scramble for the currency hiked dollar yields and rendered it operationally hard to borrow. Both price and quantity rationing provided a third source of support to the dollar's exchange rate.

[2] The observations would line up the same way if the euro or the yen were used as the numeraire.

Libor and dollar swap yield premium

In per cent



[1] Weighted by 2007 FX swap turnover. The sample is made up of Australia, Brazil, Canada, Denmark, the euro area, Hong Kong SAR, India, Japan, Korea, Mexico (only three-month panel), New Zealand, Norway, Singapore, South Africa, Sweden, Switzerland and the United Kingdom. Weights are derived from swap turnover in April 2007. [2] Includes the countries in footnote 1 and Bulgaria, Chile, Colombia, Croatia; the Czech Republic, Estonia, Hungary, Iceland, Poland, Romania and Turkey.

Source: BIS calculations. Graph 2

Losses on banks' balance sheets …

The dollar shortage – an acute difficulty for banks to raise dollars – reflected unbalanced growth in international banking. In expanding abroad in this decade, European banks accumulated dollar assets well beyond their dollar deposits, and funded the difference in the interbank and other wholesale markets. By contrast, US banks expanded their foreign claims modestly and ended up with comparatively little need for funding in European currencies.

The global financial crisis exposed the vulnerability of banks that relied on wholesale funding, especially in a currency other than their domestic currency. From August 2007, the prospect of having to fund off-balance sheet entities and the fear of the exposure of financial firms to impaired assets led interbank markets to dry up. After the bankruptcy of Lehman, a run on many US money market funds put at risk a trillion dollars of European banks' funding.

Much like Japanese banks 12 years ago, European banks that found it hard to raise funds in the interbank market relied more on secured funding markets, such as repos and foreign exchange swaps. As they swapped euros, pounds and Swiss francs for dollars, however, there was no matching new demand for European currencies by US banks. As a result of this demand-supply imbalance, and despite years of US current account deficits, the global banking system suffered from an acute US dollar shortage. The cost of dollar funding in the global foreign exchange swap market soared (Graph 2).

… push up borrowing costs for *all* dollar borrowers …

This shortage, and high dollar yields in the market, contributed to a sharp appreciation of the currency in late 2008. Companies around the world that had been financing inventories or international trade in dollars found it hard to roll over maturing dollar debts and faced price incentives to draw on funding in other currencies to pay down such debts.[3] While there might have been an

… leading to repayment of dollar advances

[3] Banks in the United States report that dollar claims on non-banks outside the United States fell from $684 billion to $478 billion in the second half of 2008, according to TIC data.

unusual degree of quantity rather than price rationing, one would expect dollar appreciation as these firms bought dollars in the spot market.

Overhedging: non-US banks

Losses on dollar assets unbalance books ...

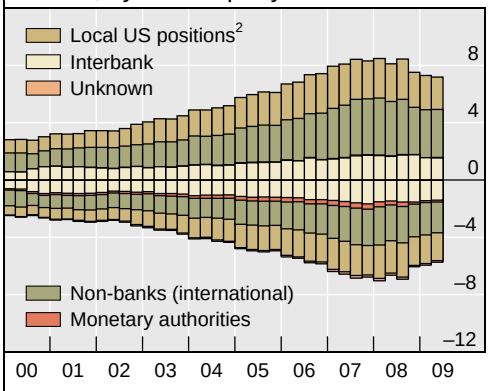
A fourth source of upward pressure on the US dollar arose as a result of the retirement of dollar debt in parallel with the recognition of losses on dollar securities by non-US banks. As noted, in the years to mid-2007, many banking systems invested heavily in US dollar assets (Graph 3, left-hand panel), funding these positions by borrowing dollars directly from a variety of counterparties, and via cross-currency financing using foreign exchange swaps (Graph 3, right-hand panel).[4]

As these non-US banks wrote down dollar assets, they had to square their books in a way that contributed to the upward pressure on the dollar. Writedowns for the banking systems in Graph 3 totalled an estimated $361 billion from the onset of the crisis to end-2008, and $434 billion by the

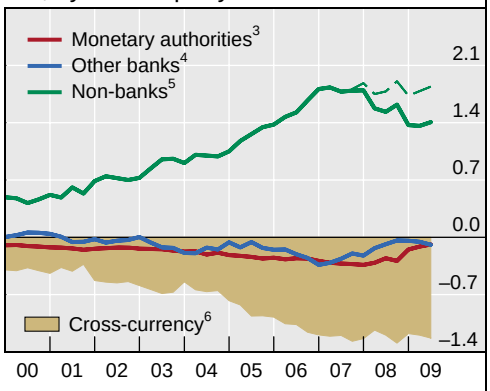
Selected banks' USD balance sheet positions[1]

In trillions of US dollars

Gross, by counterparty sector



Net, by counterparty sector



[1] Estimates are constructed by aggregating the on-balance sheet cross-border and local positions reported by Canadian, Dutch, German, Japanese, Swiss and UK banks' offices. [2] US dollar positions vis-à-vis US residents booked by banks' offices in the United States. No counterparty sector breakdown is available for these positions. [3] Cross-border positions in all currencies and local positions in foreign currencies vis-à-vis official monetary authorities. Excluding liabilities to Japanese monetary authorities placed in banks located in Japan. [4] Estimated net interbank lending to other (unaffiliated) banks. [5] The net position vis-à-vis non-banks is estimated as the sum of net international positions vis-à-vis non-banks and net local US positions (vis-à-vis all sectors). The dashed green line is the estimate after adding back in writedowns of assets (Bloomberg), the bulk of which are assumed to be writedowns of US dollar-denominated assets. [6] Implied cross-currency funding (ie FX swaps) which equates gross US dollar assets and liabilities.

Sources: Bloomberg; BIS consolidated statistics (immediate borrower basis); BIS locational statistics by nationality. Graph 3

According to BIS data, banks outside the United States report that their dollar claims on non-banks outside the United States decreased by $115 billion in the same period.

[4] Graph 3 shows the aggregate US dollar balance sheet positions for those major banking systems which were long dollars prior to the crisis, ie whose on-balance sheet dollar assets exceeded their dollar liabilities, implying net dollar financing from the FX swap market. These estimates are constructed by splicing together information from the BIS consolidated banking statistics (immediate borrower basis) and the BIS locational banking statistics by nationality. See McGuire and von Peter (2009) for details.

end of Q2 2009 (right-hand panel, gap between solid and dashed green lines). These writedowns left banks that originally balanced their US dollar assets and liabilities with an excess of dollar liabilities over dollar assets – an "overhedged" dollar position. This imbalance could be redressed by not rolling over dollar debt and instead buying dollars outright in the spot market to repay debt. Such spot buying of dollars strengthened the dollar.

... forcing dollar purchases by non-US banks ...

Overhedging: non-US institutional investors

... and institutional investors

A fifth source of upward pressure on the US dollar is a variation on the fourth, with the actors being "real money" institutional investors rather than leveraged banks. To limit the foreign exchange risk in holdings of US securities, long-term investors like pension funds in Europe and Australia sell dollars forward against domestic currencies. In Australia, about half of non-bank financial firm holdings of foreign securities are hedged back into domestic currency, evidently more so in the case of bonds than equities.[5] As the price of US equities and credit portfolios declined in the latter half of 2008, such hedges needed to be adjusted downwards, ie the portfolios became overhedged. Operationally, maturing forward sales of dollars that in more stable markets would be rolled forward (through foreign exchange swaps) were simply extinguished through spot purchases of dollars.

Of course, such dynamics would not put net upward pressure on the dollar if US portfolios of European and other non-US securities were of similar size and management. Such a notion of symmetry led some European institutional investors to approach their US counterparts, such as state employee and teachers' pension funds, about the possibility of swapping dollars and euros bilaterally, given the disruption in the markets. The Europeans learned that the European holdings of their US counterparts were smaller than their US holdings, and also typically not currency-hedged. Thus, it appears that dynamic currency hedging of European and Australian portfolios of US securities may exert an exchange rate effect because there is not symmetrical and offsetting hedging by large US portfolios. Thus, when US equity and risky bonds fell in value in the second half of 2008, pension funds outside the United States bought dollars, contributing to dollar strength.

Conclusion

The factors described above[6] played an unusual role in the second half of 2008. Under normal circumstances, expectations of monetary policy changes,

[5] The Australian Bureau of Statistics surveyed pension funds, mutual funds and other non-bank financial institutions in 2005 and found that about half of their foreign assets were hedged (Becker et al (2005)). Market data reported by Baker and Wong (2009) suggest that pension funds hedged almost all of their foreign bond portfolios back into Australian dollars, but hedged only a little under half of their foreign equity portfolios. Hedge ratios remain high (Australian Bureau of Statistics (2009)).

[6] Ours is not an exhaustive list. See Jara et al (2009) for a description of foreign exchange option structures that led to dollar obligations by many emerging market companies, another case of overhedging.

the strength of investment demand, the stance of fiscal policy and long-run accumulation of international assets and liabilities figure more prominently in exchange rate developments.

Looking ahead, the factors reviewed in this special feature make for crosswinds for the dollar. Safe haven flows that favoured the dollar have been reversing (FOMC (2009)). Carry trades always defy measurement, but such positions, with the dollar as a funding currency, are thought to be increasing, putting upward pressure on higher-yielding currencies. In contrast, while the spread between Libor and expected overnight rates has normalised, the premium on dollars in swap markets is still providing some support to the dollar. Writedowns of dollar assets by non-US banks continue, albeit at a reduced pace, and are said to have some way to go (IMF (2009)). And, at writing, with asset prices rising, hedging of dollar holdings in the United States by European and Australian institutional investors weighs on the dollar.

It is worth noting that, at current US yields, carry trades *and* institutional investors' hedges respond similarly to big changes in asset prices and volatility. In particular, when equities fall, risk appetite shrinks and volatility is increasing, dollars are bought by *both* types of investors, as in late 2008; with "risk on", equity prices rising and declining volatility, dollars are sold by *both*, albeit perhaps at different frequencies.

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