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The spillover of money market turbulence to FX swap and cross-currency swap markets[1]

We analyse the spillover of the turmoil in money markets in the second half of 2007 to FX swap and long-term cross-currency basis swap markets. We find that the use of swap markets to overcome US dollar funding shortages by non-US financial institutions resulted in marked deviations from covered interest parity conditions and the impairment of liquidity in these markets.

JEL classification: G12, G14, G15.

Foreign exchange (FX) and related derivatives markets are some of the most liquid markets in the world. The growth of interest rate and FX/currency swaps is often cited as a factor promoting the further integration of global financial markets.

This article documents the spillover of the turmoil in money markets in the second half of 2007, particularly in the US dollar, euro and sterling, to FX swap and cross-currency basis swap markets. Our analysis of swap market deviations from covered interest parity and the impairment of liquidity in the swap markets is consistent with anecdotal market observations that dollar funding shortages of non-US financial institutions were largely responsible.

In the next section, we review the money market turbulence in four currencies: US dollar, euro, pound sterling and Japanese yen. In the second section, we assess the effects on short-term FX swap markets in terms of deviations from no-arbitrage conditions between cash and swap-implied interest rates, as well as measures of changing liquidity. The third section discusses the related developments in cross-currency basis swap markets, which are more commonly used than FX swap markets at longer maturities. The final section concludes.

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Turbulence in money markets

Widening spreads of interbank rates over OIS rates

Spreads of interbank interest rates over overnight index swap (OIS) rates and treasury bill rates widened substantially in early August 2007 and then persisted at higher levels (Graph 1). As discussed in Michaud and Upper (in this issue), this probably reflected a combination of factors, including increased demand for term funding liquidity and rising credit risk premia. Market concerns were particularly acute prior to the turn of the year. While the Libor-OIS spread declined markedly in early 2008, as of mid-February it was still greater than at the beginning of 2007.

Movement in dollar market is larger and earlier …

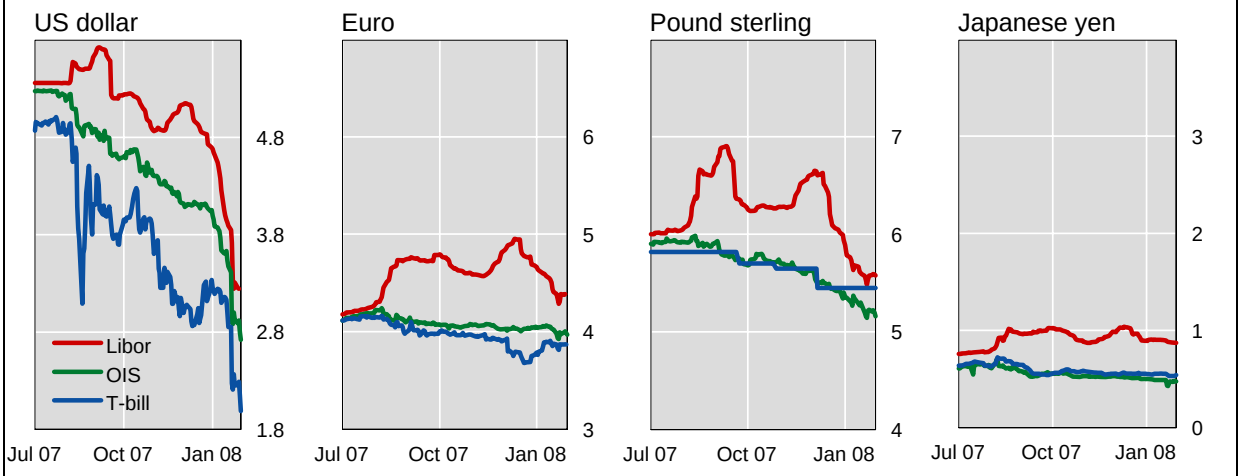
Comparing money market indicators across the dollar, euro, sterling and yen, it appears that while the direction of movements has followed the same general pattern, the magnitude and timing of the moves have often differed significantly across currencies. The Libor-OIS spread has been largest in the dollar and sterling markets, in the range of 25–110 basis points, followed by the euro, where the spread has fluctuated roughly within a 20–90 basis point range since the turmoil began. By contrast, the yen Libor-OIS spread has remained within a much smaller range of 20–50 basis points. As for the timing of the surge in the Libor-OIS spreads, the most significant jump came earlier for the dollar than for sterling and the euro.

… possibly reflecting dollar funding shortages

An important aspect of the turbulence was a shortage of dollar funding for many financial institutions: frequently reported were efforts by European financial institutions to secure dollar funds to support US conduits for which they had committed backup liquidity facilities.[2] At the same time, the usual suppliers of dollar funds to the interbank market were looking to conserve their liquidity, due to their own growing needs and increased concerns over counterparty credit risk. Facing these unfavourable demand/supply conditions

Three-month interest rates

In per cent



Source: Bloomberg.

Graph 1

[2] See eg "Central bank action calms investor nerves" (Financial Times, 13 August 2007) or "Fed-ECB currency swap politically tricky" (Reuters, 13 August 2007). See also the discussion of US dollar funding in the international interbank markets in the Highlights (this issue).

in the interbank market, many non-US financial institutions moved to actively convert euro into dollar liquidity through FX swaps (ECB (2007)). Exactly how this can occur, and the potential impact on the pricing of swaps, is discussed in the next section.

Spillover to FX swap markets

An FX swap is a bilateral contract where different currencies are exchanged by combining FX spot and forward contracts (see Box). As assets in one currency serve as collateral for securing obligations in the other, FX swaps are effectively collateralised transactions, although the collateral does not necessarily cover the entire counterparty risk.[3]

Using FX swaps to raise foreign currencies

FX swaps are a means of raising foreign currencies

Financial institutions can use FX swaps to raise foreign currencies from other funding currencies. More specifically, financial institutions with a need for foreign currency funds face a choice between borrowing directly in the uncollateralised cash market for the foreign currency, or borrowing in another (typically the domestic) currency's uncollateralised cash market, and then converting the proceeds into a foreign currency obligation through an FX swap. In this article, we call the total funding cost of the second alternative the "FX swap-implied rate".

For instance, when a financial institution raises dollars via an FX swap using the euro as the funding currency, it exchanges euros for dollars at the FX spot rate, while contracting to exchange in the reverse direction at maturity at the FX forward rate. Thus, the FX swap-implied dollar rate from the euro can be defined as

$$F/S\left(1+r_{EUR}\right) \tag{1}$$

where S and F represent the FX spot and forward rates between the euro and dollar and r_{EUR} is the uncollateralised euro funding rate. F/S corresponds to the euro/dollar forward discount rate and is used for the FX swap price quotation.[4] In the same manner, we can calculate the FX swap-implied dollar rates from other funding currencies including sterling and the yen. (Financial institutions with global networks often compare cash rates for a target currency and different FX swap-implied rates based on an *array* of funding currencies.)

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[3] For instance, if the counterparty were to default at some future time during the contract period, the party would need to reconstruct the position at the current market price, which entails replacement cost. Duffie and Huang (1996) show that FX and cross-currency swaps are typically subject to significantly more exposure to counterparty risk than are interest rate swaps, due to the exchange of notional amounts.

[4] More precisely, the price of FX swaps is quoted as $F–S$. The swap price data we use in this article are NY composite rates taken from Bloomberg, where the composite bid rate is equal to the highest bid rate of all 34 currently contributing financial institutions and the composite ask rate is the lowest ask rate offered by these same financial institutions. We take the average of the bid and ask as of 17:00 New York time. Since the Libor fixing is done slightly after 11:00 London time (06:00 NY time), the time difference between FX forward discount rates and Libor might cause more volatility in the FX swap-implied dollar rates than otherwise.

The use of the FX swap market to raise dollars should depend on relative costs. When the FX swap-implied dollar rate for a given currency is less than the cost of uncollateralised dollar funds, institutions would tend to borrow on an uncollateralised basis in that currency and use the FX swap market to raise dollars. Likewise, a higher FX swap-implied dollar rate would discourage the use of FX swaps in financing. The equality of dollar and FX swap-implied rates defines a condition of indifference. In terms of the euro/dollar pair, this condition can be written as

$$1 + r_{USD} = {}^{F}\!/_{S}\left(1 + r_{EUR}\right) \qquad (2)$$

The covered interest parity (CIP) condition

which is actually equivalent to the covered interest parity (CIP) condition.

Covered interest parity

CIP postulates that interest rate differentials among currencies should be perfectly reflected in the FX forward discount rates. Arbitrage arguments are often invoked in support of CIP. For instance, if the dollar cash market rate is lower than the FX swap-implied dollar rate from the euro in equation (2), financial institutions should increase dollar funding from the cash market instead of the FX swap market until the dollar cash rate rises to the same level. Were CIP to hold, then the FX swap-implied dollar rate as defined above should be equal to the dollar cash rate, dollar Libor in our case.[5]

A number of studies have attempted to assess the degree to which the short-term CIP hypothesis is supported by the data. Most of them show that the deviations from the short-term CIP have diminished significantly among G10 currencies. However, one notable study by Taylor (1989) finds that, despite increasing efficiency in FX markets, deviations from CIP tend to rise during periods of uncertainty and turbulence,[6] and persist for some time before they are arbitraged away.

Deviations from CIP tend to arise during periods of turbulence

For CIP to hold strictly depends on minimal transaction costs, as well as the lack of political risk, credit/counterparty risk, liquidity risk and measurement error.[7] Needless to say, none of these assumptions are fail-safe, and some may have been particularly problematic during the period of financial stress under review.

Reasons CIP might not hold include …

While transaction costs and political risk are largely negligible in today's G10 currency markets, credit/counterparty risk may have increased

… counterparty risk …

[5] The use of an uncollateralised rate such as Libor in combination with FX swap prices to calculate implied rates is broadly consistent with market practice. To be sure, not every institution necessarily uses Libor in calculating the FX swap-implied dollar rate. Some use estimates of their own internal (uncollateralised) funding costs, but these naturally are not available to us. As long as the base currency is funded in uncollateralised markets, the FX swap-implied dollar rate should also include a risk premium and maintain comparability to uncollateralised dollar market rates such as dollar Libor.

[6] For instance, significant deviations were observed on such occasions as the flotation of sterling in 1972 and inception of the European Monetary System in 1979 (Taylor (1989)).

[7] Another risk of possible importance to FX swaps is settlement risk (Herstatt risk), given that two legs of an FX transaction are often settled in two different time zones at different times. However, given that this risk is likely to be highly correlated with and difficult to distinguish from credit/counterparty and liquidity risks, we do not discuss it further.

significantly in the second half of 2007 (Michaud and Upper (in this issue)). To the extent that credit/counterparty risk was concentrated on one end of the FX swap market, a deviation from CIP could have occurred. For instance, if European financial institutions on the dollar borrowing side of the FX swap market were perceived as exceptionally risky by US financial institutions on the dollar lending side, then risk premia could have been added to FX swap price.[8] This would have increased the FX swap-implied dollar rate above dollar Libor.

... liquidity risk ...

Liquidity risk too may have played a role, particularly if market liquidity was impaired due to outsized or one-sided order flow, with effects compounded by perceptions of increased counterparty risk. In the above-mentioned case of dollar funding shortages of European financial institutions, their order flow for dollars in the FX swap market was reported to have surged, due to constraints on borrowing in the uncollateralised dollar interbank market. At the same time, suppliers of dollar funds to the FX swap market, typically US financial institutions, may have become more reluctant to extend their swap lines, particularly when concerns about counterparty risk had increased. The resulting dislocations could have led FX swap-implied dollar rates to exceed dollar Libor.

... and measurement error

Finally, measurement error could have been heightened as well. During the recent turmoil, dollar Libor may have underestimated the dollar funding costs that European financial institutions actually faced. As argued in Gyntelberg and Wooldridge (in this issue), the non-binding nature of Libor, where institutions contributing to the Libor survey are not obliged to transact at the rates they report, may lead to biased quotes on the part of institutions wary of revealing information that might increase their borrowing costs in times of stress. This factor alone could have created a spread between the FX swap-implied dollar rate and dollar Libor.

FX swap-implied US dollar rates

Graph 2 plots the FX swap-implied dollar rates calculated from Libor of the euro, sterling and yen, respectively, against dollar Libor. The term of all the rates is three-month.

In the first half of 2007, we see that the FX swap-implied dollar rates from the euro and sterling moved together quite closely with dollar Libor. For the yen, the spread was negative in the first quarter of 2007, then slightly positive, but never ranged beyond 5–10 basis points. These results suggest that CIP broadly held for these currency pairs in the period preceding the turbulence.

Spreads between FX swap-implied dollar rates and dollar Libor rose from 9 August ...

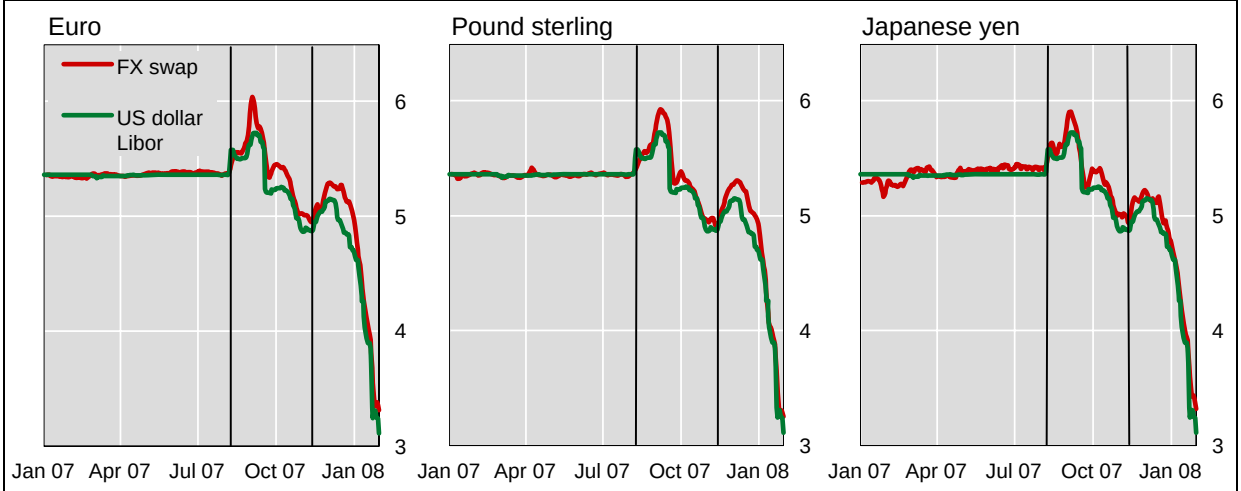
For all three potential funding currencies, the spreads between the FX swap-implied dollar rates and dollar Libor rose considerably from 9 August, moving up from July levels by close to 35 basis points in the euro, 25 basis points in sterling, and 15 basis points in the yen.[9] The homogeneity and the

[8] As discussed in footnote 3, FX swaps are not entirely free from counterparty risk.

[9] The relative quiescence of the yen/dollar swap represents a stark contrast to the late 1990s, when a so-called "Japan premium" – due to perceived differences in counterparty risk between Japanese and other financial institutions – was observed in global cash markets.

Three-month FX swap-implied US dollar rates[1]

In per cent; five-day moving averages



[1] The two vertical lines indicate 9 August and 14 November 2007; for the pound sterling, correction is made for the difference in calculation basis (360 or 365 days).

Sources: Bloomberg; BIS calculations. Graph 2

direction of the spread movement across currency pairs are supportive of the view that the source of volatility in FX swap markets was dollar funding shortages. Also supportive is the fact that the differences of FX swap-implied euro rates (from sterling and the yen) and euro Libor rates were quite small and stable over the same period. While the dollar spreads declined considerably in late September and October, from the middle of November there was resurgence towards earlier peaks in the case of the euro and sterling. After the beginning of 2008, the spreads tightened again.

… consistent with one-sided order flow

The above deviations are consistent with anecdotal evidence that, during the recent money market turmoil, European financial institutions that needed US dollars, but faced heightened concerns over their own counterparty/credit risk in dollar cash markets, turned to the FX swap market to raise dollars using both the euro and sterling as funding currencies. Movements in the FX swap price away from CIP conditions may have reflected a shift towards one-sided order flow in the FX swap market, with liquidity further impaired by the fact that institutions under increasing scrutiny for counterparty risk were concentrated on the dollar borrowing side of the market as well. Another, complementary explanation is that reported Libor was less representative of actual interbank rates during the times of particular stress, and the gap may have become greater for dollar Libor than Libor for other currencies.[10] In any case, the FX

Hanajiri (1999) argues that the FX swap-implied dollar rate from the yen diverged substantially from the baseline dollar rate in the late 1990s due to the Japan premium.

[10] A differential effect for dollar Libor is unlikely to stem from panel composition effects, since 14 out of 16 panel banks are the same across the dollar, euro and sterling panels. Rather, to the extent measurement error was a factor, it was probably due to the cost of funds being misstated by dollar Libor (more than by the posted interbank rates of other currencies) for the same set of banks.

swap-implied dollar rates appeared more sensitive to the increased demand for dollar funding than reported dollar Libor rates.[11]

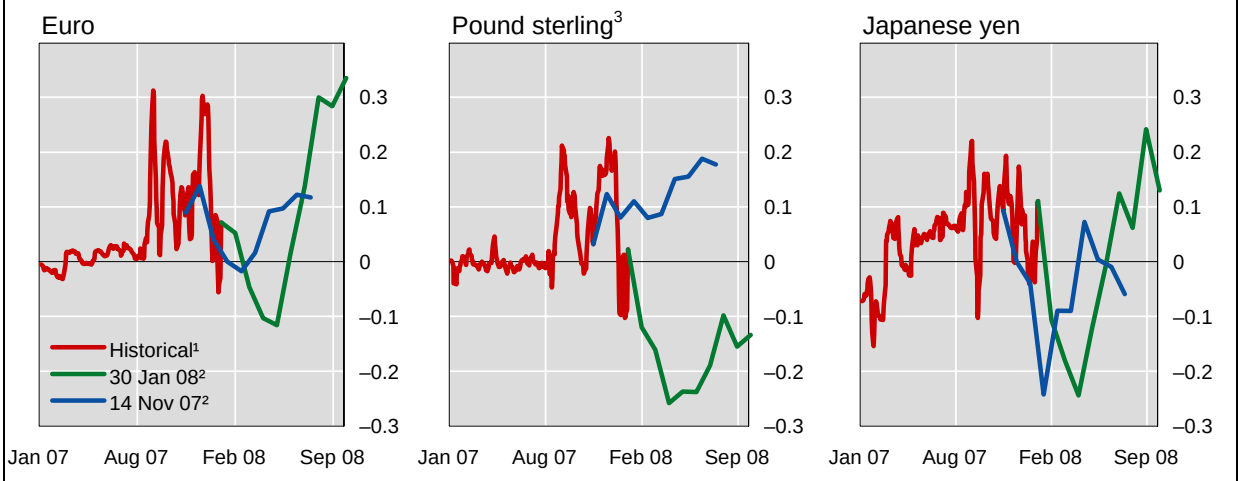
Though the degree of divergence from CIP was smaller than in the case of the euro and sterling, even the FX swap-implied dollar rates from the yen showed some such deviations, suggesting that FX swaps in yen were also used in increased volumes to secure dollar funding. This might seem surprising at first sight since Japanese financial institutions did not seem to face as much difficulty in securing dollar funding as did their euro area and UK counterparts. However, in early September and towards year-end, there were anecdotal reports of certain European financial institutions with access to the yen money market swapping considerable amounts of yen into dollars to meet their dollar funding needs.[12] In contrast to the other FX swap markets, the spread between the FX swap-implied dollar rate from yen and dollar Libor became miniscule starting in November and December, suggesting that the reliance on the yen swap market to fund demand for dollar liquidity had greatly receded by then.

Some European banks swap yen into dollars to meet funding needs

Owing partly to concerted measures by the central banking community to ease liquidity concerns in the money markets, as described in Borio and Nelson (in this issue), implied forward spreads between the FX swap-implied dollar rates and dollar Libor shifted downwards significantly as the new year began (Graph 3). However, as of end-January, they still seemed to signal

Spreads between FX swap-implied rates and Libor

In per cent



[1] Three-month spreads between FX swap-implied US dollar rates and US dollar Libor; five-day moving averages. [2] Implied three-month forward spreads between FX swap-implied US dollar rates and US dollar Libor; calculated from the term structure of the spreads on the indicated dates. [3] Correction is made for the difference in calculation basis (360 or 365 days).

Sources: Bloomberg; BIS calculations. Graph 3

[11] Ideally, observing intraday movements of FX swap-implied dollar rates would give us a deeper insight into the US dollar funding needs of specific borrowers. However, intraday cash rates consistent with the intraday FX forward discount rates were not available.

[12] Market participants also suggest that Japanese banks, anticipating the increased demand of European financial institutions in the yen/dollar FX swap market, made efforts to secure necessary dollar funding using FX swaps ahead of the fiscal half-year-end (September) and calendar year-end.

expectations of a resurgent demand in the swap market for dollar liquidity later in 2008, particularly via the euro/dollar and yen/dollar pairs. These developments were broadly in line with the view of many market participants that tight liquidity conditions in the FX swap market might return over the course of 2008.

Impaired liquidity

Impaired liquidity in FX swaps involving dollars …

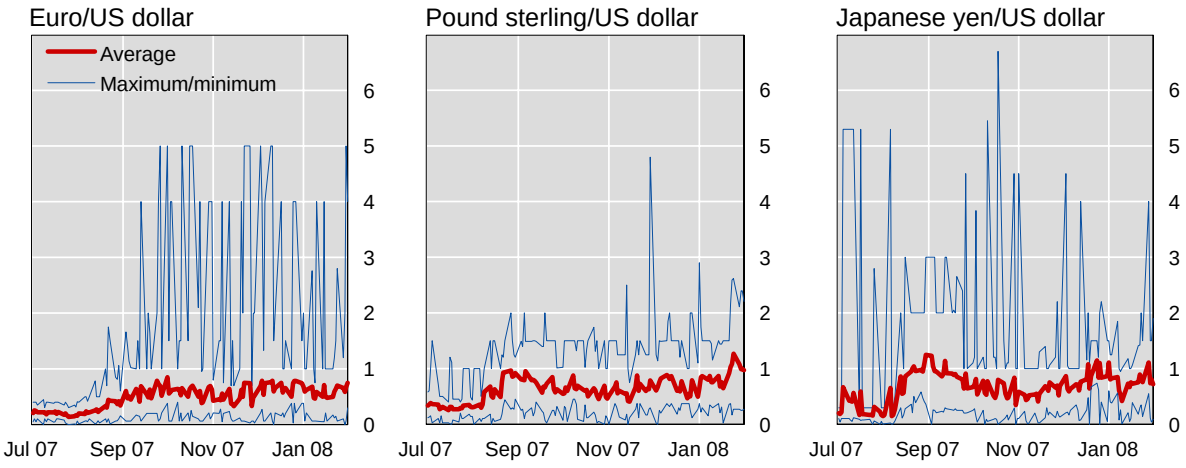
As discussed above, impaired market liquidity – more likely under conditions of increased counterparty risk – can lead to deviations from CIP. In fact, in addition to cases of liquidity crunches across fixed income and other markets, such as the LTCM episode in 1998, there have also been episodes of greatly reduced liquidity in the FX market (Lyons (2001)). And as we have just documented, during the recent period of financial stress, coinciding with the strong demand for dollar funds by European financial institutions, the prices of FX swaps involving dollars appear to have been disproportionately affected.

To be sure, measurement error provides another possible explanation for the deviations from CIP we have documented over the period. But if the deviations from CIP were purely a function of measurement error, observed liquidity in the FX swap markets per se should not have been affected. Thus, a direct examination of liquidity conditions in the FX swap market is called for.

In the absence of actual transaction data, one method of gauging liquidity is to examine quoted bid-ask spreads. Graph 4 presents the average and the range of quoted bid-ask spreads on the FX forward discount rates (the standard price metric for FX swaps) for the euro/dollar, sterling/dollar and yen/dollar pairs.[13] We find that average bid-ask spreads widened in the FX

Bid-ask spreads for three-month FX forward discount rates

In pips[1]



[1] A pip is the smallest price change that a given FX rate can make. For most major currency pairs, including the ones in this graph, one pip corresponds to the change of the fourth decimal point. Pip values can differ depending on the currency pairs, following the difference between the base currency and the terms currency.

Sources: Bloomberg; BIS calculations. Graph 4

[13] Here we use hourly closing bid-ask spreads from Bloomberg, meaning the last quoted indication for each hourly band.

swap markets, starting just around the time that significant spreads emerged between FX swap-implied rates and dollar Libor as shown in Graph 3.[14] The average bid-ask spread moved up from mid-August onwards by nearly 50% for both the euro/dollar and sterling/dollar pairs. The average yen/dollar bid-ask spread has also moved up from the lows of July and early August. In all of the charted currencies, the shift up of bid-ask spreads still persisted as of the beginning of 2008.

… as evidenced by widening bid-ask spreads

The range of bid-ask spreads has widened sharply as well, as evidenced by the blue lines in Graph 4, which plot the minimum and maximum spreads for forward discount rates during each business day. The upward shift in the range is particularly large for the euro/dollar swap, with bid-ask spreads of up to 5 pips seen on repeated occasions after September 2007. The range moved up more gradually for the sterling/dollar in August, but then was maintained through the beginning of 2008.

Spillover to the cross-currency basis swap market

Cross-currency basis swaps

Turbulence spills over to cross-currency basis swaps …

The longer-term cross-currency basis swap market was also affected by the turmoil in money markets. When market participants wish to commit to an exchange of foreign currency obligations over a term of one year or more – say, for the purpose of hedging foreign currency assets or liabilities – they often resort to the cross-currency basis swap market (see Box).[15] In such a swap contract, parties effectively borrow from each other in different currencies, exchanging principals at both the start and maturity of the swap, as well as regular interest rate payments, where the underlying index is Libor or some other interbank standard. Since the amount of future principal payment is fixed at the start of the contract, cross-currency basis swaps are largely free from FX risk in its traditional sense, as are FX swaps.[16] Though the structure is different from FX swaps, cross-currency basis swaps in many respects serve the same economic function as FX swaps.

… which have greater liquidity at longer maturities

The cross-currency basis swap market, because it has greater liquidity than straight FX swaps over all maturities of one year or more, is the main source of data for tests of long-term CIP.[17] Popper (1993) and Fletcher and

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[14] This is consistent with FRBNY (2007), which states that trading liquidity in the FX swap market was severely impaired particularly from mid-August to mid-September.

[15] There are numerous types of cross-currency swap contracts, among which the most widely used in recent years is the cross-currency basis swap.

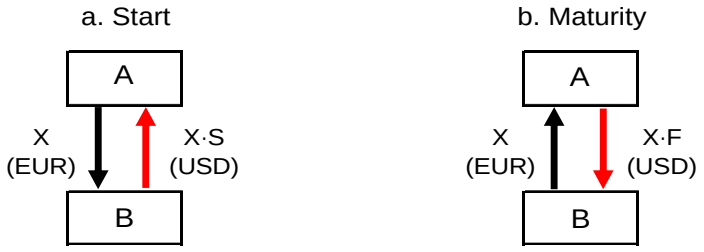
[16] In the case of cross-currency basis swaps, the interest payments are subject to FX risk. Furthermore, cross-currency basis swaps involve the same degree of counterparty risk as FX swaps, which is described in footnote 3 above.

[17] Amatatsu and Baba (2007) compare price discovery between cross-currency basis swap and long-term FX swap contracts of the same maturity in which the US dollar and Japanese yen are exchanged. They find that the cross-currency basis swap market plays a more dominant

The basic mechanics of FX swaps and cross-currency basis swaps

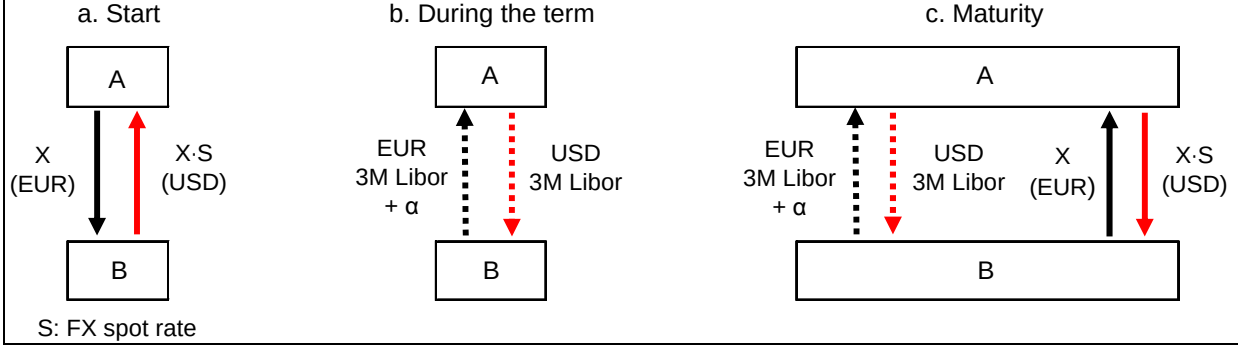
An FX swap agreement is a contract in which one party borrows one currency from, and simultaneously lends another to, the second party. Each party uses the repayment obligation to its counterparty as collateral and the amount of repayment is fixed at the FX forward rate as of the start of the contract. Thus, FX swaps can be viewed as FX risk-free collateralised borrowing/lending. The chart below illustrates the fund flows involved in a euro/US dollar swap as an example. At the start of the contract, A borrows X·S USD from, and lends X EUR to, B, where S is the FX spot rate. When the contract expires, A returns X·F USD to B, and B returns X EUR to A, where F is the FX forward rate as of the start.

FX swaps have been employed to raise foreign currencies, both for financial institutions and their customers, including exporters and importers, as well as institutional investors who wish to hedge their positions. They are also frequently used for speculative trading, typically by combining two offsetting positions with different original maturities. FX swaps are most liquid at terms shorter than one year, but transactions with longer maturities have been increasing in recent years. For comprehensive data on recent developments in turnover and outstanding in FX swaps and cross-currency swaps, see BIS (2007).



A cross-currency basis swap agreement is a contract in which one party borrows one currency from another party and simultaneously lends the same value, at current spot rates, of a second currency to that party. The parties involved in basis swaps tend to be financial institutions, either acting on their own or as agents for non-financial corporations. The chart below illustrates the flow of funds involved in a euro/US dollar swap. At the start of the contract, A borrows X·S USD from, and lends X EUR to, B. During the contract term, A receives EUR 3M Libor+ α from, and pays USD 3M Libor to, B every three months, where α is the price of the basis swap, agreed upon by the counterparties at the start of the contract. When the contract expires, A returns X·S USD to B, and B returns X EUR to A, where S is the same FX spot rate as of the start of the contract. Though the structure of cross-currency basis swaps differs from FX swaps, the former basically serve the same economic purpose as the latter, except for the exchange of floating rates during the contract term.

Cross-currency basis swaps have been employed to fund foreign currency investments, both by financial institutions and their customers, including multinational corporations engaged in foreign direct investment. They have also been used as a tool for converting currencies of liabilities, particularly by issuers of bonds denominated in foreign currencies. Mirroring the tenor of the transactions they are meant to fund, most cross-currency basis swaps are long-term, generally ranging between one and 30 years in maturity.



Taylor (1994, 1996), using cross-currency swap prices in the late 1980s and early 1990s, found that non-negligible deviations existed from the CIP condition at various times, but that such deviations diminished over time.

The conventional quoting procedure for cross-currency basis swaps is as follows. A yen/dollar 10-year basis swap, for instance, might be quoted as yen Libor minus 5 basis points versus dollar Libor flat. This means that the lender/borrower of dollar/yen funds is obligated to pay yen Libor minus 5 basis points every three months in exchange for receiving dollar Libor flat. In this fashion, the prices for swaps involving the dollar (–5 basis points in the above case) turn negative if there is strong demand for dollars and consequently a willingness to receive less in interest rate payments on the funds lent in other currencies.

Basis swap prices and liquidity

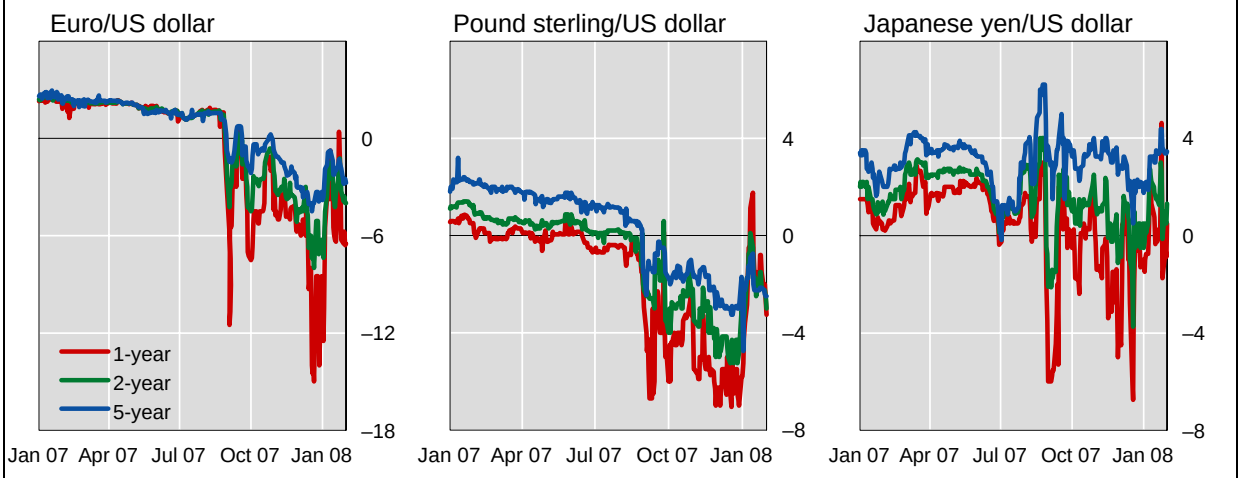
Basis swap prices traded in negative territory ...

The movements of basis swap prices over the one-, two- and five-year tenor for the euro/dollar, sterling/dollar and yen/dollar pairs are shown in Graph 5.[18] In the case of the euro/dollar, it is clear that, starting from the end of August, the basis swap of all tenors began to trade in significantly negative territory, falling by more than 10 basis points in only a few days for the one-year basis swap.

Movements in the basis swap market appear to have been affected by the deviations from (short-term) CIP documented earlier. Table 1 shows the result of tests of Granger causality between the deviation of FX swap prices from CIP

Cross-currency basis swaps

In basis points



Source: Bloomberg.

Graph 5

role in price discovery, in that cross-currency basis swaps contribute more to the volatility of the efficient price common to both swaps.

[18] The basis swap prices are also NY composite prices as of 17:00 New York time taken from Bloomberg.

Granger causality test between FX swap and cross-currency basis swap

Funding currency	Period	Causality	
		FX swap to basis swap	Basis swap to FX swap
Euro	2 Jan – 8 Aug 07	12.17**	6.87
	9 Aug 07 – 31 Jan 08	14.43**	0.15
Pound sterling	2 Jan – 8 Aug 07	2.13	0.22
	9 Aug 07 – 31 Jan 08	19.58**	1.95
Japanese yen	2 Jan – 8 Aug 07	0.15	3.58
	9 Aug 07 – 31 Jan 08	23.15**	0.00

The maturities of the FX swap and cross-currency basis swap are three months and one year, respectively. Figures denote the chi-squared statistics from VAR Granger causality/Block exogeneity Wald tests. * and ** indicate significance at the 5% and 1% level, respectively. Lag length is chosen by the Schwarz information criterion.

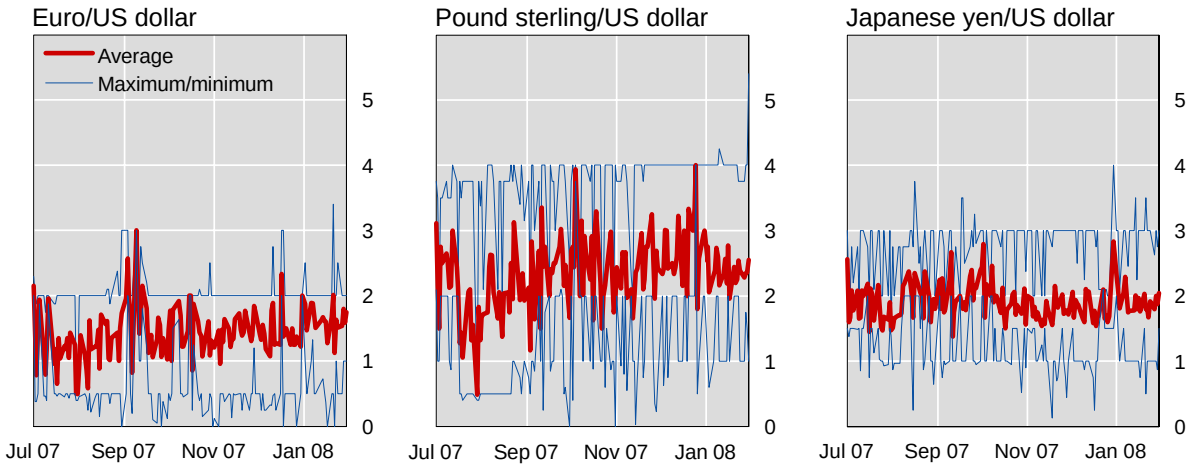
Table 1

and basis swap prices for each funding currency.[19] Using data for the period preceding the turbulence in early August 2007, a significant lead-lag relationship is found from the FX swap to the basis swap only for the euro. During the turmoil, however, all the currencies show that cross-currency basis swaps lagged significantly behind the movement of FX swaps. This suggests that FX swaps were the avenue for spreading turbulence from money markets to long-term cross-currency basis swap markets. One of the reasons for this suggested by market practitioners is that some European financial institutions turned from short-term dollar funding through FX swaps to longer-term funding through currency basis swaps, once they realised that the financial turmoil would last longer than initially expected.

... as turbulence spread through the FX swap market

Bid-ask spreads for one-year cross-currency basis swaps

In basis points



Sources: Bloomberg; BIS calculations.

Graph 6

[19] As mentioned earlier, the time zone difference between FX forward discount rates (17:00 New York time) and Libor fixing (slightly after 11:00 London time) might generate a bias in estimation results. But the changing pattern of causality during the period of financial turmoil is less likely to be affected by this factor, because we use the data consistently during the whole period.

Graph 6 shows the bid-ask spreads for one-year basis swaps.[20] Average bid-ask spreads as well as their range rose to some extent from mid-August for the euro/dollar and sterling/dollar swap, but declined soon thereafter for the euro/dollar. The degree of impairment of liquidity in the cross-currency basis swap market thus appears to have been less significant than that documented for FX swaps.

Comparison with the Japan premium episode

In order to provide one perspective on the magnitude of the price movements in cross-currency basis swaps, it is useful to compare the recent episode with the Japan premium episode in the late 1990s. At that time, due to a substantial deterioration of their creditworthiness, Japanese banks found it difficult to raise foreign currencies in global cash markets.

The euro/dollar basis swap price dropped sharply ...

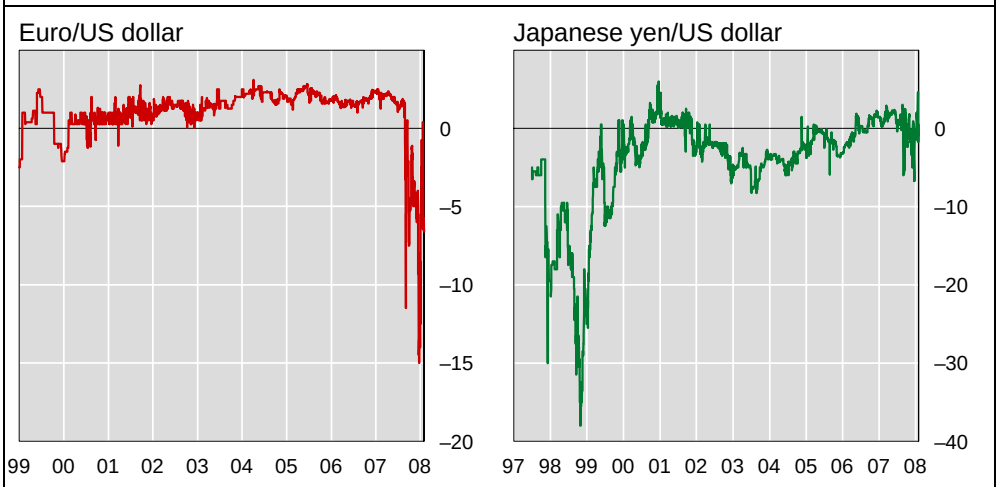
Graph 7 plots the prices of one-year basis swaps for the euro/dollar and yen/dollar pairs since the late 1990s. We find that, except for the period immediately preceding early 2000, the basis swap price for the euro/dollar pair stayed in a narrow range of 0–2.5 basis points until 2007. From the end of August 2007, however, the euro/dollar price moved into negative territory to an unprecedented degree, reaching around –15 basis points in late November.

... though not as much as that for the yen/dollar in the late 1990s

By contrast, the basis swap price for the yen/dollar pair showed a dramatic decline from late 1997 to early 1999, going below –30 basis points. During this period, Japanese banks were known to have turned to the cross-currency basis swap market to secure long-term dollar funding using their ample yen deposits for their funding currency. The comparison between the two episodes tells us that, while the recent distortion of basis swap prices for the euro/dollar pair is particularly large by its own historical standards, it remains significantly less than the price movements seen for the yen/dollar pair in the late 1990s.

One-year cross-currency basis swaps

In basis points



Source: Bloomberg.

Graph 7

[20] As is the case with the bid-ask spreads for FX forward discount rates, we use hourly closing bid-ask spreads, taken from Bloomberg.

Conclusion

We have documented that the turmoil in the money market from the second half of 2007 spilled over not only to FX swap markets, but also to the cross-currency basis swap market. The evidence is consistent with the view that the FX swap market was increasingly used by financial institutions to overcome dollar funding shortages, which resulted in marked deviations from covered interest parity conditions and an impairment of liquidity in the FX swap market from early August. Much less well known is the fact that by early September the turbulence had spread further to the longer-term cross-currency basis swap market. An unprecedented movement in the euro/dollar basis swap price reflected a surge in demand for dollar term funding relative to that of the euro. However, the degree of the distortion did not reach that seen for the yen/dollar pair in the late 1990s.

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