

Recent Trends in Cross-currency Basis

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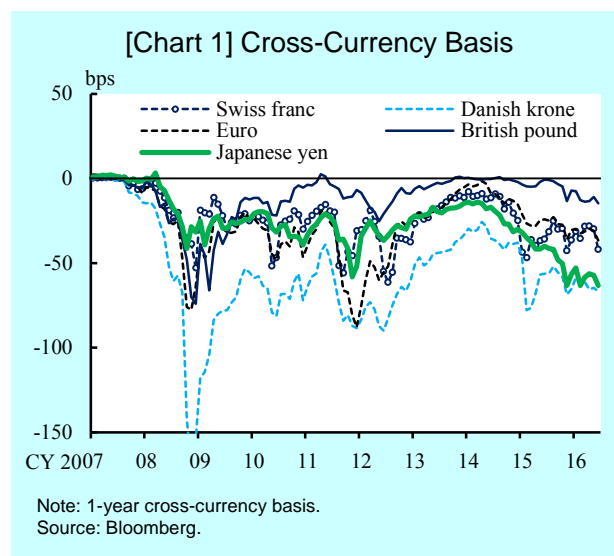
The cross-currency basis, which is the basis spread added mainly to the U.S. dollar London Interbank Offered Rate (USD LIBOR) when the USD is funded via foreign exchange (FX) swaps using the Japanese yen or the euro as a funding currency, has been widening globally since the beginning of 2014. This development is driven by (1) increased demands for U.S. dollars resulting from a divergence in the monetary policy between the U.S. and other advanced countries, (2) global banks' reduced appetite for market-making and arbitrage due to regulatory reforms, and (3) the decrease in the supply of U.S. dollars from foreign reserve managers/sovereign wealth funds against the background of declines in commodity prices and emerging currency depreciations.

Recent Widening of Cross-currency Basis

Foreign exchange swaps or cross-currency basis swaps (collectively referred to as FX swaps) are often used as a tool for foreign-currency funding or currency-risk hedging by banks and institutional investors. FX swaps are contracts in which one party simultaneously borrows one currency and lends another currency to a second party. The amount of repayment is fixed at the FX forward rates as of the starting date; thus, FX swaps can be viewed as FX-risk-free collateralized lending.¹

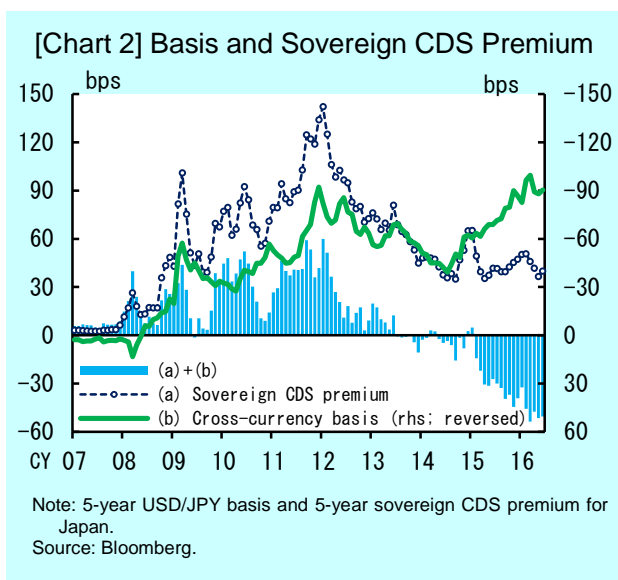
The spread added to the USD LIBOR when USD is funded via an FX swap (for example, a USD/JPY or a EUR/USD swap) is called the "cross-currency basis." The cross-currency basis has been widening for most currencies since the beginning of 2014; typically banks operating outside the U.S. have been paying larger costs compared with banks operating inside the U.S. when they borrow U.S. dollars (Chart 1).

As most global financial transactions are denominated in U.S. dollars, USD funding demand tends to be strengthened in the FX swap market. Despite potentially strong USD demand, the cross-currency basis theoretically shrinks to zero by arbitrage trading activities if the FX swap and U.S. money markets are not segmented and there are no concerns regarding counterparty credit risks. This



relation is called covered interest rate parity (CIP). For instance, if the cross-currency basis widens, one party can earn profits without risks by borrowing U.S. dollars in the money market and providing them in the FX swap market. If these activities increase, such deviations from the CIP converge to zero.

This also means that a wide basis typically implies market stress, such as heightened concerns regarding counterparty risks. During the global financial crisis of 2008–2009 and the Euro area sovereign debt crisis of 2011–2012, the cross-currency basis in major currencies had widened amid risk aversion, which was shown in the sharp rises of credit risk indicators such as sovereign and bank credit default swap (CDS) premia (Chart 2).² Market participants mutually



suspected their counterparties' credits and took a reluctant stance of cash lending, which led to a systemic USD shortage in the money market, including FX swaps. In this situation, the amounts of bids for USD funds-supplying operations by the European Central Bank (ECB) and the Bank of Japan significantly increased.

Conversely, since the beginning of 2014, the cross-currency basis has widened despite stable credit risk indicators and no significant USD funding shortages among banks.³

Instead, the recent basis widening appears to be driven by demand/supply factors, including the decrease in arbitrage activities. In particular, market participants indicate the three main drivers of this widening as follows: (1) increased USD demand in Japan and Europe against the backdrop of monetary policy divergence among advanced economies; (2) global banks' reduced appetite for market making or arbitrage trading due to the effect of regulatory reforms; and (3) the decrease in USD supply from real money investors, including foreign reserve managers. This review examines these possible drivers of the recent widening of the cross-currency basis.

Monetary Policy Divergence and Increased USD Demand

The first driver of a cross-currency basis widening is the monetary policy divergence among advanced countries. Non-U.S. investors have increased their investments in USD-denominated assets, and the portion of these investments that is hedged for FX risk or funded via FX swaps exerts a widening pressure on the basis. Further, some corporate issuers, U.S. corporations in particular, have increased the issuance of EUR-denominated bonds and have swapped these

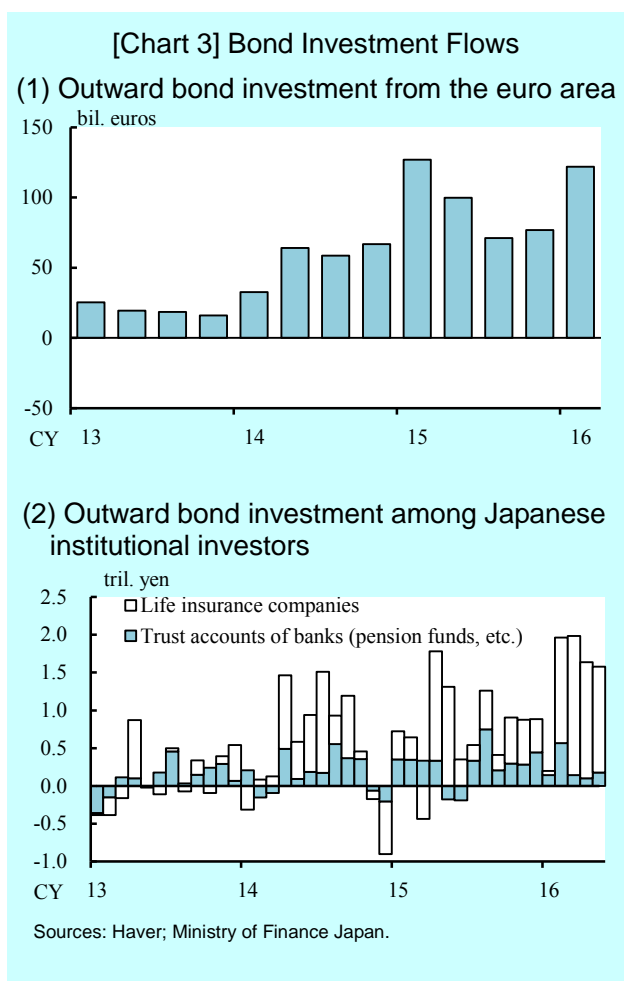
EUR proceeds into USD, which also drives the basis widening.

Investors' Demands for USD-denominated Assets

The relative attractiveness of USD-denominated assets has increased due to monetary policy divergence. In the situation that Japanese or European government bond yields are extremely low, investors in those area have searched for higher-yielding assets and actively invested in USD-denominated bonds (Chart 3). Japanese banks also continue to increase lending denominated in foreign currencies.

The investment in USD-denominated assets that is not hedged for FX risk affects the FX spot rates. Conversely, the hedged investment is economically equivalent to the transaction that one party borrows USD via FX swaps using JPY or EUR as collateral and invests in USD-denominated assets. An increase of these investments is one of the drivers of the wide basis.

Looking at foreign investments by Japanese financial institutions, pension funds basically invest in foreign assets without hedging FX risks while life insurance companies hedge around 70% of their



foreign bond investments according to their annual reports. Banks also do not seem to take FX risks. The Bank of Japan's Financial System Report estimates that the amount of foreign currency funding by Japanese financial institutions via FX swaps has an increasing trend, indicating that it is one of the triggers for the basis widening.⁴ It has also been pointed out from market participants that life insurance companies in Europe have also increased hedged foreign investments.

Corporate FX-hedged Bond Issuance

The divergence in monetary policy among advanced countries affects corporate issuers' funding activities, which also increases USD demand in the FX swap market (Chart 4).

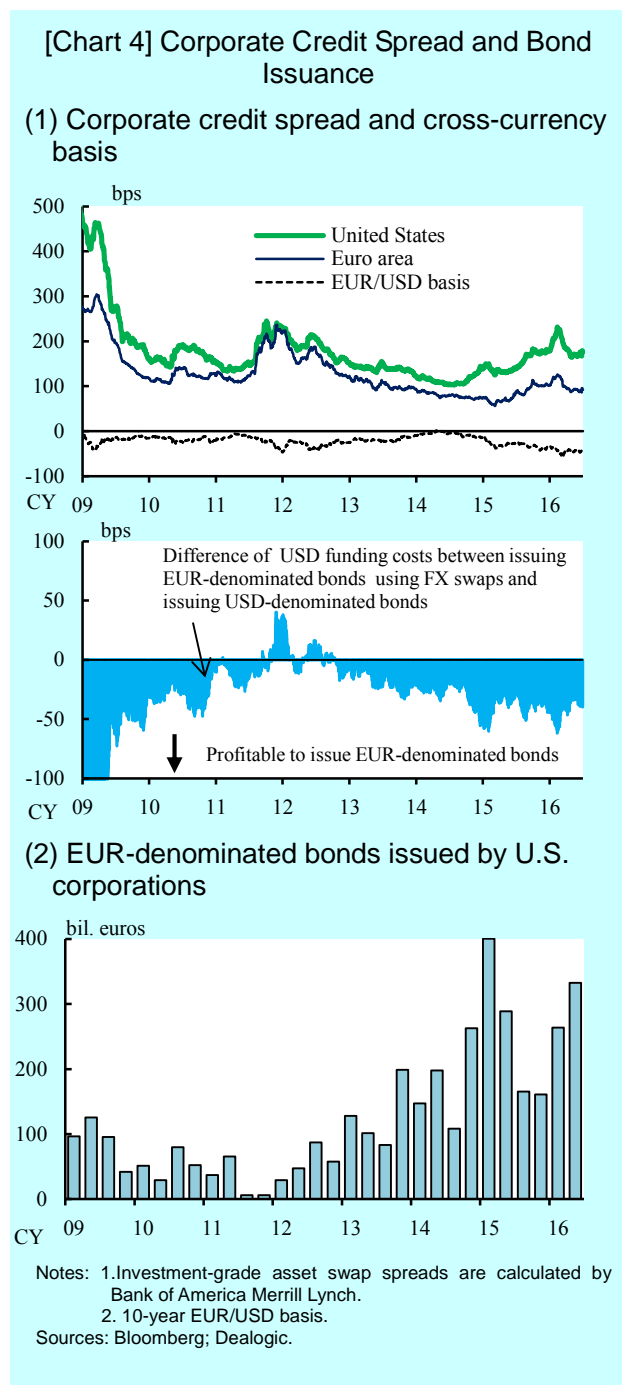
Corporate credit spreads in euro areas are lower than those in the U.S. as the ECB is expanding its asset purchase program while the U.S. Federal Reserve Board (FRB) is taking a step to normalize its monetary policy stance. In this situation, corporate issuers, U.S. corporations in particular, occasionally fund the USD by (1) issuing EUR-denominated bonds and (2) swapping these EUR proceeds into USD via FX swaps. The USD funding cost via this method is often more advantageous than that of the direct issuance of USD-denominated bonds. Consequently, the issuance of EUR-denominated bonds by U.S. corporations has increased, inducing the increased demand for USD in the EUR/USD swap market.

Similar issuances were seen in the JPY corporate bond market, albeit in much smaller amounts. Some overseas companies focused on Japan's low corporate credit spread and increased the issuance of JPY-denominated corporate bonds on the premise of swapping the raised JPY to USD.

In sum, USD demand in the FX swap market has increased against the background of activities by global investors and corporations, which has caused a widening pressure on the cross-currency basis.

Reduced Appetite for Arbitrages and the Decline in Market Liquidity

The second driver of the recent basis widening is considered to be the fact that global banks have taken a more reluctant stance in market making alongside arbitrage trading activities due to the effects of regulatory reforms. Under these circumstances, market liquidity in FX swaps has deteriorated, which amplifies the widening of the basis.

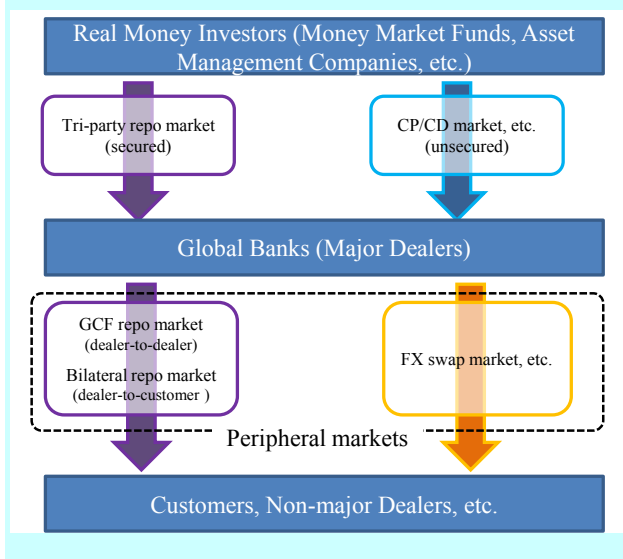


Market-making Activities in the U.S. Money Market

The FX swap market is regarded as a "peripheral" part of the U.S. money market in the sense that (1) real money investors do not act as main USD suppliers and hence (2) USD supply relies on the market-making/arbitrage-trading activities of global banks (Chart 5).

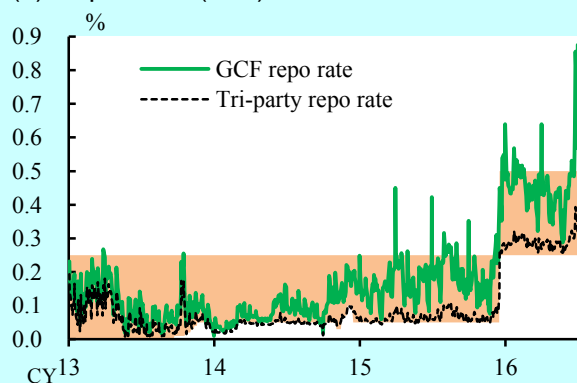
In the U.S., since the middle of 2014, overnight rates have tended to spike at quarter-ends in "peripheral" markets such as FX swaps and the general collateral finance (GCF) repo markets (Chart 6).

[Chart 5] Flow of Cash in the U.S. Money Market

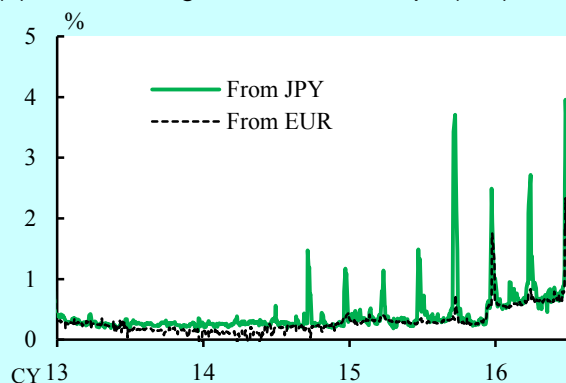


[Chart 6] U.S. Money Market Rates

(1) Repo rates (O/N)



(2) USD funding costs via FX swaps (1W)



Notes: 1. In the upper chart, shaded area indicates the corridor between interest rates on excess reserves (upper part) and reverse repo rates (lower part; rates before their introduction <before September 23, 2013> are considered as zero). Repo rates for U.S. Treasury collateral.
2. In the lower chart, USD funding costs are those of borrowing JPY (EUR) at LIBOR rates and swapping the cash into USD via FX swaps.

Sources: Bloomberg; BNY Mellon; BOJ.

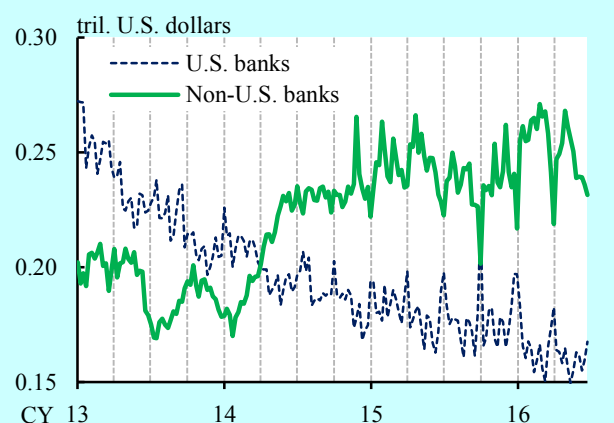
The main driver of the quarter-end spikes of funding costs in "peripheral" markets is likely to be the balance sheet management by global banks, as

detailed below:

- (1) Since 2013, U.S. banks have deleveraged due partly to the stricter leverage ratio in the U.S. (in which a higher ratio is required, and is calculated on the basis of daily averaged assets).
- (2) Although non-U.S. banks, European banks in particular, had increased positions in the U.S. money market, they have started to shrink their assets at quarter-ends since the middle of 2014, partly to keep the leverage ratio at quarter-ends low (in many countries, although not the U.S., banks report only the leverage ratio at quarter-ends).
- (3) At quarter-ends, U.S. banks increase market-making and arbitrage-trading activities in the money market at higher rates, reflecting regulatory charges.

These activities are shown in the balance sheet data of banks operating in the U.S.: the stricter regulations for U.S. banks have shifted positions in U.S. money markets to non-U.S. banks; however, at quarter-ends, this shift is partly reversed (Chart 7).

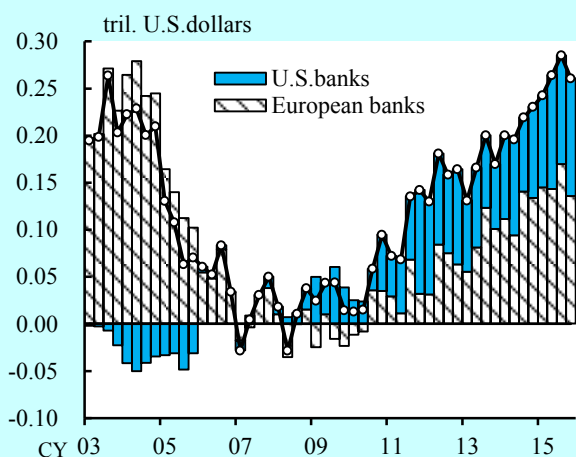
[Chart 7] Market Volume in the U.S. Money Market



Note: Outstanding amounts of interbank loans and Fed funds alongside repos with non-banks.
Source: FRB.

There seems to be a similar trend in the FX swap market. Chart 8 illustrates the estimated quarter-end USD supply by U.S. and European banks in the USD/JPY swap market, which is calculated by subtracting JPY-denominated liabilities from JPY-denominated assets (assuming that the residual amount of yen is funded via FX swaps) using Bank for International Settlements (BIS) global banking statistics. Looking at the chart, while this analysis is subject to a margin of error,⁵ the amount of USD supplied by U.S. banks at quarter-ends has increased, whereas that supplied by European banks has remained flat since the middle of 2014.

[Chart 8] USD Supply from Foreign Banks via USD/JPY Swaps



Source: BIS.

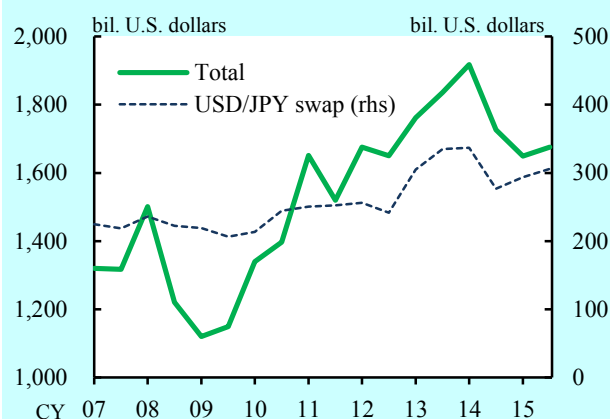
Impacts on Market Liquidity

The changes in global banks' activities are likely to lower the liquidity in the FX swap market through several channels.

BIS, among others, indicated possible (intended) effects of regulatory reforms on market liquidity in fixed-income markets. They argued that newly introduced regulations, such as leverage ratio requirements and the Volker rule, might have reduced the appetite for market making and therefore might have lowered the market liquidity.⁶ A similar mechanism might work in the FX swap market. For instance, regulatory reforms, such as the introduction of a leverage ratio requirement, would reduce arbitrage trading activities between the FX swap market and the money market due to the increased cost of expanding balance sheets. In fact, the transaction volume in the FX swap market reached a peak at the beginning of 2014 and has been leveling off (Chart 9).

In addition to the direct impacts of regulatory reforms, the increased uncertainty of USD funding rates at quarter-ends as shown above may decrease global banks' market-making activities for FX swaps with longer tenors. This is because the FX swap market makers regularly cover their positions using short-term FX swaps that have relatively high liquidity. Thus, under uncertainty regarding quarter-end rates, it is difficult for market makers to quote bid/ask prices for term instruments over quarter-ends with narrow spreads, which seems to lower the market liquidity. This tendency has been observed from 2015 in the USD/JPY swap market where rate spikes over quarter-ends have been notable

[Chart 9] Transaction Volume in the FX Swap Market



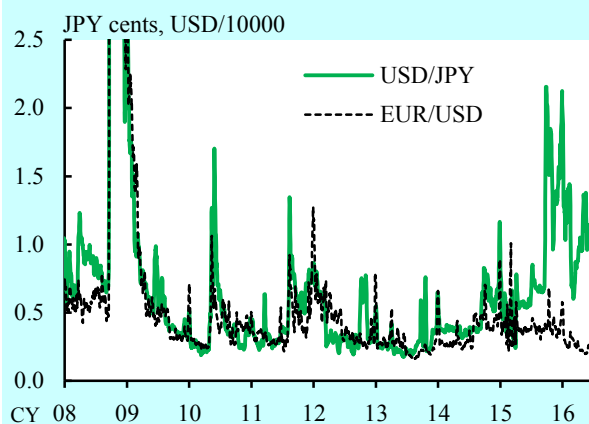
Note: Transaction volume is the total of average transaction volume per day for London, New York, Singapore, Sydney and Tokyo markets. Double counting of each transaction volumes between the markets is not adjusted.

Source: Foreign Exchange Committee of each country.

(Chart 10).

The reduced appetite for arbitrage trading and market-making activities and the decline in market liquidity are thought to amplify the cross-currency basis widening; compared with in the past, the basis easily widens under small demand/supply shocks.⁷

[Chart 10] Bid-Ask Spread



Note: Bid-ask spreads are 5-day moving average of intraday bid-ask spreads of 3-month currency forwards. Intraday bid-ask spread is the average of the hourly bid-ask spread. Closing prices are used for days where hourly data were unavailable.

Source: Bloomberg.

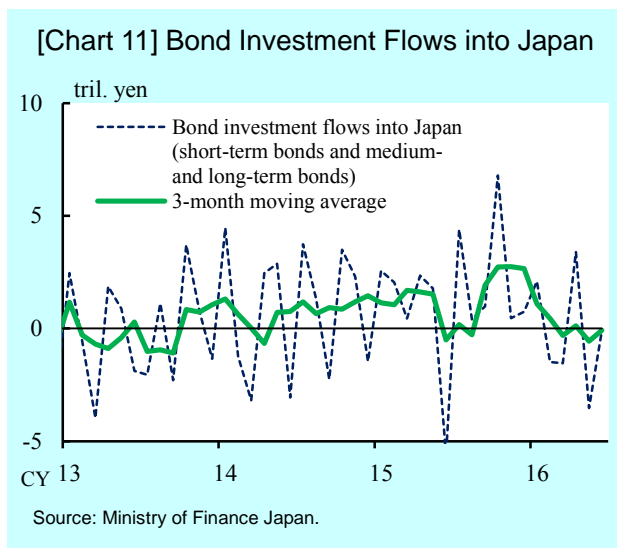
Decrease in USD Supply from Real Money Investors

The third driver of the widening cross-currency basis is thought to be that foreign reserve managers and sovereign wealth funds in emerging countries might have recently become reluctant to supply U.S. dollars in the FX swap market.

In case that the cross-currency basis is wide, USD

holders can fund yen or euros with lower rates via FX swaps. For example, real money investors, including foreign reserve managers, have earned higher yields than U.S. treasuries without taking FX risks by funding yen with low rates in the USD/JPY swap market and investing in Japanese government bonds (JGBs). The increased "FX-hedged investments in JGBs" had expanded the USD supply in the FX swap market, curbing cross-currency basis widening.

Market participants indicate, however, that from the summer of 2015, real money investors -- including foreign reserve managers -- have sometimes restrained the supply of U.S. dollars in the FX swap market. In fact, the bond investment flows to Japan, including FX-hedged investments, showed a trend of inflows from the beginning of 2014 when the widening cross-currency basis was first observed. Yet such investment inflows were temporarily curbed in the middle of 2015 and the beginning of 2016 (Figure 11).



This development seems to occur against the backdrop of an extreme drop in value of emerging currency and commodity prices. For example, foreign reserve managers are incentivized to invest in more liquid USD-denominated assets, including demand deposits or T-bills, instead of supplying U.S. dollars via longer-term FX swaps if their need to intervene in the FX market to protect the currency increase. Furthermore, if fiscal balances worsen against the backdrop of the decline in commodity prices, sovereign wealth funds might decrease their funds for investments or heighten USD liquidity preference in order to support their fiscal balances.

Concluding Remarks

This review examined the possible drivers of the recent widening of the cross-currency basis. Specifically, (1) the increased demands for USD in

Japan or Europe against the backdrop of monetary policy divergence among advanced countries is thought to be a USD demand-side factor. In addition, (2) the global banks' reduced appetite for market-making or arbitrage-trading activities due to the effects of regulatory reforms, and (3) the possible decrease in USD supply from foreign reserve managers and sovereign wealth funds are thought to be a USD supply-side factor. Given the changes in the foreign currency funding environment and Japanese banks' investment and funding structure with regard to foreign currencies, Bank of Japan's Financial System Report summarizes the tasks and challenges for Japanese banks in terms of foreign currency liquidity risk management.⁸

The examinations in this review lead to important points to consider for future developments regarding the cross-currency basis.

First, careful attention should be continuously paid to how concerns regarding advanced economies' monetary policies impact USD funding demand. As financial markets and corporations are globalized, (1) investors continue to invest in relatively attractive foreign assets using FX swaps and (2) global corporations also continue to search for optimal funding tools by comparing several countries' corporate credit spreads. In such situations, global investors/corporations might strengthen USD demand further via FX swaps if the divergence in monetary policy among advanced economies is highly emphasized.⁹

Second, it is important to pay attention to the global banks' trading stances as they are affected by regulatory reforms. Looking forward from a somewhat longer perspective, an improvement in the stability of financial institutions and financial systems through regulatory reforms would curb the risk of a rapid reduction in market-making activities during times of stress and would bring positive effects to the liquidity and functioning of the market. Conversely, regulatory reforms may increase market-making costs during normal periods, and in a phase where various regulations are gradually being implemented, market liquidity may be temporarily deteriorated as financial institutions and markets absorb the impacts of these regulations.

Considering future developments of financial regulations regarding FX swaps, (1) the impacts of the leverage ratio may be strengthened due to a finalized additional leverage ratio to global systemically important banks (G-SIBs) alongside the implemented foreign banking organizations (FBO) regulation in the

U.S. Furthermore, (2) after details of net stable funding ratio are decided, financial institutions will react to the regulation, and (3) if the USD supply from money market funds to global banks in unsecured markets, including CD/CP, is decreased due to U.S. money market fund reform, (a) financial institutions may shift funding tools from CP/CD to FX swaps, or (b) they may become reluctant to provide USD raised via CP/CD in the FX swap market. In the course of a "transition period" to a new environment, careful attention should be paid to the liquidity and functioning of the market.¹⁰

Third, it is also important to note whether USD suppliers or USD funding tools are diversified given the changes in market situation. With heightened uncertainties regarding commodity prices and capital flows to emerging markets, it is still an open question as to whether real money investors, including foreign reserve managers, can become reliable USD suppliers. Meanwhile, given that potential short-term USD investment demand seems to be globally strong, careful attention also should be paid to whether new USD suppliers participate in the FX swap market against the backdrop of the widening cross-currency basis.

¹ Cross-currency basis swaps, which are essentially transactions equivalent to FX swaps, are contracts in which an amount of money exchanged at spot and forward dates is fixed to be equivalent while short-term rates of different currency are exchanged during the period.

² CDS premiums of individual banks have a similar development. Developments of widening cross-currency basis during the global financial crisis or the Euro area sovereign debt crisis are detailed in the Bank of Japan reviews below.

Ando [2012] "Recent Developments in U.S. dollar Funding Costs through FX Swaps," *Bank of Japan Review Series*, 12-E-3

Imakubo, Kimura and Nagano [2008] "Cross-currency transmission of money market tensions," *Bank of Japan Review Series*, 08-E-2

³ The volatility of quarter-end rates alongside the impact of the Britain's referendum on EU membership temporarily induced a section of market participants to reduce the USD supply toward the end of June 2016. During the period, however, extreme widening of USD LIBOR-OIS spreads was not observed and there was no significant USD shortage in the U.S. money markets.

⁴ Figure IV-3-7 in "Financial System Report (April 2016)" illustrates that FX funding volumes by major banks, Japan Post Bank, The Norinchukin Bank, Shinkin Central Bank, and life insurance companies increased in FY 2015.

⁵ The USD supply by U.S. and European banks via USD/JPY swaps is estimated referring to the BIS working paper below.

McGuire, P. and G. von Peter [2009] "The U.S. dollar Shortage in Global Banking and the International Policy Response," *BIS Working Papers*, No. 291.

⁶ See the papers below. These papers focus on the market

liquidity in fixed income markets and indicate that the regulatory reforms, the leverage ratio in particular, may affect the market-making activities for low-risk assets. This seems to work in the FX swap market.

Bank for International Settlements [2016] "Fixed Income Market Liquidity," *CGFS papers* No 55.

Office of Financial Research [2015] *Financial Stability Report*

⁷ Pinnington and Shamloo [2016] argue that the main driver of widening USD/CHF basis from 2015 is widening bid-ask spreads due to the deteriorated market liquidity.

Pinnington, J. and M. Shamloo [2016] "Limits to Arbitrage and Deviations from Covered Interest Rate Parity," *Bank of Canada Staff Discussion Paper* 2016-4

⁸ Financial System Report (April 2016) identifies the tasks and challenges for Japanese banks, including preservation of stable funding bases in major foreign currencies, especially the USD, and strengthening of their ability to respond to potential market stresses.

⁹ USD demand via FX swaps may decrease if the U.S. yield curve is flattened due to rate hikes. This is because tightening spreads between short-term and long-term rates make FX-hedged investments in U.S. treasuries less appealing. Furthermore, it is also because "carry trades" combining funding the yen and investing in U.S. money markets, which cause reverse flows of current short-term USD funding, may be accelerated if short-term interest rate differentials between Japan and the U.S. widen. In fact, in the phase where short-term interest rate differentials between Japan and the U.S. had extremely widened during 2005-2007, the increased yen carry trades had made USD/JPY basis temporarily positive, implying that there were yen funding premiums.

¹⁰ Regarding an example of arguments about positive or negative impacts of regulatory reforms on market liquidity, see BIS [2016] indicated above.

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