

Cross-currency basis swaps: A primer

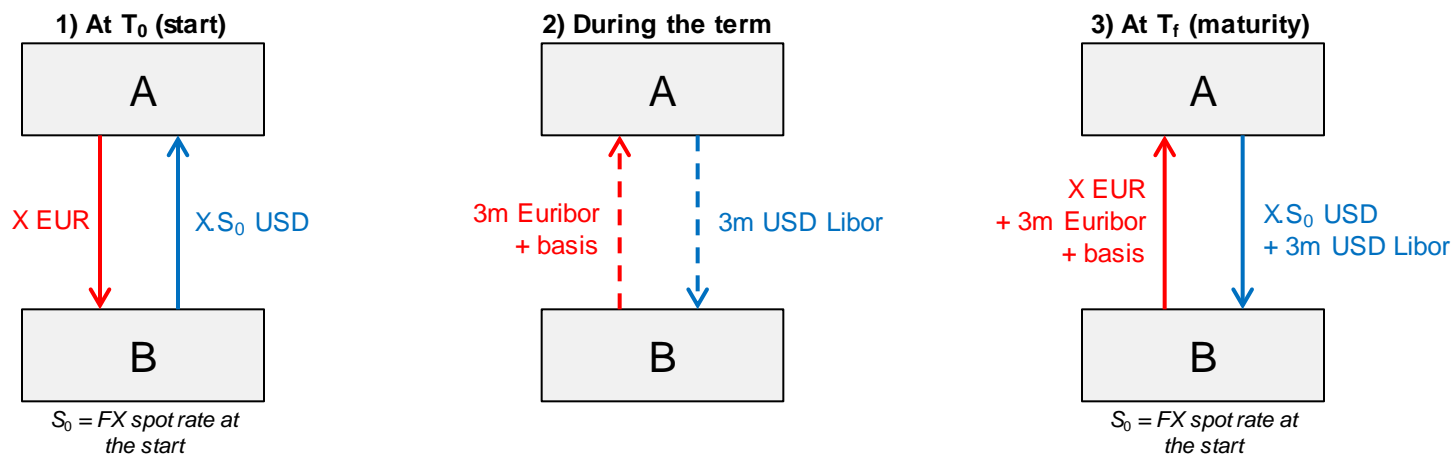


1. Definitions



Cross-currency basis swap: Definitions

- **Definition:** A cross-currency basis swap is a floating/floating swap where two parties borrow from – and simultaneously lend to – each other an equivalent amount of money denominated in two different currencies for a predefined period of time.
 - At the start of the swap, the two parties exchange nominals denominated in two different currencies, equivalent in value at the spot exchange rate (eg, EUR 100mn vs USD 112mn).
 - During the life of the swap, floating interest rate payments are exchanged, typically on a quarterly basis, to remunerate each party for its respective loan. The index of reference for these intermediate payments is Libor, or some other interbank standard, to which the basis is added on one leg.
 - At maturity, the same nominals are re-exchanged (eg, USD 112mn vs EUR 100mn), regardless of the final FX spot rate: **cross-currency basis swaps are largely free from FX risk.**
- **Illustration:** Flows involved in a EURUSD x-ccy basis swap:



- *Mark-to-market cross-currency basis swap:*
 - In a mark-to-market (MTM) x-ccy basis swap, the nominal on one leg will be readjusted periodically at current FX rates.
 - The nominal reset takes place every time floating payments are exchanged, but the calculation of these floating payments is based on the nominal amounts reset at the preceding period.
 - The nominals exchanged at maturity are therefore the nominals that have been readjusted in the previous period.
 - MTM basis swaps aim to minimise the counterparty credit risk arising from changes in collateral due to moves in FX.

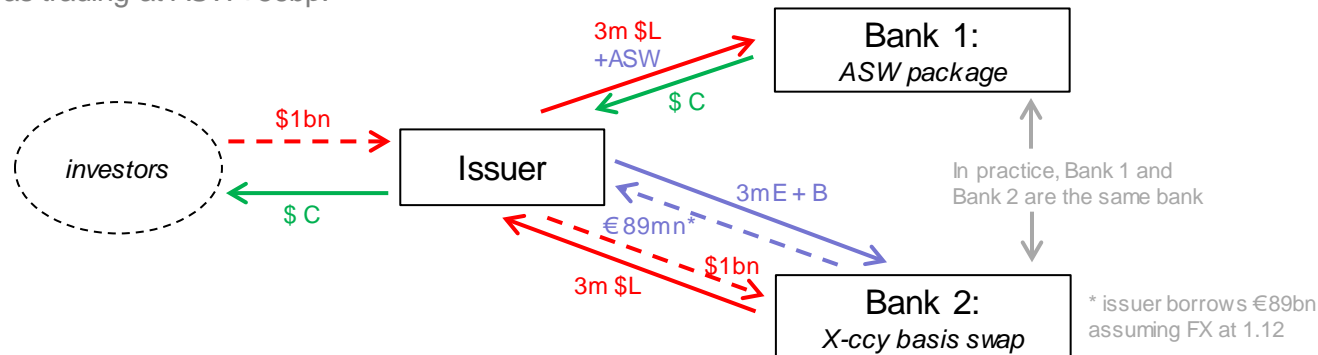
- *Quotation: The basis is quoted on the non-USD leg*
 - For instance, if a 10y JPYUSD x-ccy basis swap is quoted -65bp, it means the borrower of JPY funds will pay JPY Libor -65bp every three months in exchange for receiving USD Libor flat from its USD loan. Inversely, the borrower of USD funds will pay USD Libor flat in exchange for receiving JPY Libor -65bp from its JPY loan.
 - **A deeply negative basis** (-65bp in the above example) **therefore suggests an exacerbated demand for US dollars**, as one party is willing to receive much less interest rates on its non-USD loan.

- *Terminology:* Because the basis is quoted on the non-USD leg, 'paying' the basis means borrowing the other currency (non-USD eg, the GBP) versus lending USD; while 'receiving' the basis implies lending the non-USD currency versus borrowing in USD.
 - In a EURUSD x-ccy basis (EUBSx in BBG), the basis is quoted on the EUR leg.
 - In a GBPUSD x-ccy basis (BPBSx in BBG), the basis is quoted on the GBP leg.



Cross-currency basis swap: Utilisation

- **Issuing bonds in a foreign currency** (with repatriation of the proceeds to the domestic currency): used for diversification purposes and/or to find more advantageous funding costs. *Who?* Supras, agencies, corporates etc.
 - On 31 Jan 2012, EIB – whose funding needs are in EUR – issued a 7y USD benchmark bond at ASW+65bp. At the time, the 7y EURUSD x-ccy basis was quoted at -40bp. By issuing in USD, cross-currency swapped back to EUR, EIB sold a 7y bond at an estimated cost of EUR ASW+25bp (excluding execution costs). The same day, a 7y EIB benchmark bond denominated in EUR was trading at ASW+56bp.



- **Financing assets in foreign currencies:** used by entities with limited deposits in a foreign currency. *Who?* Financial institutions, particularly during the 2008 financial crisis.
- **Investing in foreign currency bonds:** more popular in a very low rate environment when investors seek non-traditional instruments to enhance their portfolio return.
- The parties involved in cross-currency swaps tend to be financial institutions, either acting on their own or as intermediary for non-financial corporations.
- Mirroring the tenor of the transactions they are meant to fund, most cross-currency basis swaps are long term, generally ranging from 1y to 30y.
- Below 1y, FX swaps are more common; beyond 1y, the cross-currency basis swap market offers greater liquidity.



Covered interest parity & x-ccy basis

Covered Interest Parity (CIP): $(1+r_f) = F/S_{d/f} * (1+r_d)$

Where r_f = foreign interest rate, r_d = domestic interest rate, and F and S = spot and forward exchange rates between the two currencies

$$X\text{-ccy basis} \approx x = S/F_{d/f} * [1 + (IRS \text{ vs } 3m)_f] - [1 + (IRS \text{ vs } 3m)_d]$$

■ Covered interest parity

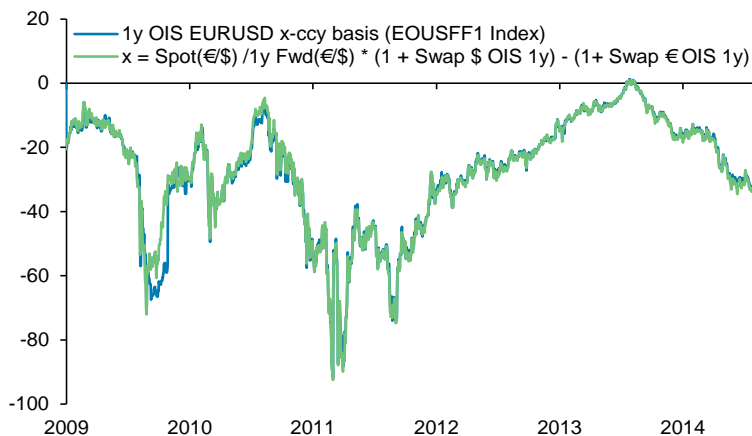
- A condition where the relationship between interest rates and the FX spot and forward currency values of two currencies is in equilibrium.
- There is no arbitrage opportunity between, say the EUR and USD, when the FX forward F verifies this condition, ie when:
 $F_{\text{€}\$} = S_{\text{€}\$} * (1+r_{\$}) / (1+r_{\text{€}})$

■ Deviation from covered interest parity

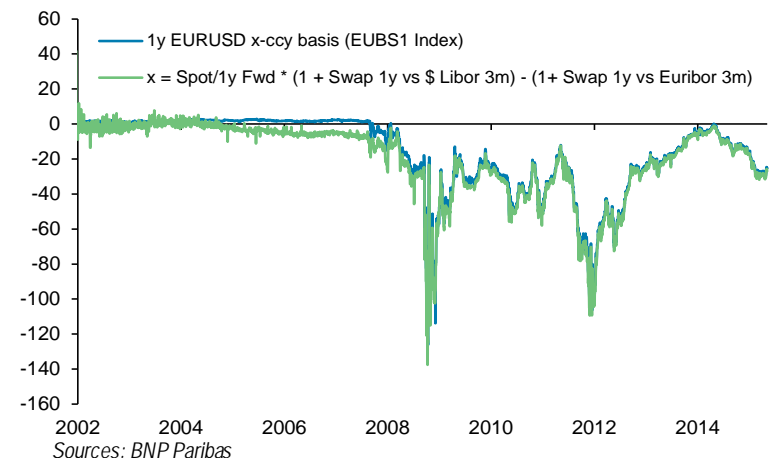
- Consider a situation where the above relationship does not hold: $(1+r_f) \neq F/S_{d/f} * (1+r_d)$
- It does not hold because one has to account for another variable, x, where $x \neq 0$ and: $(1+r_f) = F/S_{d/f} * (1+(r_d+x))$
- As the charts below show, x is more or less the x-ccy basis.

⇒ **Implications: The x-ccy basis is a function of the interest rates prevailing in two currencies, and of the spot and forward exchange rates between those two currencies.**

1y OIS EURUSD x-ccy basis vs deviation from CIP (bp)



1y EURUSD x-ccy basis vs deviation from CIP (bp)

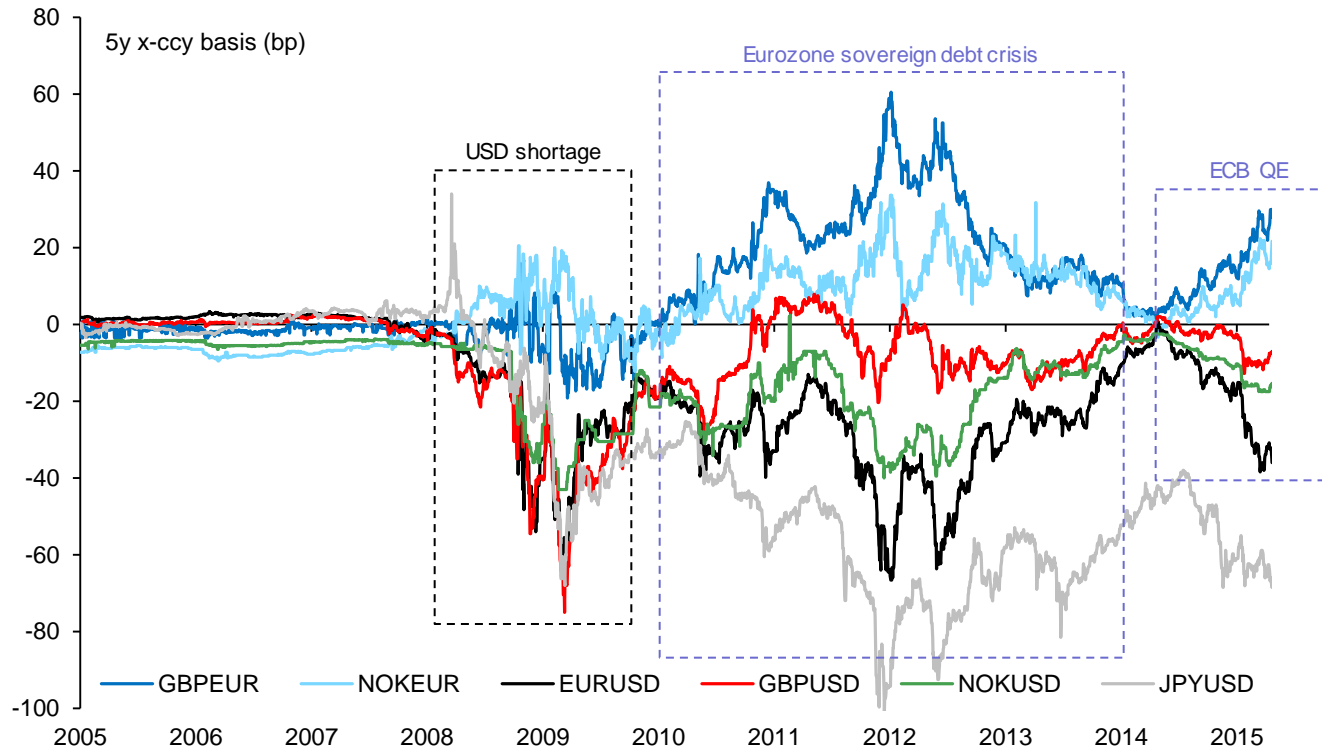


2. The drivers



Drivers of x-ccy basis swaps

Different periods lead to different drivers



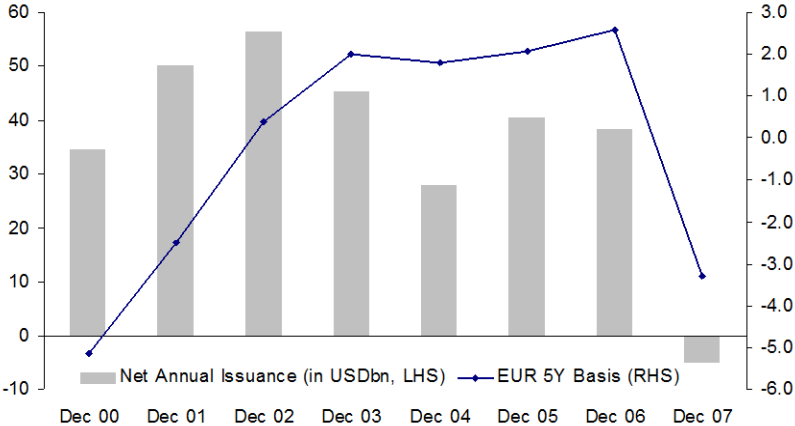
Source: BNP Paribas



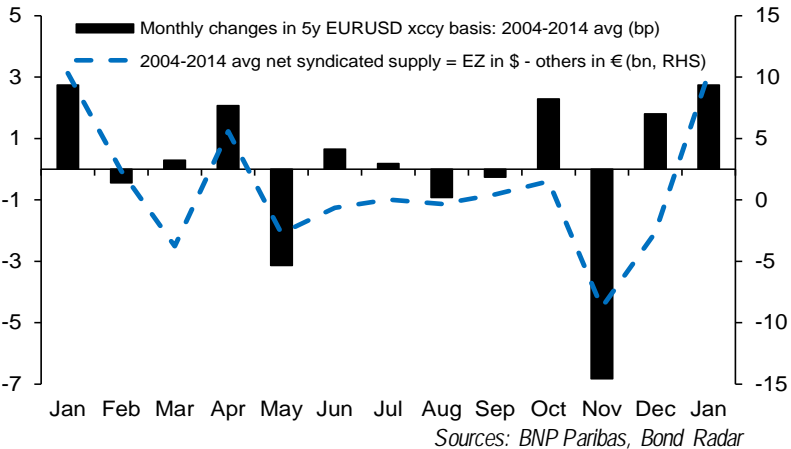
Drivers of the x-ccy basis

1. Foreign currency bond issuance: A permanent driver

Net issuance is a traditional driver



Monthly issuance and changes in EURUSD x-ccy basis



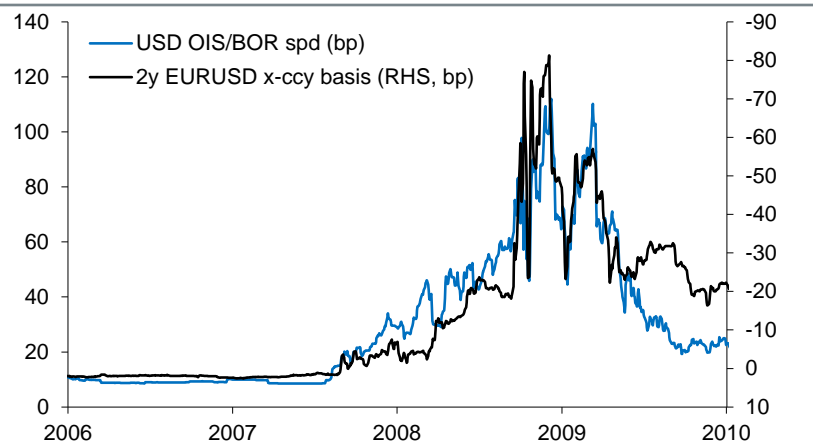
- We define 'net issuance' as follows: for instance, if we look at the EURUSD x-ccy basis:
 - Net volume of issuance = USD issuance initiated by eurozone entities - EUR issuance initiated by US entities
- The net volume of foreign currency bond issuance between two regions is the traditional driver of x-ccy basis swap markets: it is of acute importance in a non-crisis environment.
- **Identifying seasonal patterns of net issuance during the year is an important factor as it helps predict temporary shocks on the x-ccy basis during the year.**
 - When eurozone entities issue in USD, they pay the basis; conversely, when US entities issue in EUR, they receive the basis.
 - A seasonal deluge of USD-denominated issuance by eurozone entities in January typically sparks a marked tightening of the EURUSD cross-currency basis around that time, as interest to pay the basis dominates.

➔ **When interest to pay the basis dominates (European entities issue in USD), the basis tends to 'tighten' (turn less negative); when interest to receive the basis dominates (US entities issue in EUR), the basis tends to 'widen' (ie turn more negative).**

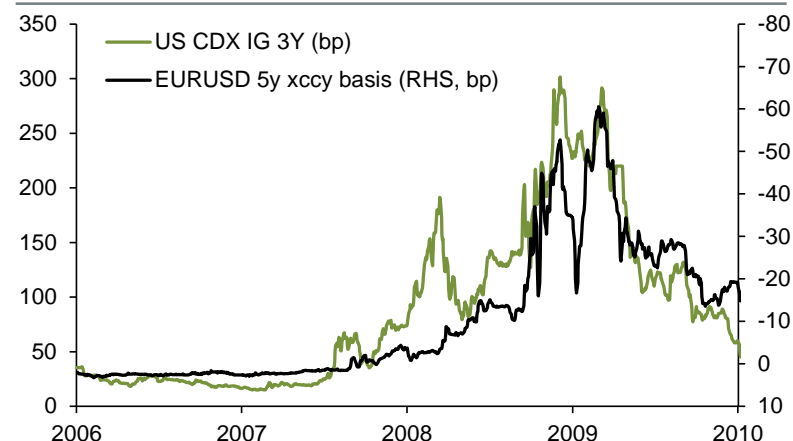
Drivers of the x-ccy basis

2. Credit risk premia & liquidity concerns: Dominant during the financial crisis

High sensitivity to \$OIS/BOR spds during the credit crunch



Basket of US IG entity CDS spreads vs x-ccy basis



Source: BNP Paribas

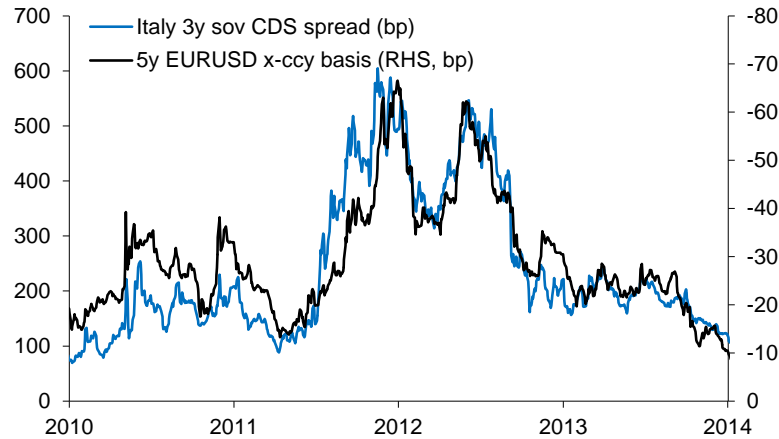
- The OIS/BOR spreads widening in 2007-2008, particularly in USD, reflected increased demand for USD term funding, and rising credit risk premia.
- An important aspect of the turbulence was a clear USD funding shortage for many institutions: It was frequently reported that European financial institutions made efforts to secure USD funds to support US conduits for which they had committed backup liquidity facilities, while at the same time, the usual suppliers of USD to the interbank market were looking to conserve their liquidity amid increased concerns over counterparty credit risk.
- Facing these unfavourable demand/supply conditions in the interbank market, many non-US financial institutions moved to actively convert EUR to USD through FX swaps, resulting in marked deviations from covered interest parity.
- Marked deviations in the covered interest parity therefore ultimately resulted in a widening of the x-ccy basis. It was also reported that some European financial institutions moved from short-term USD funding through FX swaps to longer-term USD funding through x-ccy basis swaps, once they realised that the financial turmoil would last longer than expected.

➔ The money market turmoil that began in the second half of 2007 gradually spilled over to cross-currency basis swaps, through the intermediary of FX swaps.

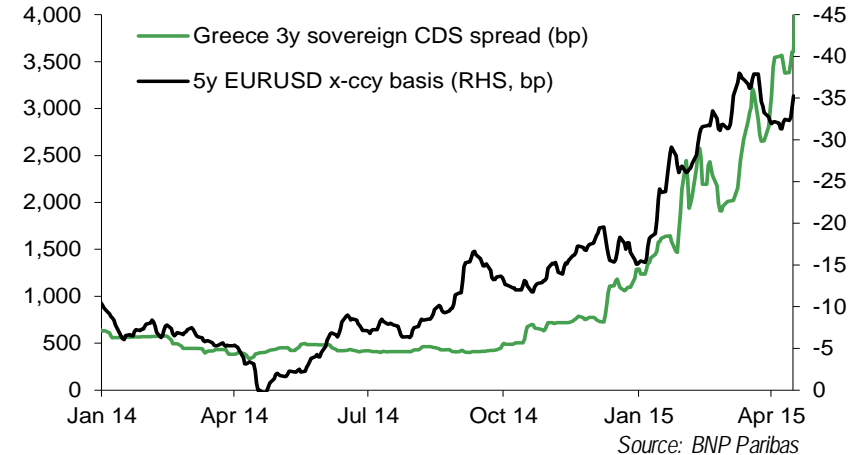


3. Sovereign risk premia: Taking centre stage during the eurozone sovereign debt crisis

Italian sov CDS to gauge the degree of stress in the EZ



Renewed Greek concerns are still affecting the x-ccy basis

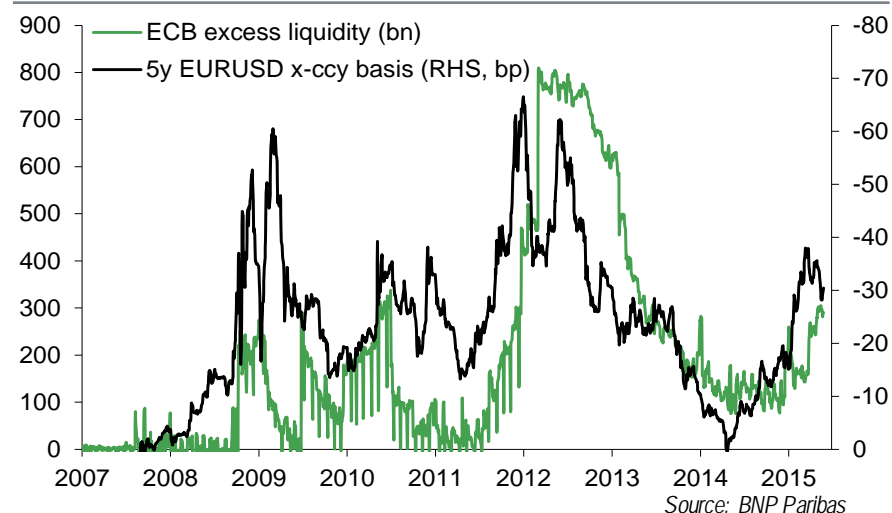


- Sovereign CDS spreads are a good proxy to capture the degree of risk perceived towards a given country; they are of particular importance when it comes to euro x-ccy bases because of the potential impact of a eurozone break-up on the future of the currency.
- At the peak of the eurozone sovereign debt crisis, growing fears of a eurozone break-up contributed to a sharp widening of the x-ccy basis, as investors demanded higher and higher compensation in exchange for lending their perceived safer currency in exchange for the euro: the cost of borrowing euros versus another currency declined.
- A lack of appetite for European assets at the peak of the crisis, owing to the acute uncertainty over the eurozone's future, implied lower EUR funding needs from outside the euro area, fewer EUR-denominated bond purchases by foreign investors, and less USD issuance by European issuers, all resulting in a diminished interest in paying the basis.

➔ **Renewed risk-off, uncertainty regarding the future of the euro area and diminished appetite for European assets all contributed to a large widening in EUR x-ccy bases in 2010-2012.**

4. Excess liquidity: A key factor since the ECB introduced unlimited access to EUR funding

ECB excess liquidity vs EURUSD x-ccy basis



- From the moment the ECB introduced the fixed-rate tender with full allotment procedure in October 2008, banks have had unlimited access to EUR funding, which generated excess liquidity as banks' demand for funding exceeded liquidity needs.
- More banks have access to ECB funding than to the Fed; it therefore became relatively easy for a bank to fund in EUR at the ECB, and to simultaneously convert this funding into USD through the cross-currency basis swap market.

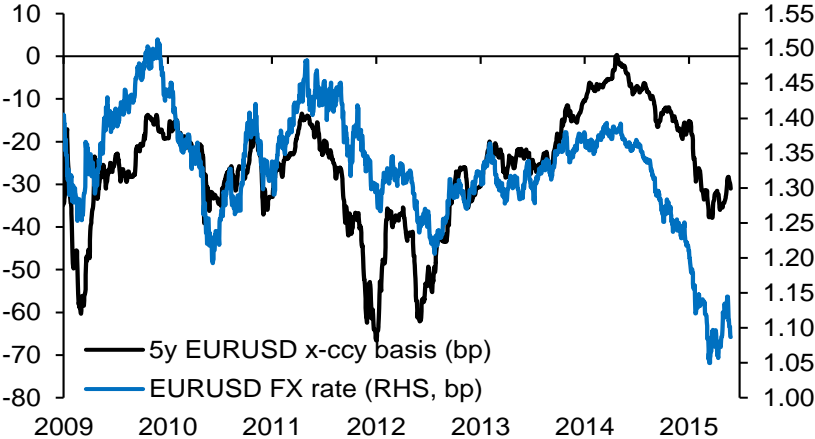
➔ **Increases in the ECB's excess liquidity can reflect, to some extent, an increase in synthetic USD funding, and thus explain a widening of the basis as excess liquidity rises, and a tightening as excess liquidity falls.**

- The two 3y LTROs, launched in December 2011 and March 2012, and anticipation of ECB QE at the beginning of 2015, have had a dramatic impact on the x-ccy basis: the LTROs notably because they alleviated the risk-off sentiment, having contributed to restoring confidence in the eurozone; and ECB QE expectations because the consequent, dramatic decline in EUR yields and credit spreads led to a surge in EUR-bond issuance activity from overseas.
- But generally speaking, a rise in excess liquidity cheapens the cost of funding in a currency, as substantial amounts of cash flood the market, and thus depreciates the basis as less interest is required to borrow in euros.

Drivers of the x-ccy basis

5. Other notable variables: Exchange rate

EURUSD FX spot vs x-ccy basis



Source: BNP Paribas

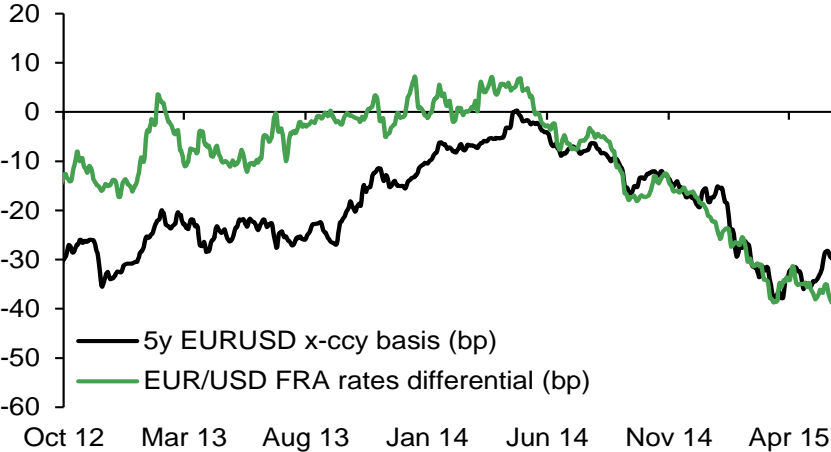
- **The relationships between exchange rates and the x-ccy basis, and between funding cost differentials and the x-ccy basis, do not always hold:** before 2008, there was no relationship whatsoever, because the covered interest parity was more or less in equilibrium. When it is not, the x-ccy basis is naturally linked to fluctuations in FX and monetary policy rate differentials (see p.6).

- A widening of the EURUSD x-ccy basis means one needs to pay less interest to borrow euros, reflecting a diminished cost of funding in EUR versus USD. A widening of the x-ccy basis therefore reflects a depreciation of the EUR relative to the USD, in basis terms. The correlation between EURUSD x-ccy basis and FX since 2008 therefore demonstrates a general depreciation (or appreciation) of the EUR, in basis and currency simultaneously.
- Hedging activity contributes to this relationship: a downward move in the EURUSD FX spot typically triggers purchase orders in FX forwards where EUR is bought by corporates as a hedge, ultimately leading dealers to hedge themselves through FX or x-ccy swaps, where they receive the basis.
- Another factor that may have contributed to the bolstering of the FX/x-ccy basis relationship is the need to post collateral on x-ccy basis swaps since 2007, and the wide use of mark-to-market x-ccy swap and nominal resets as a result.



5. Other notable variables: Interest rate differential

EUR/USD interest rate differential vs x-ccy basis



■ The relationships between exchange rates and the x-ccy basis, and between funding cost differentials and the x-ccy basis, do not always hold: before 2008, there was no relationship whatsoever because the covered interest parity was more or less in equilibrium. When it is not, the x-ccy basis is naturally linked to fluctuations in FX and monetary policy rate differentials (see p.6).

- The correlation between EUR/USD interest rates differential and the x-ccy basis has become more meaningful since summer 2012 – when the ECB cut the deposit facility rate (DFR) to 0% – and increased even more from June 2014, when the DFR fell into negative territory for the first time ever.
- We believe that, from that time, European financial institutions’ attempts to unload some of their excess euros onto US financial institutions or the Fed to avoid the negative carry on holding reserves in Europe, may have boosted this relationship.



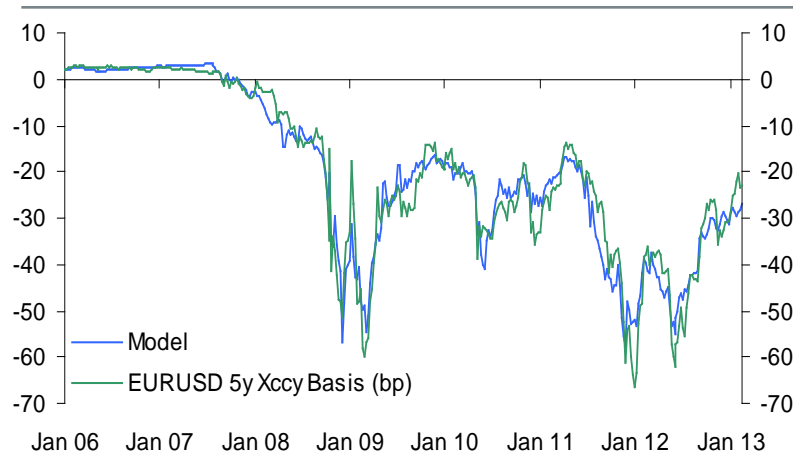
3. EURUSD x-ccy basis: our fair value models



Our fair value models

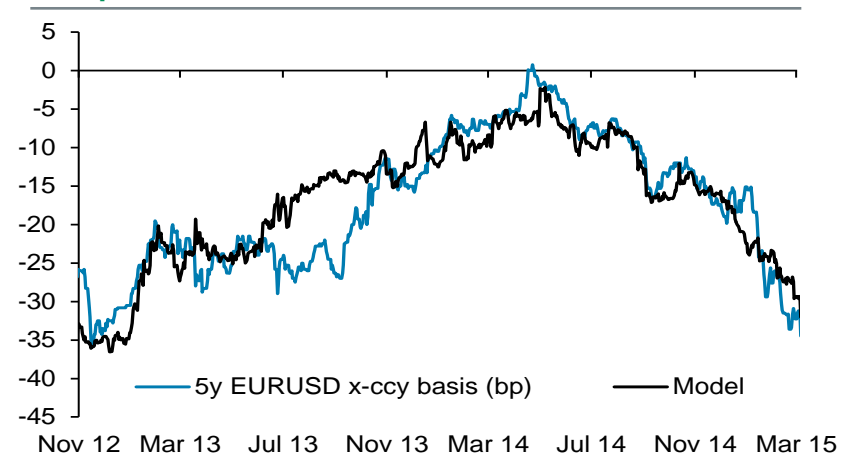
Different periods lead to different models

Our 'crisis model'



Sources: BNP Paribas

Our 'post-crisis model'



- Our 'crisis model' is based on the major drivers of the x-ccy basis during the financial crisis and eurozone sovereign debt crisis:

- USD OIS/BOR spreads: to factor in changes in credit risk premia and concerns over liquidity
- Italy sov CDS spread: to factor in changes in sentiment towards the eurozone
- ECB excess liquidity

$$EURUSD\ XCcy = \alpha + \beta_1(\$ OIS/BOR) + \beta_2(CDS\ Sov\ Italy) + \beta_3(ECB\ Excess\ Liquidity)$$

- Our 'post-crisis model' is based on more significant drivers when confidence returns:

- EUR/USD FRA differential: to factor in changes in anticipation over the degree of monetary policy divergence between two currencies
- ECB excess liquidity, or ECB balance sheet

$$EURUSD\ XCcy = \alpha + \beta_1(\text{€ FRA rate} - \$ FRA\ rate) + \beta_2(ECB\ Excess\ Liquidity) \rightarrow \text{Current model}$$



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