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Disentangling Credit and Liquidity Risks from Interbank Spreads

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This letter presents the findings of research carried out at the Banque de France. The views expressed in this post are those of the authors and do not necessarily reflect the position of the Banque de France. Any errors or omissions are the responsibility of the authors.

The recent financial crisis triggered a persistent freeze in the interbank loan market, the market where banks lend to each other, mostly at a short-term horizon. In Europe, this translated into a surge in the spread between the Euribor rate, the reference short-term rate on the euro area interbank market, and the OIS rate, which is considered as a risk-free benchmark. This letter analyses fluctuations of the Euribor-OIS spread since 2007, while highlighting the respective roles of two sources of risk: credit risk and liquidity risk. The decrease in interbank market tensions that initiated in early 2012 appears to reflect mostly a decrease in liquidity risk, which can be traced back to two unconventional monetary policy measures of the Eurosystem: the Very Long Term Refinancing Operations (VLTROs) of late 2011 and the announcement of the Outright Monetary Transactions (OMT) by mid-2012.

In the aftermath of the 2007-2008 financial crisis, the level of perceived interbank risk – as measured by the interest rate spreads between unsecured and secured interbank loans – moved from extremely low levels to a sudden peak following the Lehman bankruptcy, both in the United States and the euro area. In this context, in order to maintain the proper functioning of monetary policy transmission mechanisms, central banks had to resort to unconventional monetary policies.

These unconventional monetary policies (UMP hereafter) in the euro area were designed to target two main risks embedded in interbank loans: credit risk and liquidity risk. Both risks are priced in the rate at which banks lend to each other without collateral. This unsecured rate can be proxied by the Euribor rates which exist for different maturities. The first risk contained in these rates relates to the probability of default of the counterparty of the loan and its failure to reimburse the loan. This risk is referred to as credit risk. Second, liquidity constraints may also represent a significant risk from the lender's point of view, and can therefore translate into an increase in the rate at which this bank is willing to lend. Taking this into account at the inception of the loan, the lender asks for a specific additional compensation (resulting in a higher lending rate) to take on this risk.[1]

Alleviating interbank-market tensions was one of the key objectives of UMP in the euro area. Here, we distinguish three main phases of UMP.

(I) The Securities Market Programme (SMP) consisted in sterilized purchases of bonds on the secondary market. It was designed to "*ensure depth and liquidity in [...] market segments that are dysfunctional*" and was implemented in May 2010 and August 2011.

1 *Specifically, the liquidity risk that is described here is often referred to as funding liquidity risk. It can be distinguished from market liquidity risk. However, these two liquidity risks are difficult to decipher empirically, and are often so closely related that they cannot be distinguished. See for instance Brunnermeier and Pedersen (2009).*

(II) Later, on 8 December 2011, the ECB disclosed the design of a Very Long Term Refinancing Operation (VLTRO), through which 3-year maturity open market operation were proposed in the form of reverse repos. Two operations were conducted with full allotment on 21 December 2011 and on 29 February 2012 of EUR 489 billion and EUR 530 billion to 523 and 800 banks respectively.

(III) Last, during the summer of 2012, Mario Draghi announced the creation of Outright Monetary Transactions (OMT) in his London speech.[2] Conditionally on fiscal adjustments or the enforcement of precautionary programmes by candidate countries, the ECB is allowed to trade in secondary sovereign bond markets with "no *ex ante* quantitative limits". While this latter framework was announced, it has not been applied in practice yet.

The Euribor-OIS spread as an indicator of interbank credit and liquidity tensions

As stressed above, the interbank money market is at the heart of bank funding. It is an over-the-counter market (OTC) where interbank loans are negotiated with maturities ranging from one day to 12 months. As banks do not possess the same characteristics and underlying risks, each bank sets specific lending rates and incurs specific borrowing rates. However, disaggregated rates are not publicly available.[3] In order to conduct an analysis of interbank risks, a more aggregated measure must be considered. A central reference is the Euro Interbank Offered Rate (Euribor), which provides a measure of the interest rate at which banks can raise unsecured funds from other financial institutions.[4] There is one rate for each maturity between one week and twelve months.

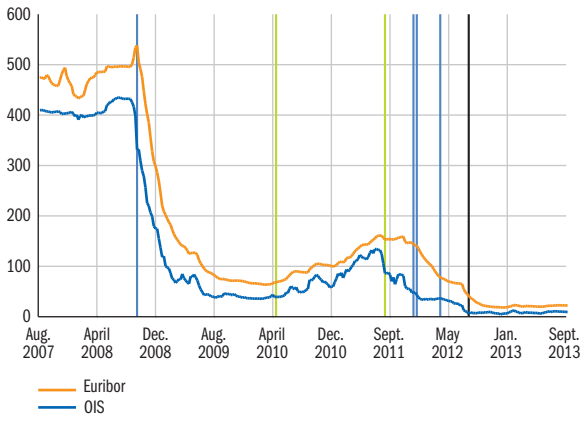
As explained above, the Euribor contains credit- and liquidity-related components. However, these are not the only components of this yield. Indeed, it also incorporates the expectations of future short-term rates. Typically, in the absence of credit and liquidity effects, the Euribor rates would equate to risk-free rates. In our analysis, the risk-free rates are proxied by the Overnight Indexed Swap (OIS) rates. An OIS is a fixed-for-floating interest rate swap with a floating rate leg indexed on overnight interbank rates, the EONIA in the euro area case. OIS have become especially popular hedging and positioning vehicles in euro financial markets and have grown significantly in importance during the financial turmoil of the last few years. The OIS curve is more and more seen by market participants as a proxy of the risk-free interbank yield curve (see e.g. BIS, 2013).[5]

The panel a of Chart 1 displays both the 3-month Euribor and OIS rates from August 2007 to September 2013.

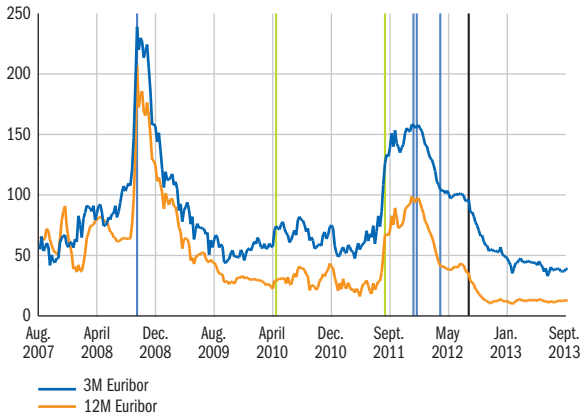
C1 Euribor and OIS rates and spreads

(in basis points)

a) 3M Euribor and OIS rates



b) 3M and 12M Euribor-OIS spreads



Note: Vertical axes stand from left to right for: Fixed rate full allotment (first blue axis), SMP programme announcements (next two green axis), VLTRO announcement and allotments (next three blue axis), and Mario Draghi's London speech (last black axis).

2 See http://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html

3 *Notwithstanding, the individual contributions of panel banks are available at* http://www.euribor-ebf.eu/euribor-org. *However, given the specific question that is posed to the banks ("What are the rates at which euro interbank term deposits are being offered within the euro area by one prime bank to another?"), their contributions do not necessarily reveal their own lending or borrowing costs.*

4 *The European Banking Federation publishes a daily reference rate based on the trimmed averaged interest rates at which euro area banks offer to lend unsecured funds to other banks in the euro wholesale money market. These rates are based on a survey that is sent to a panel of 40 to 50 banks in the euro area (see the question of the survey in the previous footnote).*

5 *As no principal is exchanged, the OIS requires nearly no immobilisation of capital. Further, due to netting and credit enhancement mechanisms (including call margins), the counterparty risk is limited in the case of a swap contract.*

While this chart shows that Euribor and OIS rates present strong common fluctuations, the panel b also highlights that the spread between the two rates has undergone substantial variations over the last five years. The panel a also emphasizes that while Euribor-OIS spreads of different maturities present different levels, their fluctuations show important co-movements.[6] This suggests that a very small set of factors is sufficient to capture most of the fluctuations in yields. This particular feature is taken into account in our estimation methodology.[7]

Modelling and decomposing Euribor-OIS spreads

In our modelling approach, we assume that the fluctuations of the Euribor-OIS spreads (of different maturities) depend on two risk factors. One of these factors is related to credit risk and the other to liquidity risk. We construct these factors linking them to credit risk and liquidity risk proxies. While the credit proxy is based on a set of 36 euro area banks' CDS premia,[8] the liquidity proxy is computed as a combination of variables capturing different aspects of liquidity pricing (market liquidity and funding liquidity).[9] Interestingly, our methodology allows us to exhibit, for the spreads of each maturity, an additional effect corresponding to the co-movement of credit and liquidity risk components.[10]

It is important for at least two reasons to use the information contained in the entire term structure of Euribor-OIS spreads (instead of only one maturity) to perform such an exercise. First, by including several maturities in our sample, we improve the quality and precision of our model estimation. Second, the term structure dimension of our analysis is exploited to identify the part of the spreads that correspond to risk premia.[11] Risk premia properly defined are indeed the components of yields or spreads that would not exist if (a) economic agents or investors were risk-neutral or (b) the risks involved in the considered asset were diversifiable. Obviously (a) does not generally hold as investors are worried about large losses and will try to get an insurance against such situations (they are risk-adverse). In our case, (b) does not hold either since euro area interbank risk cannot be diversified away. Risk premia are therefore expected to be present in Euribor-OIS spreads. It is important to note that these risk premia do not account for the whole Euribor-OIS spreads. In other words, even if agents were risk-neutral, the Euribor-OIS spread would not be zero. Indeed, in that case, these spreads would be equal to the loss related to the total amount of risk –credit and liquidity– that a bank expects to face when lending to another bank. The risk premia therefore could be seen as distaste for the sole presence of risk.[12] The other component, which is denoted the "expectation part" of the Euribor-OIS spread, reflects the agents' perception of the probability that these risks materialize at a given horizon in the future.

All in all, our methodology allows us to decompose the spreads in two ways: credit vs. liquidity and expected vs. risk-premia parts. Chart 2 shows the decompositions of the 6-month maturity spread. This figure (panel a) shows that the liquidity factor accounts for much of the volatile variations in the spreads, in particular during the period of distress in late 2008 (after the Lehman collapse) and end 2011 (in a period of particular strain in the euro area sovereign markets). It can also be seen that the credit part has increased almost monotonously over the estimation period.

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6 *A principal component analysis performed on the four EURIBOR-OIS spreads proves that the first principal component captures most of spread fluctuations. It explains nearly 96% of the whole variance of the spreads.*

7 *For details about the macro-finance model used (a quadratic Gaussian term structure model), see Dubecq* et al. *(2013).*

8 *Of theses banks, 8 are German, 6 are Italian, 5 are Spanish, 4 are French, 4 are Dutch, 3 are Irish, 3 are Portuguese, 2 are Austrian, and one is Belgian.*

9 *A first liquidity-pricing factor is the KfW-Bund spread. KfW is a public German agency, whose bonds are guaranteed by the Federal Republic of Germany. Hence, they possess the same credit quality as their sovereign counterparts, the "Bund". KfW bonds being less liquid than their sovereign counterpart, the KfW-Bund spread essentially reflects liquidity-pricing effects. A second liquidity factor is the Tbill-repo spread, computed as the yield differential between the 3-month German T-bill and the 3-month general collateral repurchase agreement rate (repo). A third factor is based on the replies of banks to a liquidity-related question of the Bank Lending Survey (BLS) conducted by the ECB.*

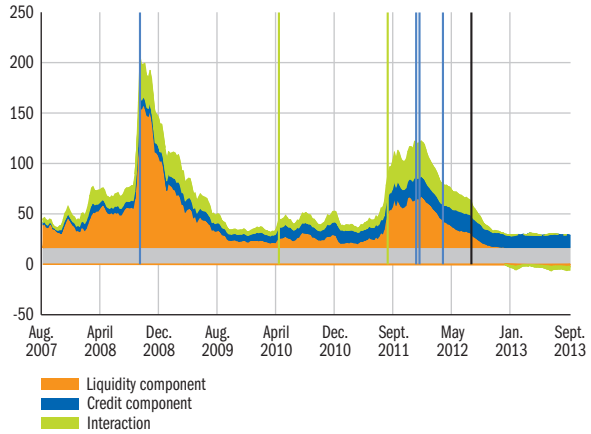
10 *This results from the fact that we use a quadratic term-structure model: in the model, the term structure of spreads is accounted for by a quadratic function of the liquidity and the credit factors. Therefore, some components of the spreads correspond to products of both factors.*

11 *Our model belongs to the class of the quadratic term structure model (QTSMs). See for example Leippold and Wu (2002).*

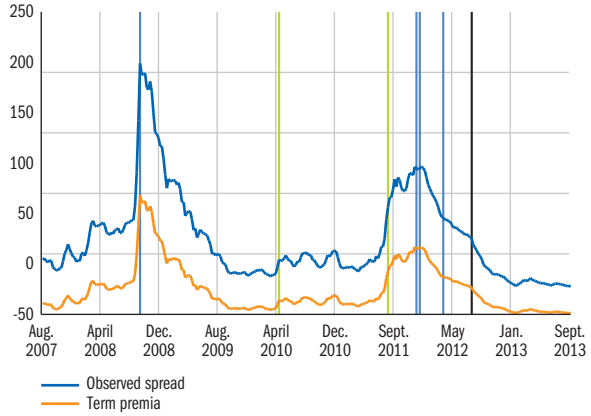
12 *Neglecting the liquidity-related component, let us consider a Bank B that has a probability of default of 1% over a one-year horizon and wants to borrow from Bank A. If Bank A were risk-neutral, it would lend to Bank B at a rate equal to the 1-year OIS rate +1%. But if Bank A is risk-averse, it may charge a higher interest rate, say 1.5%. In that case, 1% is the expected part of the spread and 0.5% is its risk-premium part.*

C2 Spread decomposition
(in basis points)

a) Credit and liquidity decomposition



b) Term premia decomposition



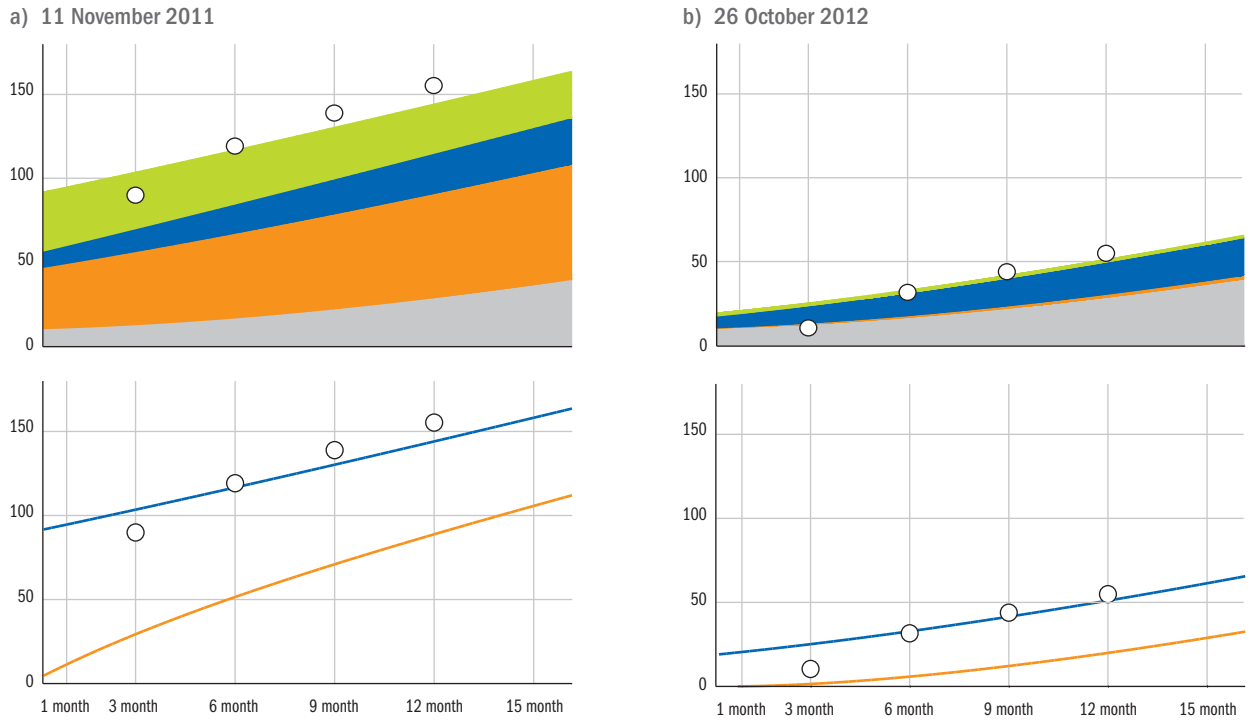
Note: On the upper panel, orange component is liquidity-related, blue is credit-related, and green is the interaction term. Grey area is not attributable to any of those (residual). On the bottom panel, blue solid line is the model-implied term structure and orange line is the term-premia component. Units are in basis points. Vertical axes stand from left to right for: Fixed rate full allotment (first blue axis), SMP program announcements (next two green axis), VLTRO announcement and allotments (next three blue axis), and Mario Draghi's London speech (last black axis).

The panel b of Chart 2 shows that the total term premia and the observed spread are positively correlated. Consistently with the fact that interbank loans carry systematic (non-diversifiable) risks, term premia account for a substantial share of the spreads. Figure 3 presents decompositions of the term structure of Euribor-OIS spreads at different dates. In particular, the bottom row shows the share of the modelled spreads that is accounted for by the term premium; the longer the maturity, the larger this share.

The impact of unconventional monetary policy on interbank risk

These decomposition results allow us to investigate the effects of UMP actions on the credit and liquidity components of the Euribor-OIS spreads. Interestingly, the Euribor-OIS spreads have decreased continuously since the VLTRO announcement in December 2011. This drop has led many commentators (and central bankers) to claim that the ECB's UMP refinancing operations were successful in alleviating interbank market tensions. In particular, according to ECB officials, the non-standard VLTROs addressed "only the liquidity side of the [interbank market] problem". Our results seem to support this view as the liquidity component of the spreads has slowly faded away to nearly zero since the VLTRO announcement date (see Chart 2). A further positive effect can also be attributed to the OMT announcement through liquidity. Besides, the bottom panel of Chart 2 shows that term premia have dramatically decreased since early 2012, which suggests that policy measures have been effective in addressing the systemic nature of interbank risks. Chart 3 provides additional evidence, focusing on the term structure dimension of the decomposition: after the SMP and before the VLTRO announcement (first column of charts), liquidity risk still accounts for most of the term structure of interbank spreads. However, after the VLTRO allotments, liquidity risk represents only 10 to 20 basis points across maturities and becomes negligible for all maturities after the OMT announcement (second column). In comparison, those policy measures had virtually no impact on the credit component of the spread. Turning to the last row of Charts 2 and 3, it appears that UMP actions were followed by decreases in both the expected component and the term premia.

C3 Decomposition of the term structure of Euribor-OIS spraeds in November 2011 and October 2012
(in basis points)



Note: Orange component is liquidity-related, blue is credit-related, and green is the interaction term. Grey area is not attributable to any of those (residual). On the bottom panel, blue solid line is the model-implied term structure and orange line is the term-premia component.

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