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Discussion paper

# Bank Supervision after the Financial Crisis: Signals from the Market for Liquidity

BY  
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## 1. Introduction

The financial turmoil that we have been living with since August 2007 has left central banks, regulators, politicians, and economists with two big, overriding questions: How do we best get out of the crisis and how should banks be regulated and markets organized to avoid such crises in the future. This paper deals with the second question. Specifically, the paper deals with the third pillar of Bank supervision under Basel II, namely market discipline. The idea of this pillar, as summarized by Emmons, Gilbert, and Vaughan (2001), is for supervisors and regulators to make use of information about the financial health of banks that is contained in securities prices. In particular, as explained by Emmons et al: “The recent market discipline discussion centers on proposals to require some banks to issue a standardized form of subordinated debt.” Flannery (1998) discusses this more broadly and reviews the evidence on the effectiveness of using market information in prudential supervision. My proposal here is that the market discipline approach could usefully look for information about banks’ financial health outside of the securities markets. The market that I would suggest is especially valuable

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is the market for liquidity. This is motivated by the simple observation that the financial crisis of 07/08 has manifested itself in -- and rippled outwards from -- this market.

Below, I briefly outline some features of the market for liquidity during the crisis and draw some comparisons to times of normalcy, before turning to my proposal. Some of what we see during the crisis period arguably can be explained by imperfections such as adverse selection, leading to credit rationing and relatively high unsecured rates. There are also imperfections present in the market for liquidity during times of normalcy (see, e.g., Bindseil, Nyborg, and Strebulaev~(2008)). Thus, as new regulation gets shaped in the wake of the crisis, it would appear that it is valuable to put measures in place to control these imperfections so that they do not flare up again. The suggestions I make in this paper are motivated by this concern.

## **2. The Market for Liquidity During the Great Financial Turmoil**

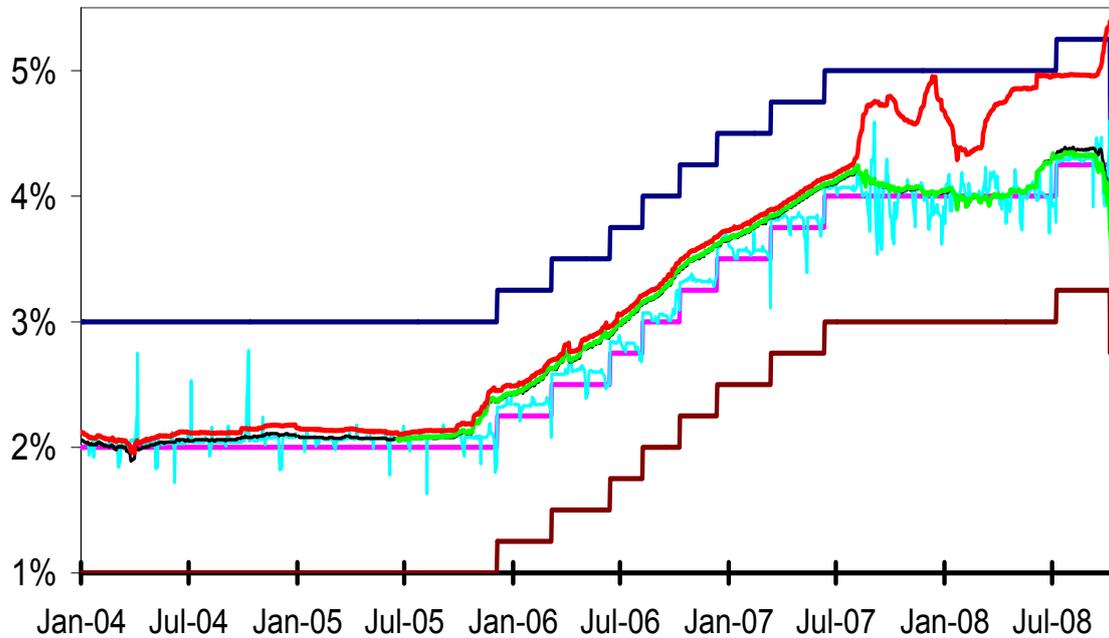
My discussion is based on the market for liquidity in the euro area. The focus is on the behavior of different interbank rates relative to each other and relative to the European Central Bank's (ECB) policy rate.

Figure 1 plots seven key euro interest rates for the time period January 2004 to 14 October 2008. Three of these are set by the ECB, namely the ECB's policy rate (minimum bid rate in the main refinancing operations, pink), the marginal lending facility (dark blue), and the deposit facility (brown). Until 9 October 2008, the latter two were always 100 basis points (bp) above and below the policy rate, respectively.

The four other rates depicted are interbank rates; the Eonia (the overnight rate, light blue) and three 3-month rates, Euribor (red), Eonia swap (green), and Eurepo (black).<sup>2</sup> While all these rates could well be referred to as short term rates, I will refer to the 3-month rates as longer term rates. In terms of the money market, they represent relatively long term funding and also it is to some extent an arbitrary choice to plot 3-month rates rather than 12-month rates (or even 1-month rates).

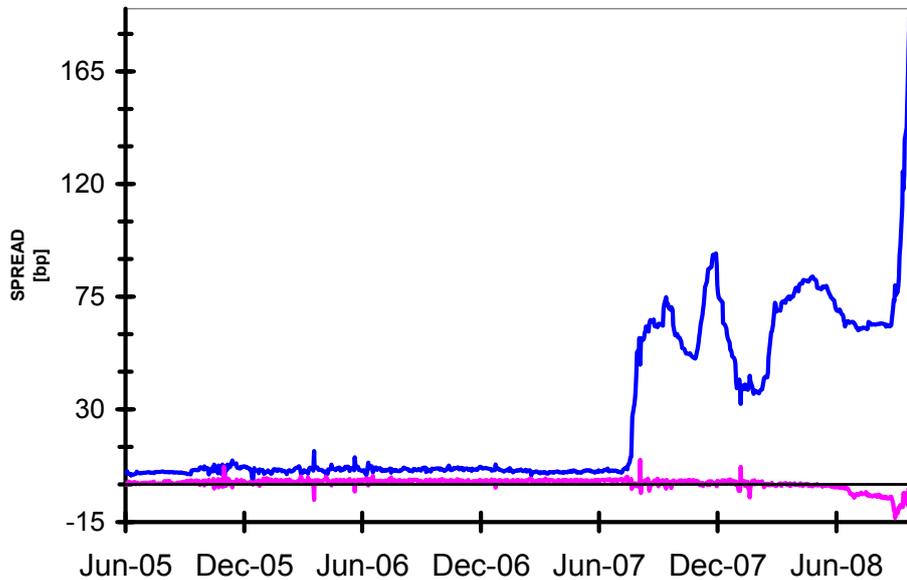
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<sup>2</sup> Euribor, Eonia swap, and Eurepo also exist for other maturities. See [www.euribor.org](http://www.euribor.org).



**Figure 1.** Key Rates in the Euro Area, January 2004 to 14 October 2008. The figure plots seven rates, three of which are set by the ECB and four of which are determined in interbank trading. The three rates set by the ECB are (from top to bottom): (1) The marginal lending facility (blue), (2) The policy rate (minimum bid rate in ECB main refinancing operations, pink), (3) The deposit facility (brown). The four interbank rates are: (4) 3-month Euribor (red), (5) 3-month Eonia swap (green), (6) 3-month Eurepo (black), and (7) the Eonia (light blue). The Eonia swap rate is only available from 20 June 2005. Source: [www.euribor.org](http://www.euribor.org)

The crisis is seen in the sharp rise in 3-month Euribor in August 2007. It is clear that this increase does not represent expectations about ECB rate hikes since the other two 3-month rates held steady.



**Figure 2.** Interbank rate spreads (in basis points), 20 June 2005 – 16 October 2008: (1) 3-month Euribor less 3-month Eonia swap (blue), and (2) 3-month Eonia swap less 3-month Eurepo (pink).

Source: [www.euribor.org](http://www.euribor.org)

Figure 2 graphs the spreads between 3-month Euribor and 3-month Eonia swap (blue) and between 3-month Eonia swap and 3-month Eurepo. The graphs illustrate the dramatic rise in the unsecured rate (Euribor) relative to a three month rate with relatively low credit risk (Eonia swap) and the secured rate (Eurepo). Furthermore, the figure illustrates that the 3-month Eonia swap and Eurepo rates were very close both during the pre-crisis period as well as the crisis period.

Table 1 puts some numbers to what we see in the figures. The table divides the time from 20 June 2005 to 13 October 2008 into three periods. The pre-crisis period (20 June 2005 to 30 June 2007), the first stage of the crisis (August 2007 to 12 September 2008), and what one could call the panic stage of the crisis, after the Lehman insolvency (15 September 2008 to 13 October 2008).<sup>3</sup>

<sup>3</sup> July 2007 arguably represents a transition period from relative calm to crisis and has been excluded. Data from this time could be included in the pre-crisis period without making any noticeable difference.

**Table 1:** Average Rate Spreads (basis points).

Period	3 Month Rates		Overnight	Mixed
	Euribor – Eonia Swap	Eonia Swap - Eurepo	Eonia - Policy Rate	Eonia swap – Policy Rate
7/05-6/07	5.69 (0.04)	1.22 (0.03)	7.12 (0.26)	22.11 (0.41)
8/07-12/9/08	62.05 (0.94)	-0.47 (0.13)	0.92 (0.73)	6.86 (0.46)
15/9/08-13/10/08	115.45 (8.76)	-7.47 (0.76)	8.22 (4.86)	-11.91 (2.84)

Source: [www.euribor.org](http://www.euribor.org) Standard errors in brackets.

In each of these three time periods, the table reports the means of four spreads: (1) 3-month Euribor less 3-month Eonia swap, (2) 3-month Eonia swap less 3-month Eurepo, (3) Eonia less the ECB's policy rate, and (4) 3-month Eonia swap less the policy rate.

The table reveals several interesting features of the market for liquidity during and across the three time periods. First, overnight rates have not been adversely affected by the crisis. However, the average spread between the Eonia and the policy rate actually fell from a pre-crisis level of 7.12 bp to 0.92 bp during the first stage of the crisis and then rose back up again to 8.22 bp during the panic stage of the crisis. Thus the impact on the level of overnight rates has not been dramatic, arguably because of the extraordinary quantities of liquidity injected during the crisis by the ECB. Furthermore, Cassola et al (2008) report that the volume of overnight trades involving the Eonia panel banks actually rose relative to standard levels in the period 8/2007 to 3/2008. Thus, the overnight rate did not only drop, but the volume in the overnight segment of the

unsecured trade went up. This illustrates that the cost of liquidity did not increase for banks that were able to roll over interbank loans on an overnight basis at the Eonia rate.<sup>4</sup>

Second, while unsecured rates have shot up dramatically during the crisis, the more secure longer term rates have held steady. The Euribor – Eonia swap spread averages to 5.69 bp in the pre-crisis period, shot up to 62.05 bp in the first stage of the crisis and went further up to 115.45 bp during the panic stage. Meanwhile, the spread between the 3-month Eonia swap and the policy rate went from an average of 22.11 bp during the pre-crisis period to 6.86 bp during the first stage of the crisis period. During the panic stage, it fell further to -11.91 bp, in part because of expectations of ECB rate cuts. The behavior of the 3-month Eonia swap rate illustrates that banks in good standing, that could roll over overnight loans, but were worried about overnight volatility, could lock in low longer term funding costs by paying the fixed leg in an Eonia swap.

Longer term liquidity could also be had during the crisis at rates around the policy rate for those banks that had general collateral (government bonds). The spread between the 3-month Eonia swap and the 3-month Eurepo fell from 1.22 bp during the pre-crisis period to slightly below 0 during the first stage of the crisis and all the way to -7.47 bp during the panic stage. The negative swap-repo spread is in itself noteworthy as it suggests a higher default risk in some government paper as compared with unsecured interbank loans. However, the general point here is that even though longer term unsecured rates, with full risk of the principal, increased dramatically during the crisis and especially during the panic stage of the crisis, longer term liquidity was available at good rates for banks that were good credits and had good collateral.

The high longer term unsecured rates during the crisis have been held up in the media as illustrating the severity of the problem in the market for liquidity. For example, substantial attention has been given to the Libor – OIS spread, with a high such spread meant to illustrate that liquidity is dear. It is also argued that it impedes the monetary

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<sup>4</sup> The Eonia is based on actual trades: According [www.euribor.org](http://www.euribor.org): “It is computed as a weighted average of all overnight unsecured lending transactions undertaken in the interbank market, initiated within the euro area by the contributing banks.”

policy transmission mechanism, because it increases effective interest rates relative to where the central bank would like them to be. The correlation between euro Libor and Euribor is 0.999 during each of the three time periods in Table 1.<sup>5</sup> Thus, for the euro area, we may equally focus on the Euribor – Eonia swap spread. As argued above, this spread being large is not a problem for banks that can roll over overnight loans or have government bonds as collateral.

Nevertheless, there are reasons for why a high Euribor – Eonia swap (or Libor – OIS) spread can be a problem. First, as discussed above, not all banks will be able to roll over overnight loans or have sufficient collateral to obtain relatively cheap longer term funding. Second, it represents a cost to banks that have been funding themselves explicitly or implicitly in the longer term money market (e.g. 3 months), for example through paying the floating leg in interest rate swaps or having other derivative positions, for example unhedged written interest rate caps, with a long exposure to 3-month, say, unsecured rates. Third, a high Euribor - Eonia swap spread may have negative repercussions on the real sector. Banks may require higher rates from businesses and households and may also cut back on lending. Furthermore, many loan contracts are indexed in Euribor or Libor. Thus, a high Euribor – Eonia swap spread can have a negative impact on banks' balance sheets and also on investments in real assets. Thus, this problem in the market for liquidity can be a problem for the wider economy.

The rise in unsecured rates relative to secured rates is consistent with a high degree of adverse selection with respect to the quality of banks' balance sheets. Indeed many commentators and insiders have complained about the opaqueness of banks' balance sheets and the products created in securitization. For example, as expressed by Mervyn King, the Governor of the Bank of England,

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<sup>5</sup> The average 3-month Euribor – euro Libor spread were -0.026 bp, 0.105 bp, and 0.582 bp, respectively, during the three time periods in Table 1.

*Well we'd been through a decade of extraordinarily low interest rates and that had encouraged people to invest in more risky and exotic instruments in order to earn the sort of rates of return to which they had become accustomed before we moved into a low inflation, low interest rate era. And people managed to persuade themselves that perhaps they weren't taking such large risks and they were persuaded to buy and take onboard these new and complex financial instruments, which turned out to be both riskier and much more opaque than the investors had originally understood. And we said that because these instruments were both riskier and more opaque and complex, it was quite possible that one day the markets in those instruments would become illiquid. And hence, the ability to sell the instruments and realize cash would be diminished.* The Guardian, Tuesday, 6 November 2007.

Consistent with this view, the crisis period has seen large decreases in the collateral value of mortgage backed securities. Even the pfandbriefe market has been adversely affected.

Imperfections in the market for liquidity are also present during times of normalcy, albeit to a much smaller extent and much harder to detect in the data. Studying bidder behavior in ECB main refinancing operations, Bindseil, Nyborg, and Strebulaev (2002, 2008) find evidence consistent with short squeezes or possibly credit rationing (differentiating between these two issues is difficult with their data). In addition, there is anecdotal evidence that credit rationing takes place in the market for liquidity during times of normalcy. It seems plausible that the issues discussed above represent, at least to some extent, a flaring up of imperfections that are present during times of normalcy. This would be one reason for why active monitoring of the interbank market could be a valuable activity for supervisors and regulators to engage in, so as to be able to stop the rot before it sets in.

### **3. Bank Supervision using the Market for Liquidity**

My proposal contains a primary and secondary element, which I discuss in turn.

#### **3.1. Monitor Banks by Monitoring the Market for Liquidity**

My main proposal is to tap into the large amount of intelligence that is produced about the credit worthiness of banks every day by banks themselves. There is not only time

variation in interbank rates relative to each other and to the policy rate, as seen above, there is also significant cross-sectional variation. For example, unsecured rates vary greatly across banks, presumably reflecting, at least in part, differences in the market's assessment of their credit worthiness. Thus, these rates contain valuable information to supervisors and regulators.

As an example of differences among banks in the price banks pay for liquidity, Fecht, Nyborg, and Rocholl (2008) report that in 78 ECB main refinancing operations from 6/2000 to 12/2001, the average difference between high and low paying German banks is 11.5 basis points (this is for two week money). It is likely that what banks are willing to pay in ECB's operations reflects conditions in the interbank market.

Another example of cross-sectional variation in rates paid for liquidity is provided by Table 2, this time using US data. The table breaks the intraday spread between high and low Fed funds transactions into the same time periods as for Table 1. During the pre-crisis period, the high-low spread was 76.19 bp. By way of comparison, the average target rate over this time period was 4.72%. During the first stage of the crisis, the average high-low spread increased to 205.97 bp, despite a fall in the average target rate to 3.30%. During the panic stage of the crisis, the high-low spread averaged to 460.86 bp, while the target rate was at 2% until 08/10/08 when it dropped to 1.5%. While the high-low spread presented here does not necessarily reflect the spread between the average rates paid by different banks, it is highly suggestive of significant cross-sectional variation in the cost of liquidity.

**Table 2:** Fed Funds, Intraday High-Low Spread

Period	High – Low Intraday, Fed Funds (basis points)
7/05-6/07	76.19 (3.44)
8/07-12/9/08	205.97 (8.94)
15/9/08-13/10/08	460.86 (44.09)

Source: <http://www.newyorkfed.org/markets/omo/dmm/historical/fedfunds/index.cfm>

Standard error in brackets.

My proposal involves collecting data on all trades in the market for liquidity, unsecured and secured alike, that banks are involved in. Using this data, appropriate algorithms can then flag problem banks to supervisors and regulators. Features of the data that may be useful to investigate include:

- What rates do different banks pay for unsecured loans? Warning flags can be raised, for example, for banks paying unusually large rates relative to the cross-sectional mean. Unusual changes to the pattern of funding or to a bank's funding cost percentile could also give rise to warning flags.
- Counterparty exposure. Large exposure to banks with high borrowing rates, for example, can give rise to a warning signal.
- Repo rates: High rates or haircuts on particular securitization products can also be problem for a bank that holds (on or off balance sheet) large quantities of the bad collateral. Monitoring this can therefore also be very valuable.
- High repo rates or haircuts on particular securitization products also suggest a problem at the issuing/originating bank.

Banks that are flagged through these procedures will then have to be looked into more carefully. By doing this, it may be possible to intervene in a poorly performing bank or a particular practice before things get out of hand. One can also apply this kind of monitoring to the credit derivatives market.

### 3.1. Promoting a Repo Market for Non-Government Bond Collateral

The problem described above for longer term unsecured funding, suggests that it would also be valuable for the banks to be less reliant on such funding. As seen, repo rates for government bonds have held up well during the crisis, suggesting that the interbank market would be more resilient if it relied more on secured funding. A challenge here is that securitization products have not been trusted as collateral during the crisis, as evidenced by their falling collateral values by the breakdown of the repo market for such collateral. This suggests that standardization of securitization products and more reliable ratings of these securities would be valuable.

Standardization and more reliable ratings of securitization products also has other advantages. It can help promote a more resilient interbank repo market for these products and thereby: (i) provide supervisor and regulators with a market where they can fetch valuable information regarding the soundness of banks and products they have issued, (ii) help reduce bank balance sheet opaqueness, which in turn can help mitigate future extreme increases in longer term unsecured rates, (iii) help central banks such as the ECB, that rely on these products in their monetary policy implementation, to set more appropriate haircuts for eligible collateral in open market operations.

## 4. Concluding Remarks

Relative to the pre-crisis period, the market for liquidity during the crisis period has seen large increases in longer term unsecured rates, but not in longer term secured rates – or

even in longer term unsecured rates with low credit risk. This suggests that fear, or adverse selection, with respect to banks' balance sheets have been a key feature of the crisis. In this paper, I have made a broad proposal that is intended to provide early warning signals to supervisors and regulators with respect to concerns over individual banks' credit worthiness by tapping into the information that is produced by banks themselves when they trade in the market for liquidity.

## References

1. Bindseil, Ulrich, Kjell G. Nyborg, and Ilya Strebulaev, June 2008, "Repo Auctions and the Market for Corporate Control", European Central Bank, Norwegian School of Economics and Business Administration, and Stanford University.
2. Cassola, N., C. Holthausen, and M. Lo Duca, July 2008, "The 2007/2008 Turmoil: A Challenge for the Integration of the Euro Area Money Market?", European Central Bank, July.
3. Emmons, William R., R. Alton Gilbert, and Mark D. Vaughan, October 2001, "A Third Pillar of Bank Supervision: Examinations and Capital Requirements Already Seek to Control Risk. Can Markets Support this Effort?", The Regional Economist, Federal Reserve Bank of St Louis.
4. Flannery, Mark, "Using Market Information in Prudential Bank Supervision: A Review of U.S. Empirical Evidence." *Journal of Money, Credit and Banking*, 1998, 30, pp. 273-305.
5. Fecht, Falko, Kjell G. Nyborg, and Jorg Rocholl, 2008, "The Price of Liquidity: Bank Characteristics and Market Conditions", working paper, Deutsche Bundesbank.
6. Nyborg, Kjell G., Ulrich Bindseil, and Ilya Strebulaev, 2002, "Bidding and Performance in Repo Auctions: Evidence from ECB Open Market Operations", European Central Bank, working paper no. 157.