

# ERSA Research Brief

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## The Eurozone interbank market “freeze” under the microscope: lessons from TARGET2

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Eurozone banks become sensitive to counterparty characteristics after the Lehman Brothers' insolvency but do not stop lending altogether, contrary to the common narrative. Banks rather start hoarding liquidity by shortening the maturity of their interbank assets. The subsequent change in turnover volumes is accompanied by a significant structural change of the interbank network. We show that this structural change is indeed relevant: Banks with higher network centrality have better access to liquidity and make higher intermediation spreads.

The interbank market is one of the most important sources of liquidity for Eurozone banks because, unlike in the US, interbank lending in the Eurozone accounts for roughly 25% of banks' balance sheet size. The insolvency of the US investment bank Lehman Brothers in September 2008 led to unprecedented turmoil in interbank markets around the world. Fear of a total breakdown of the interbank market shaped much of the immediate policy response by central banks. As Trichet (2010) puts it: "Given heightened concerns about counterparty risk – which intensified dramatically after the failure of Lehman – cash-rich banks proved unwilling to lend to banks needing liquidity. As a result, the money market came close to a total freeze. [...] There was a clear and present danger that the resulting tightening of financial conditions would lead to augment the risk of a deflationary spiral, to trigger additional credit losses and a vicious downward cycle of financial and real distress."

In a new working paper (Gabrieli and Georg 2014) we study the Eurozone interbank market in the aftermath of the Lehman insolvency using novel data of all transactions settled between all Eurozone banks obtained from the TARGET2 large value payment system. Our data is unique along two dimensions. First, we not only include transactions in the overnight maturity segment, but all transactions with a maturity of up to one year (i.e. the term maturity segment). And second, in addition to the settlement banks involved, we have information about the ultimate originator and final beneficiary of each trade. This information, together with the use of identifiers for interbank transactions, allows us to reliably obtain information about interbank loans even for maturities longer than overnight.

Using these novel data, we are able to study not only the aggregate volume and price dynamics, but also the structure of the network of interbank loans. Our starting hypothesis is that banks which are very central in the interbank network might benefit from their pivotal position by having better access to liquidity and making larger intermediation spreads, particularly following a large liquidity shock. We therefore use the Lehman insolvency as an exogenous shock to study the following questions: Did the interbank market, as policy makers and market participants feared, indeed freeze in September 2008? And if so, was such a freeze caused by heightened sensitivity to counterparty risk, or did banks start hoarding liquidity? How did the aggregate dynamics impact on the network structure of the interbank market? And does it really matter where in the interbank network a bank

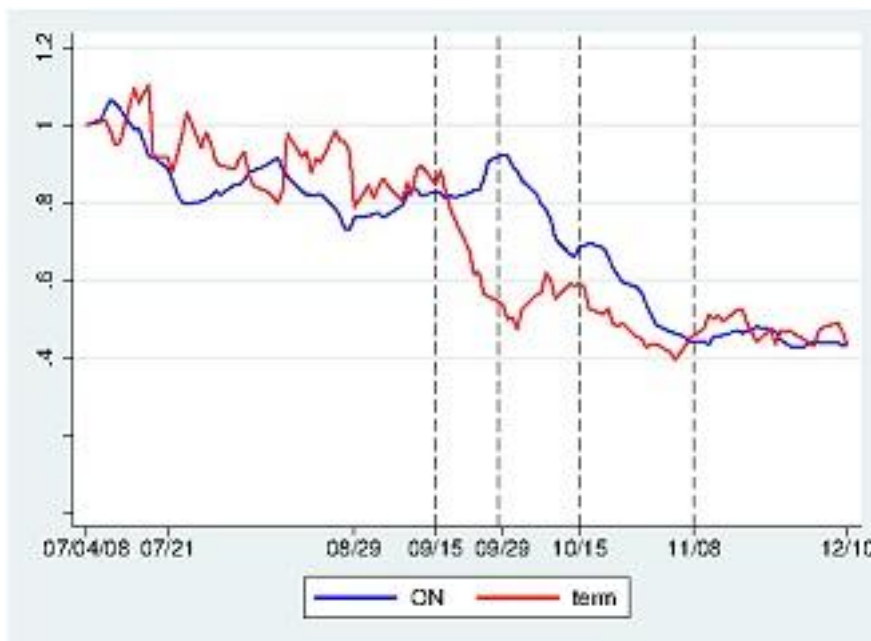
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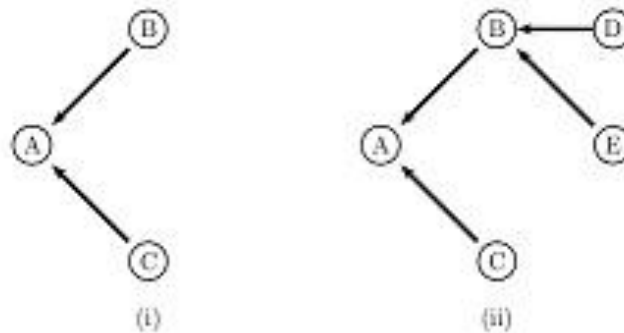
is positioned exactly?

We start by studying the aggregate volume, price, and maturity dynamics of the Euroarea interbank market, both for the overnight and the maturity term segment. The amount lent on the interbank market in the overnight segment is significantly reduced once we account for counterparty characteristics, but only after the European Central Bank (ECB) conducted a special refinancing operation (SRO) with no predetermined amount (i.e. effectively full-allotment) on 30 September 2008. Before the SRO we even see an increase in overnight interbank lending, well in line with the results of Afonso, Kovner, and Schoar (2011), who show that while the US fed funds market experienced stress in the aftermath of the Lehman insolvency, it did not freeze. The price of overnight liquidity increased on Monday 15 and Tuesday 16 September 2008, but decreased already in the days thereafter. This price decrease was amplified following the special refinancing operation and particularly after the start of the full-allotment policy on 15 October 2008.

These are strong indications that, immediately after the Lehman insolvency, banks are worried about being rationed in their interbank borrowing (a strong increase in the price of liquidity can be a precursor to quantity rationing) and as a consequence reduce their term interbank lending. By providing overnight instead of term interbank loans, banks increase the liquidity of their balance sheet - well in line with the predictions of the literature on liquidity hoarding (e.g. Heider, Hoerova, and Holthausen (2009), Acharya, Gale and Yorulmazer (2011)). The resulting maturity shortening can be seen in Figure 1. Until the Lehman insolvency, overnight and term interbank lending are strongly positively correlated. Following Lehman, and until the adoption of the full-allotment regime by the ECB on 15 October 2008, the two term segments are negatively correlated. Once full-allotment is adopted, there is a strong positive correlation again and the dynamics returns to normal.



Such substantial change in the aggregate volumes (and prices) inevitably leads to a change in the network structure of the over-the-counter interbank market. Why such structural change might matter for a bank's access to liquidity can be seen by an intuitive argument. Compare the two situations depicted in Figure 2. In both cases, bank A borrows from two counterparties, B and C. While those counterparties have no counterparties of their own in the first case, bank B borrows from D and E in the second case. If bank A now tries to raise liquidity, it is more likely to obtain it from bank B in the second case, simply because bank B can ask its counterparties for the additional funds. In network terms: Bank A has a higher network centrality in the second case than in the first. Especially when liquidity is scarce we thus have reason to believe that bank A in the second case will have better access to liquidity.



In our analysis, We we first quantify the change in the network structure in both maturity segments. Empirical studies of interbank networks have found them to have a core-periphery structure where a relatively small, but highly interconnected core of banks links a large number of very little interconnected peripheral banks (Craig and von Peter (2014)). The Euroarea euro area interbank network, however, is not exactly of the core-periphery type. Rather, there is a core-periphery structure in each country where the largest banks in each core are themselves connected in a Euroarea core. In the overnight interbank network, both the Euroarea core and -periphery shrink after the Lehman insolvency, but the periphery shrinks more. In the term interbank network the Euroarea core increases almost twofold, while the periphery shrinks substantially. Given how rigid interbank networks are in normal times, the observed structural change after the Lehman insolvency is quite sizeable, which makes it the ideal situation to test whether a bank's position in the interbank network affects the bank's access to liquidity.

To test our hypothesis, we use the methodology developed in Khwaja an Mian (2008) and construct a panel of overnight interbank loans that exist before and after the Lehman insolvency and use borrowing-bank fixed effects after first-differencing the data to absorb all borrowing-bank specific demand shocks. This implies that we restrict our sample to banks that borrow from the same two counterparties, both before and after the Lehman insolvency (all our results hold qualitatively when we perform the analysis in the term segment, but our sample size is much smaller).

The results of our analysis strongly support our hypothesis: Lender-banks that see a 1% reduction in interbank borrowing reduce their lending by 2% after the Lehman shock. A 1% reduction in the number of counterparties a lender-bank borrows from leads to a 0.2% reduction in the number of counterparties this bank lends to. A one-unit decrease in a lender-bank's betweenness centrality leads to a 0.61 unit decrease in the amount of liquidity it provides. Our results are qualitatively robust when we use different measures of a bank's centrality, a different definition of the term market segments (e.g. a separation in overnight, up to one month maturity, and between one and twelve months maturity), and a change in the length of the time-window around the Lehman insolvency. We also study the extensive margin of liquidity, i.e. whether a bank has access to liquidity at all, and find a significant impact of a bank's network position on the probability that an existing loan is renewed and a non-existing loan is created following the post-Lehman shock. Finally, we study the effect of the interbank network structure on intermediation spreads. A one unit increase in betweenness centrality implies a 0.27 basis points higher intermediation spread, which shows that banks with a higher centrality not only are get more likely to get liquidity, they get it at cheaper prices.

Our our results provide a novel perspective on interbank market freezes. We are the first to provide evidence for liquidity hoarding through maturity shortening, which highlights the necessity of studying the term segment of the interbank market as well along with the overnight segment. We also show that the substantial change in the aggregate dynamics of the interbank market is accompanied by a substantial change in the interbank network structure. Crucially, we show provide evidence that this structural change is consequential for banks' access to liquidity.

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