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# Liquidity Risk and Credit Supply during the Financial Crisis: The Case of German Banks

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## **Abstract:**

This study provides the evidence of the performance of SRI funds in the UK and in France both before and during the financial crisis. We find that in the pre-crisis (2004-2007) period all French and UK funds outperformed the market. According to the modified Sharpe ratio, French and UK funds also outperformed during the crisis period (2007-2009) when compared with relative market benchmarks. This result is not confirmed by the Jensen alpha or the Treynor ratio, but these instruments did not indicate significant underperformance. Overall, our results show that while there is no significant difference in financial performance between SRI funds and non-SRI funds.

**JEL classification:** G12:G20:G23

**Keywords:** Socially Responsible Investing, Sharp ratio, Modified Sharp ratio, Beta, Jensen's Alpha, Performance evaluation, bear market, market conditions.

# **Liquidity Risk and Credit Supply during the Financial Crisis: The Case of German Banks**

## **1.INTRODUCTION**

In a traditional financial intermediation, banks provide liquidity to the overall economy through transactions on their balance sheets, creating a situation of non-affiliation of their assets and liabilities. This activity of maturity transformation is possible because the banks are supposed to be better able than their depositors to make the selection and monitoring of loans and borrowers and the diversification of their asset portfolio and because of this, banks are able to reduce information asymmetries in credit markets.

In recent decades, the financial system has developed a more efficient management of liquidity. Thanks to financial innovations, banks have moved from a model of "originate to hold" (detention and granting of credit) to an "originate to distribute" (and awarding of transfer credit) and rely more on market financing. This permitted further relaxation of credit constraints in the economy, growth of loans to be partially disconnected from that of bank deposits.

The global credit crisis of 2007 born as a result of inadequate liquidity management in the same way as previous financial crisis in the emerging economies. At the time of credit crisis savings in the financial institutions in the banks and financial markets are reduced leading towards shortage of allocation of credit due to deteriorating liquidity. This misallocation of investments reduces profitability and liquidity of financial institutions as they have to generate savings from other parts of the world to remain in the market.

Before the financial crisis of 2007 banks are performing nicely and showing higher profitability and lend at cheaper costs to customers but soon this reduction in liquidity created trouble for many governments and financial institutions because regulatory bodies and governments provides huge bailout packages to public financial institutions to overcome shortage of liquidity. The changing conditions of markets shows a challenge to regulatory bodies that how to manage liquidity and credit allocation.

Regulatory bodies respond to this situation by introducing new regulations in basel III capital accord such as they introduced leverage and buffer capital to facilitate efficient functioning of financial institutions and reduced any potential chances of credit crisis in the future. Basel III accord try to solve the puzzle about appropriate level of liquidity and capital. These complex regulations helps financial institutions to maintain their financial position thus reducing the chance of bank run. In short these regulations results in effective management of liquidity and capital (Diamond & Rajan 2009; King & Tarbert 2011).

The shortage of liquidity causes many problems for financial institutions as this will restrict the allocation of capital for investment purpose. When this problem persists banks are unable to finance the new projects or continue the existing investments. Ultimately this will cause efficiency loss as other banks with surplus liquidity finance those projects resulted in bad performance than originating financial institutions. This shows the significance of effective management of liquidity for profitability of banks not only for individual banks but for the whole financial system (Wagner 2007).

Recent financial crisis of 2007 reduces the liquidity of major financial institutions and central banks support public sector banks by injecting the liquidity in the system. However this strategy did not increase growth in the credit but it increases hoarding of cash by financial institutions for

covering their huge losses such as Federal reserve inject liquidity in the financial system but it did not leads towards stimulation of credit in the economy(Cornett *et al.* 2011).

This study contributes to the existing body of literature by liquidity risk and creation of credit using data of German banks over the period 2006-2011.As per author knowledge this is the first study that tried to find this relationship in the context of German financial institutions.Although some authors tested this relationship in European context.

The financial system of the Germany is based on three pillars or categories based on different organizational and ownership structures.First category includes private banks those are large banks,subsidiaries of foreign banks and banks are at local level. The smaller and local banks are created by partnership and sole proprietorships while other larger banks at private sector incorporated as joint stock companies.The main activity of the public sector banks to generate savings and they are owned local and national level by the government. Cooperative banks and credit corporations also operates in Germany.Finally German financial sector includes diverse financial institutions for provision of different financial services to consumers and business sector(Brunnermeier 2008).

In this paper our focus is on German banks and we tried to find the relation of liquidity risk exposure to growth in liquid assets and growth in loans during the crisis period. We also contributes to existing literature by examining implications of liquidity risk exposure to credit supply for German banks which as per author knowledge ignored in existing literature. Our results enabled us to explain the major factors responsible for the decline in new credit creation.The rest of the paper is structured as follows: Section 2 will present the review of literature.While collection and research methodology is defined in the section 3 and Section 4 will present our findings and section 5 concludes.

## 2.LITERATURE REVIEW

The creation and management of liquidity is crucial for banks and financial institutions during financial difficulties. They need liquidity for payment of customer obligations. The global financial crisis is the result of inadequate management of liquidity and different markets halted because of this crisis. The central banks and governments injected huge amount of liquidity to financial system. From above discussion one question arise that how do we define liquidity? it is simply the share of investments in liquid securities. It is the duty of the financial institution to reduce liquidity risk within and overall financial system by devising plans for effective management of liquid assets (Tirole 2011).

At the time of financial difficulties banks face serious difficulties for liquidity creation and it can increase exposure of banks to liquidity risk. Although all financial institutions face these changes but sound management and planning hedge them from adverse trends in business cycle (Simona & Eugenia 2010).

During the financial crisis banks reduced lending and holds more liquid assets. This liquidity exposure affected the banks in different ways; such as on the asset side some banks doubt their liquidity management ability and hoarded liquidity. On the other hand, banks reduced the lending and started relying on equity capital and bank deposits for funding purposes. (Strahan 2012).

Gatev *et al.* (2007) conducted study on liquidity risk in different market situations and finds that banks with high loan liquidity risk faces more risk while during financial difficulties deposits plays a key role in provision of liquidity to banks.

Lou and Sadka (2011) studied the performance of liquid and illiquid stocks during financial crisis. Authors compared the historical betas with historical liquidity for empirical

investigation. They further controlled the liquidity level and find no difference in returns of stocks. These findings suggest implications for better risk management techniques.

Berger and Bouwman (2011) observed the bank performance relationship with capital and variation of this relationship during financial crisis. Authors find that small banks are in a better position to maintain their position in the market during difficulties. On the other hand, inflows of capital increase performance of large banks in crisis. These results hold with robustness tests.

Ioan *et al.* (2008) conducted a study on the role of central banks in management of liquidity during dynamic changes in the financial system. They stressed the reasons behind financial crisis such as liquidity. Further, they argued that people must be aware about such risks. Central banks intervene in the free market to protect some banks from bankruptcy filing such as lending 30\$ billion to JP Morgan. Europeans want central banks to protect them from worldwide depression and loss of liquidity.

### **3. DATA COLLECTION AND THE METHODOLOGY**

We use the model developed by Ivashina and Scharfstein (2010) in which she defines four elements as the main factors for liquidity risk management. (1) Liquidity of assets, (2) Deposits as a function of total financial structure, (3) equity capital as a fraction of the financial structure, (4) funding liquidity exposure as a new loan generation. We build our monthly data ranges from January 2006 to March 2011. This includes pre-crisis period and the crisis period. Five main categories of banks are selected for our analysis. These include commercial banks, regional banks, Landsbanken, savings banks and credit unions. Our sample has observations before and during the crisis period.

We estimate and analyze the following three equations:

(1)

$$\begin{aligned} \Delta \text{Liquid Assets}_{i,t} / \text{Assets}_{i,t-1} = & \beta^1 \text{ Illiquid Assets} / \text{Assets}_{i,t-1} + \beta^2 \text{ Illiquid Assets} / \text{Assets}_{i,t-1} * \text{TED}_t + \\ & \beta^3 \text{ Core Deposits} / \text{Assets}_{i,t-1} + \beta^4 \text{ Core Deposits} / \text{Assets}_{i,t-1} * \text{TED} + \\ & \beta^5 \text{ Capital} / \text{Assets}_{i,t-1} + \beta^6 \text{ Capital} / \text{Assets}_{i,t-1} \text{TED} + \\ & \beta^7 \text{ Commit} / (\text{Commit} + \text{Assets})_{i,t-1} + \beta^8 \text{ Commit} / (\text{Commit} + \text{Assets})_{i,t-1} * \text{TED} \\ & + \beta^9 \log \text{Assets}_{i,t-1} + \beta^{10} \log \text{Assets}_{i,t-1} * \text{TED} \quad [1] \end{aligned}$$

(2)

$$\begin{aligned} \Delta \text{Loans}_t / \text{Assets}_{i,t-1} = & \lambda^1 \text{ Illiquid Assets} / \text{Assets}_{i,t-1} + \lambda^2 \text{ Illiquid Assets} / \text{Assets}_{i,t-1} * \text{TED}_t + \\ & \lambda^3 \text{ Core Deposits} / \text{Assets}_{i,t-1} + \lambda^4 \text{ Core Deposits} / \text{Assets}_{i,t-1} * \text{TED} + \\ & \lambda^5 \text{ Capital} / \text{Assets}_{i,t-1} + \lambda^6 \text{ Capital} / \text{Assets}_{i,t-1} * \text{TED} + \\ & \lambda^7 \text{ Commit} / (\text{Commit} + \text{Assets})_{i,t-1} + \lambda^8 \text{ Commit} / (\text{Commit} + \text{Assets})_{i,t-1} * \text{TED} \\ & + \lambda^9 \log \text{Assets}_{i,t-1} + \lambda^{10} \log \text{Assets}_{i,t-1} * \text{TED} \quad [2] \end{aligned}$$

(3)

$$\begin{aligned} \Delta \text{Credits}_t / (\text{Commit} + \text{Assets})_{i,t-1} = & \gamma^1 \text{ Illiquid Assets} / \text{Assets}_{i,t-1} + \gamma^2 \text{ Illiquid Assets} / \text{Assets}_{i,t-1} * \text{TED}_t + \\ & \gamma^3 \text{ Core Deposits} / \text{Assets}_{i,t-1} + \gamma^4 \text{ Core Deposits} / \text{Assets}_{i,t-1} * \text{TED} + \\ & \gamma^5 \text{ Capital} / \text{Assets}_{i,t-1} + \gamma^6 \text{ Capital} / \text{Assets}_{i,t-1} * \text{TED} + \\ & \gamma^7 \text{ Commit} / (\text{Commit} + \text{Assets})_{i,t-1} + \gamma^8 \text{ Commit} / (\text{Commit} + \text{Assets})_{i,t-1} * \text{TED} \\ & + \gamma^9 \log \text{Assets}_{i,t-1} + \gamma^{10} \log \text{Assets}_{i,t-1} * \text{TED} \quad [3] \end{aligned}$$

Our data is composed of 5 years and 3 months. Regression (1) tests how banks adjust their holdings of liquid assets. Regression (2) analyses how bank lending on the balance sheet adjusts while regression (3) investigates how total credit origination adjusts. We used explanatory variables in our model which include firm investment portfolio assets fraction those are illiquid at the beginning ( $\text{Illiquid Assets} / \text{Assets}_{i,t-1}$ ), Next we used firm balance sheet fraction with core deposits at the start of the period ( $\text{Core Deposits} / \text{Assets}_{i,t-1}$ ), risk weighted assets fraction of balance sheet is financed using Tier 1 capital at the beginning period ( $\text{Capital} / \text{Assets}_{i,t-1}$ ), Further we used the ration of unused to used commitments plus assets at the start of the time

period( $\text{Commit} / (\text{Commit} + \text{Assets})_{i,t-1}$ ), Finally we used the log of total assets at the beginning period ( $\text{Log Assets}_{i,t-1}$ ).

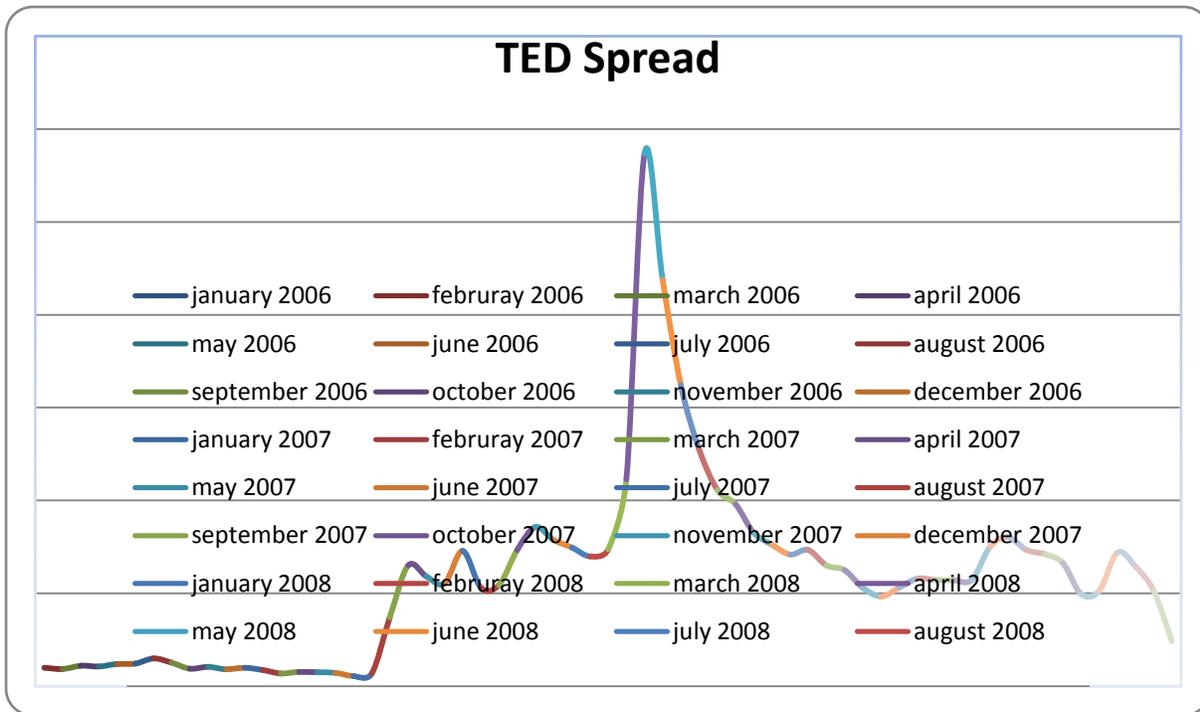
We hypothesize that during crisis period those banks with shortage of liquidity increase their liquid assets for credit creation and lending.

Thus, we anticipate  $\beta > 0$ ,  $\gamma^2 < 0$  and  $\lambda^2 < 0$ . If during financial crisis, core deposits and capital is utilized as financing source, Further we expect banks with higher levels of capital and core deposits to be more willing to depress their liquidity buffers. Additionally, if these are stable sources of funding and allowed the banking institutions to remain to lend during the crisis, we expect  $\gamma^4 > 0$ ,  $\gamma^6 > 0$  and  $\lambda^4 > 0$ ,  $\lambda^6 > 0$ .

In recent financial crisis banks were not in a better position to grant loan securitization such as origination and distribution of loans is not the same as they had before the crisis period. Moreover liquidity situation of banks deteriorates at that time and liquidity of asset and mortgage backed securities almost came to end. By considering the above factors we expect banks with less liquid assets tend to increase their liquid assets during crisis.

We used all these variables in regression also we checked explanatory variables interaction with the TED spread. TED spread is simply the difference between 3-month EURIBOR rates and Risk Free Rate of Germany.

Fig I shows the TED spread for our analysis period. It is clear from the figure that TED reaches to its maximum value after September 2008 and then decreases afterwards.



**FIGURE I**

Our data consists of monthly values collected from Banking Statistics 2011 published by Central Bank of Germany (DEUTSCHE BUNDESBANK) which regulates all banks of Germany. Our analysis period for this paper is from January 2006 to February 2011. This will include pre-crisis period (from January 2006 to July 2007) and crisis period (from August 2007 to March 2011).

*Insert Table 1 Here*

#### **4.EMPIRICAL RESULTS**

This section examines the relation of liquidity risk exposure to growth in liquid assets and growth in loans during the crisis period. We also explain implications of liquidity risk exposure to credit supply for German banks.

### **Private banks**

Results in Table 2 underscore that  $Illiquid\ Assets/Assets_{i,t-1} * TED_t$  is the only coefficient that is significant for the Eq. (1) which shows that during the crisis period, illiquid assets of Private Banks decreased which shows that liquid assets of banks increased. Similarly to equation (3) coefficient of  $Commit/(commit +assets)_{i,t-1} *TED$  and  $log\ assets_{i,t-1}$  are significantly positive which show that banks can have more credit.

*Insert Table 2 Here*

### **Public Sector Bank**

Table II presents the results of regional bank regression. The results of regression (2) show that assets of banks have significant positive value and they have more money available for lending. Equation (3) shows the banks have significant positive value of deposits and commitments which indicate that they have adequate deposits for lending. It means that lending and deposits have the positive relation.

*Insert Table 3 Here*

## **5.CONCLUSION**

During the recent financial crisis banks liquidity situation deteriorates as financial institutions and markets are halted and markets for mortgage and asset backed securities are crashed specially in USA. The increase in the use of assets as collateral has been one of the causes of the financial crisis. By contagion, an aggravating factor has emerged: the non-performing assets have eliminated the flow of huge amounts of assets. Some of which were of good quality. The proliferation of off-balance sheet structures involved in maturity transformation was an additional factor destabilizing the markets. These structures, lack of "safety cushions" that

provide the capital, found unable to hold illiquid long as investors have decided not to renew short-term lending to these structures, which caused a wave of forced sales and hence lower prices. Channels of liquidity provision depends on the structured and securitized assets are, by their very nature, fragile: they rely on innovative instruments, lack of secondary markets deep and robust. The opacity and complexity of the products have constituted major obstacles to the emergence of such secondary markets and the availability of observable market prices.

In this study,our findings indicates that private banks with less liquid assets increased liquidity with reduction in lending to customers.Further we find that banks prefer to rely on stable source of financing for instance core deposits and high quality capital and they continued lending.Liquidity risk(off-balance sheet) which is in the form of withdrawn loan obligations is appeared as borrowers drew on prior commitments in huge quantities.In conclusion our findings shows that public banks with more assets tend to lend more and those banks with more core deposits most effectively use their credit lines.

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**Table I:** Number of banks in Germany examined between 2006 and March 2011.

This table lists the distribution of the sample banks by year. We segregate banks into five kinds of banks commercial banks, regional banks, Landerbanken, savings banks and credit. The data are collected from Banking Statistics 2011 published by Central Bank of Germany (<http://www.bundesbank.de/index.en.php>).

<b>Bank Category/Year</b>	<b>No. of Banks</b>	<b>Bank Category/Year</b>	<b>No. of Banks</b>
Commercial banks		Regional banks	
2006	255	2006	158
2007	258	2007	158
2008	271	2008	163
2009	274	2009	164
2010-11	280	2010-11	168
Landsbanken		Savings banks	
2006	12	2006	458
2007	12	2007	448
2008	11	2008	444
2009	10	2009	434
2010-11	10	2010-11	430
Credit Unions		Big banks	
2006	1294	2006	2222
2007	1257	2007	2295
2008	1228	2008	2143
2009	1157	2009	2878
2010-11	1140	2010-11	2314

**TABLE II REGRESSION ANALYSIS ON PRIVATE BANKING**

These tables report regressions of monthly growth in liquid assets standardized by beginning of period assets of commercial banks. The data are observed monthly over the period 2006 to 2011. TED spread is the difference between 6-month EURIBOR rates and Risk Free Rate of Germany. The data are collected from Banking Statistics 2011 published by Central Bank of Germany (<http://www.bundesbank.de/index.en.php>). \*\*\*, \*\*, and \* denote that the coefficients are statistically significantly different from zero at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
<i>Illiquid Assets/Assets</i> <sub><i>i,t-1</i></sub>	0,004	0,131	0,140
<i>I</i> +	(0,962)	(1,069)	(1,130)
<i>Illiquid Assets/Assets</i> <sub><i>i,t-1</i></sub>	-0,013*	-0,92	-0,0124
* <i>TED</i> <sub><i>t</i></sub>	(-1,862)	(-0,423)	(-0,565)
<i>Core Deposits/Assets</i> <sub><i>i,t-1</i></sub>	0,000	0,161	0,162
<i>I</i> +	(0,037)	(0,947)	(0,950)
<i>Core Deposits/Assets</i> <sub><i>i,t-1</i></sub>	0,005	0,256	0,270
<i>I</i> * <i>TED</i>	(0,621)	(1,084)	(1,137)
<i>Capital / Assets</i> <sub><i>i,t-1</i></sub>	-0,046	-0,968	-1,006
	(-1,108)	(-0,776)	(-0,801)
<i>Capital/Assets</i> <sub><i>i,t-1</i></sub> *	0,014	1,041	1,021
<i>TED</i>	(0,414)	(1,016)	(0,99)
<i>Commit/(Commit</i>	-0,017	-1,147	-1,167
<i>+Assets)</i> <sub><i>i,t-1</i></sub>	(-0682)	(-1,49)	(-1,506)
<i>Commit/(Commit</i>	0,001	1,847	1,864*
<i>+Assets)</i> <sub><i>i,t-1</i></sub> * <i>TED</i>	(0,037)	(1,675)	(1,68)
<i>Log Assets</i> <sub><i>i,t-1</i></sub>	0,005	0,715*	0,725*
	(0,660)	(2,773)	(2,095)
<i>Log Assets</i> <sub><i>i,t-1</i></sub> * <i>TED</i>	0,001	-0,065*	-0,630
	(0,878)	(-1,965)	(-1,891)
<i>R</i> <sup>2</sup> (%)	18,9	23,1	23

\*\*\*, \*\*, \* show values are significant at 1%, 5% and 10%