Credit Crunch in Germany, Novelty or Reality?

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Abstract

The availability of credit has been an issue of particular concern in Germany during the financial meltdown of 2008-2009. Contraction of loans, especially business loans, together with an ongoing recession led to a growing fear about an upcoming shortage in lending. This paper analyses existence of a possible "credit crunch" in Germany by employing a disequilibrium model. The downward course of credit growth might be due to either weak demand of loans stemming from recession or supply side factors. Hence we attempt to disentangle credit supply from demand with our disequilibrium model using quarterly data from 2000q1 to 2009q3. With the outbreak of the financial crisis in the fourth quarter of 2008, we observe a supply dependent credit crunch. The slowdown in lending is not only a result of weak demand. However, there is also evidence that at the moment, credit markets are at equilibrium in Germany. The results do not reflect a "current" credit crunch. To detect the potential risk of a credit crunch during the forecast period from 2009q4 to 2010q4, we further anticipate the impact of various scenarios on lending. Our analysis offer that any deterioration of equity capital of banks results in a supply driven credit crunch. This would delay the economic recovery; hence it is crucial for policy makers in Germany to take necessary measures.

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Contents

1 Introduction

The availability of credit has been an issue of particular concern in Germany during the financial meltdown of 2008-2009. Lending to domestic non-monetary financial institutions by banks in Germany has dampened since the summer of 2008. Contraction of loans, especially business loans, together with an ongoing recession led to a growing fear about an upcoming "credit crunch" in Germany. In fact, a credit tightening is observed Euro-zone wide as well.

It is necessary to define a "credit crunch" before attempting to identify if it exists or not. However, this term is used in an interchangeable way to describe different occasions. First of all, we have to make sure that anecdotal evidence of credit denials is hardly evidence of a credit crunch[1]. Some borrowers could be too optimistic and far from evaluating the risks of their projects realistically; whereas some loan officers could be too skeptical. Such denials might occur simply due to incomplete information. Thus, it is essential to explore this concept more carefully. Bernanke and Lown (1991)(5) define a credit crunch as "a significant leftward shift in the supply curve for bank loans, holding constant both the safe real interest rate and the quality of potential borrowers". The definition of credit crunch that we adopt in this paper is brought up by Council of Economic Advisors (1991)(15) and follows "a credit crunch is a situation in which the supply of credit is restricted below the range usually identified with prevailing market interest rates and the profitability of investment projects." The reduction in the available supply of credit might be due to some funding problems of the lenders caused by disintermediation or strict regulation. It might also result from the weaknesses of lender's balance sheet. In the literature, this mechanism is called bank lending channel. Bernanke and Gertler (1995)(4) enlighten the credit channel of monetary policy transmission and propose two possible linkages between credit markets and monetary policy: the first one is the above mentioned "bank lending channel" and the second one is "balance sheet channel". The

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[1]See Syron (1991)(17).

second channel embraces that the balance sheets of the borrower and their income statements, and therefore their decisions about future investments depend on the changes in monetary policy. A vast amount of literature has discussed these linkages, such as Bernanke and Blinder (1988)(3), Bernanke (1993a)(2), Hubbard (1995)(10), Kashyap and Stein (1994) (11), Bernanke et al. (1996)(6). Theoretical studies are supported by a wide range of empirical works. Ding et al. (1998)(8) analyzes East Asian experience of credit shortage during after going into a detailed description of propagation mechanism of a credit crunch. Lang and Nakamura (1995)(12) look at bank lending channel in US and show that it plays a role in the transmission of monetary policy.

In Germany, there are several facts which trigger the fear of a credit crunch. First of all, as it is mentioned above, lending to enterprises and self employed has slowed down since mid of 2008[2]. Between November 2008 and April 2009, German banks have significantly reduced their asset positions due to global financial crisis. Yet this trend still continues at a slower pace. Especially, the insolvency of US investment bank Lehman Brothers in September 2008 has trimmed down the external and inter-bank assets in German banking sector. Bank Lending Survey (BLS) (Bundesbank, 2009 (7)) results also cast doubt on a possible credit crunch. From the start of the financial turmoil in the third quarter of 2007, particularly from the third quarter of 2008 on, German banks report that they tightened their credit standards in some incidents. What is more, Basel II rules have been revised and extensive changes were made in the international framework for liquidity risk measurement, standards and monitoring. New rules will be legislated by the end of 2010. Basel Committee on Banking and Supervision has also considered raising capital requirements of banks. Losses of banks together with higher capital base requirements might cause banks to restrict their credits. Above all, in case the estimated write-offs in German banking sector[3] realize, this would

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[2]The annual growth rate of loans to the domestic private sector in Germany fell by 2.7 percentage points to 1.1% between July 2008 and July 2009.

[3]ECB (2009b)(1) has estimated further write-offs of approximately e 212 billions for Euro area banking sector to the end of 2010. This corresponds to approximately e 70 billions

put the credit availability at a high risk. Therefore, the fragile path of economic upturn would veer off the road again in Germany, where the domestic bank loan is the key financing source for enterprises and households. Illiquidity might result in an output level below potential together with job losses and even default, which then amplifies recession. This chain of happenings then turns into a vicious circle.

Alternatively, the slowdown in credit growth might be caused by weak demand, which is a consequence of recession. However, low interest rates should encourage investment and credit demand again. Therefore, it is not straightforward to drive conclusions about the direction of the credit demand.

Our research question in this paper is whether there exists credit crunch in Germany or not. Analyzing this question is extremely important and highly policy relevant, above all for an efficient capital allocation; the economy should be supplied with sufficient funds necessary to enhance business activity. We employ a disequilibrium model in order to identify credit demand and credit supply separately. There are several applications of disequilibrium models for creit markets in the literature. Pazarbasioglu (1996)(16) look at the credit market in Finland following the banking crisis of 1991-92 and suggest that the Finnish credit market does not seem to suggest the presence of a credit crunch. Nels and Schmidt (2004)(14) study the German credit markets from 1990 to 2003, and offer evidence for a credit crunch. Ghosh and Ghosh (1999)(9) investigate a possible credit crunch in the East Asian countries during 1997-98 and finds little evidence of quantity rationing at the aggregate level. We admit that it is not an easy task to isolate the credit demand from supply factors since there are common aspects which restrict both demand and supply at the same time. Nevertheless, we challenge to disentangle credit supply from demand with our disequilibrium model. In our model, banks are unwilling to increase interest rate enough to eliminate excess demand if adverse selection effects and asymmetric information decrease expected profits.

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of write-downs for German banking sector.

The results of our empirical analysis suggest that there was a temporary credit crunch with the outbreak of financial turbulance in the third quarter of 2008. However, the credit markets are at equilibrium in Germany at the moment. The results do not reflect a "current" credit crunch. To detect the potential risk of a credit crunch during the forecast period from 2009q4 to 2010q4, we further anticipate the impact of various scenarios on lending. Any deterioration of equity capital of banks could result in a supply driven credit crunch. This would delay the economic recovery.

The remainder of the paper is organized as follows. Section 2 outlines our disequilibrium model. Section 3 presents the empirical results and provides some interpretation. Section 4 provides some concluding remarks.

2   The Model

It is crucial to know whether the current decline in bank-lending to enterprises and self-employed is supply or demand dependent in order to investigate a possible credit crunch in Germany. To address this question, we estimate a disequilibrium model which goes back to Maddala and Nelson (1974)(13). The idea of this model is that the actual lending is determined either by demand for credit (C_t^D) or supply of credit (C_t^S). The minimum of these two variables determines the actual lending . A credit crunch is present when the supply of credit is less than the demand for credit ($C_t^S < C_t^D$).

Initially we find out the determinants of both credit supply and credit demand and then we estimate the following system of equations using a maximum likelihood methodology:

$$C_t^S = a_1 + a_2 D_t + a_3 i_t^l + a_4 \left(i_t^l - i_t^{mm} \right) + a_5 \pi_t^e + a_6 CD_t + u_{1t} \qquad (1)$$

$$C_t^D = b_1 + b_2 i_t^l + b_3 OG_t + b_4 r_t^{cb} + b_5 \pi_t^e + b_6 \Delta gdp_t^e + b_7 CD_t + u_{2t} \qquad (2)$$

$$C_t = \min\left\{ C_t^D, C_t^S \right\} \tag{3}$$

where u_{1t} and u_{2t} are idiosyncratic error terms.

In our model, credit supply (C_t^S) is specified by equation (1). D_t is the lending capacity of the banks approximated by demand deposits, time deposits and total capital. The more lending capacity a bank has, the more credit she can supply. i_t^l is the lending rate which represents the profitability of a bank in the supply equation. Rising interest rates will motivate a bank to supply more credit. The difference between lending rate and money market rate $\left(i_t^l - i_t^{mm} \right)$ serves as a risk measure for a bank which includes agency costs and moral hazard stemming from asymmetric information between borrowers and lenders. A higher spread means higher risks to provide credit. The expected inflation (π_t^e) is a measure of general economic risks. In an inflationary environment, banks will be tighter to offer loans. CD_t are the corporate deposits for the granting of bank loans and represent collateral for firms.

Equation (2) is the specification of credit demand (C_t^D). Lending rate, $\imath_t^l$ is the cost of getting credit for enterprises in our demand equation. If credits become more costly, firms will recant from credits. Output gap (OG_t) and the expected growth (Δgdp_t^e) determine future investment requirements. If the economy is expected to grow, enterprises are going to expand their investments plans and demand more credit. Yield on corporate bonds (r_t^u) is utilized as a measure of alternative investment opportunities. If firms are to pay more yields to investors, they demand more credit instead of issuing deposits. Contrary to the supply equation, higher inflation will have a positive effect on demand, since inflation is going to erode the value of debt. Finally, the more collateral (CD_t) an enterprise has, the more volume of credit he can afford.

The final equation declares that the observed credit volume (C_t) is determined by the minimum of supply and demand.

Maddala and Nelson (1974) (13) propose a maximum likelihood method to

solve the model presented above. It is possible to determine the probabilities with which each observation belongs to the demand or supply function with the model suggested. The log likelihood is defined as:

$$ML = \sum_{t=1}^{n} log\left[f_1(C_t) * F_2(C_t) + f_2(C_t) * F_1(C_t)\right] \tag{4}$$

where

$$f_1(C_t) = \frac{1}{\sqrt{2\pi}\sigma_1} \exp\left[-\frac{1}{2\sigma_1^2}(C_t - \alpha X_{1t})^2\right] \tag{5}$$

$$f_2(C_t) = \frac{1}{\sqrt{2\pi}\sigma_2} \exp\left[-\frac{1}{2\sigma_2^2}(C_t - \alpha X_{2t})^2\right] \tag{6}$$

$$F_1(C_t) = \frac{1}{\sqrt{2\pi}\sigma_1} \int_{C_t}^{\infty} \exp\left[-\frac{1}{2\sigma_1^2}(C_t - \alpha X_{1t})^2\right] dC_t^S \tag{7}$$

$$F_2(C_t) = \frac{1}{\sqrt{2\pi}\sigma_2} \int_{C_t}^{\infty} \exp\left[-\frac{1}{2\sigma_2^2}(C_t - \alpha X_{2t})^2\right] dC_t^D \tag{8}$$

Finally, we use Broyden-Fletcher-Goldfarb-Shanno (BFGS) method to solve the maximum likelihood problem.

3 Empirical Analysis

3.1 Data

We analyze quarterly data from 2000q1 to 2009q3. Credit volumes to enterprises and self-employed in Germany, and available resources of banks are derived from Bundesbank Database. HIS Global Insight provides all the other relevant data for our model. We have not run the standard stationarity tests, because the time period we investigate is not long enough to give reasonable results. These tests do not work with only 39 observations.

3.2 Empirical Results

Table 1: Estimation Results

	Supply Equation	Demand Equation
constant	397.52* (229.81)	1042.50* (23.81)
D_t	0.35* (0.01)	-
i_t^l	41.48* (15.69)	-7.04* (2.20)
$i_t^l - i_t^{mm}$	-16.47* (12.53)	-
π_t^e	-74.72* (35.82)	18.47* (9.50)
CD_t	0.61 (0.40)	-0.53* (0.27)
OG_t	-	10.80* (2.64)
r_t^u	-	48.74* (5.67)
Δgdp_t^e	-	5.53 (4.74)

Table 1 shows our estimation results, the variables with "*" are significant at 95%. The numbers in paranthesis are standard deviations. All variables have the expected sign. Loan supply equation suggests that, banks increase their credit supply, if they have more available capacity to lend. In an inflationary environment which signals to higher economic risks, banks offer less credits. In case the lending rate increases, the profitability of banks also increase, so they are willing to provide more credit to firms. The coefficients for corporate deposits and spread are not significant, but they still have the right sign. When the spread is large, in other words, when there are more risks associated to agency costs, banks supply less credits. Last but not least, if corporations have more collateral, banks are more ready to lend.

In the demand equation, all the variables are significant other then expected GDP growth. If the lending rate increases, firms are reluctant to demand credit. The sign of the corporate deposits might indicate that, if firms have more corporate deposits, they might need fewer loans to invest and instead they might finance their investments from internal sources. Moreover, they demand more credits, in case they are supposed to pay more yield to corporate deposit investors. Finally, in an inflationary environment, enterprises require more loans.

Figure 1: Estimations for Credit Supply, Credit Demand and Actual Credit
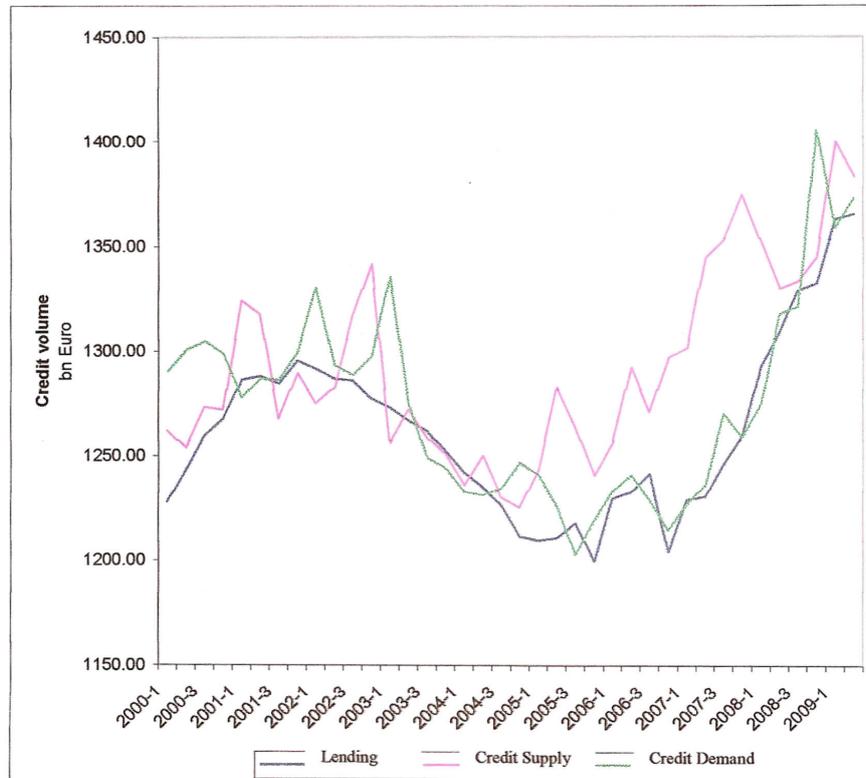
Figure 1 shows the estimation results of the analysis visually. It is noteworthy to mention that before the economic and financial crisis in 2005 and the third quarter of 2008, an excess supply of credit is observed. With the outbreak of the financial crisis in the fourth quarter of 2008, the supply of credit is lower than the demand for credit, so that we can speak of a supply dependent credit crunch. However, there is also evidence that at the moment, credit markets are at equilibrium in Germany. The results do not reflect a "current" credit crunch. There is also a "credit crunch" in the period from 2001 to 2003, where the demand for credit is significantly above the level of supply of credit. An analysis of the explanatory factors, however, shows that the credit crunch in 2008 was pushed to a greater extend by bank-specific factors - namely, the deterioration of the capital adequacy of banks-. We conclude that, during the financial and economic crisis in 2008, a decline in credit was driven not only by economic factors but also bank-specific factors.

To detect the potential risk of a credit crunch during the forecast period from 2009q4 to 2010q4, we further anticipate the impact of various scenarios on lending. The scenarios are listed in Table 2. Under scenario 1, there are no write-offs and the economy evolves as in estimates of DIW. Under scenario 2 and 3, write-offs of €70 billion realize (estimate of the ECB 2009), whereas in the third scenario, there is a more optimistic business cycle trend. Under Scenario 4, write-offs are more drastic: €120 billion.

Table 2: Scenario Analysis

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Economic Trend	DIW Prognosis	DIW Progn.	A more optimistic prognosis(0.6 real % quarterly GDP growth from 2009q3 on)	DIW Progn.
Lending Capacity of Banks	No write-offs	Write-offs of €70 bn. (linearly distrib. from 2009q3 to 2010q4)	Write-offs of €70 bn. (linearly distrib. from 2009q3 to 2010q4)	Write-offs of €120 bn. (linearly distrib. from 2009q3 to 2010q4)

Under scenario 1, no credit crunch is expected in Germany in the coming quarters based on our econometric model. The forecast results can be seen in Figure 2. It depicts "excess" supply of loans. A credit crunch exists when excess supply is below zero; the last quarter of 2008, we can talk about a credit shortage. The economic stimulus packages should have pumped enough liquidity to the economy, that it was only "transitory". The forecast shows that any deterioration of equity capital of banks results in a supply driven credit crunch. Finally, a comparison of the results from different scenarios reveals that the risk of write-offs is the most important factor in the creation of a possible credit crunch.

Figure 2: Scenario Analysis
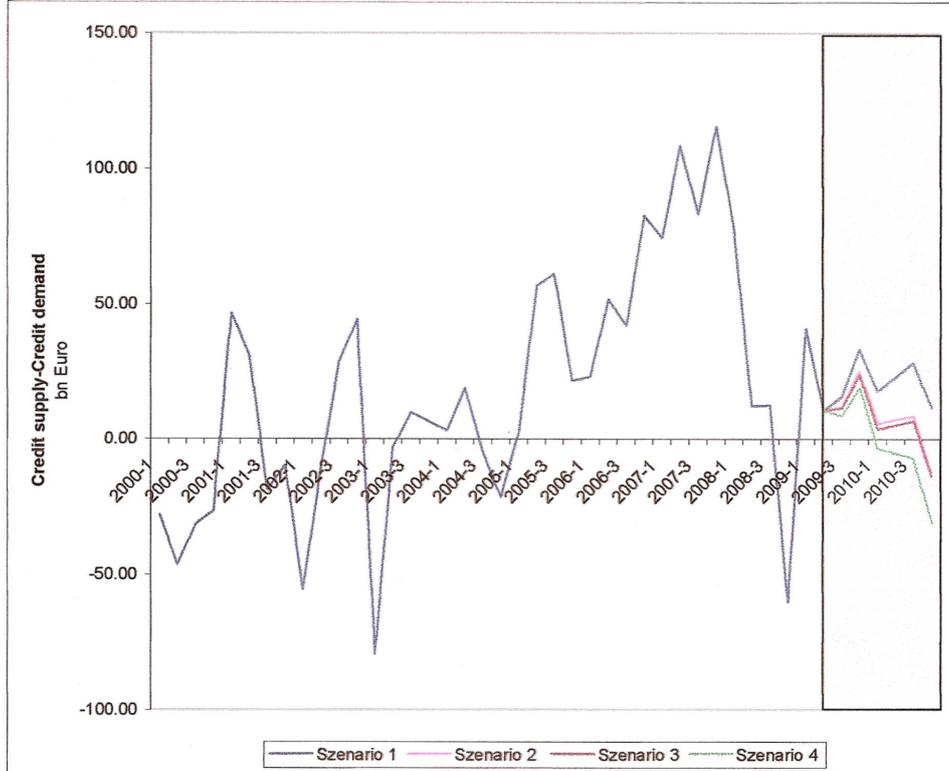
4   Conclusion

This paper has analysed existence of a possible "credit crunch" in Germany using a disequilibrium model and maximum likelihood estimation. This topic has been at the top of agenda in recent months, since a credit shortage would hinder the upturn of the economy. After the bankruptcy of US investment bank Lehman Brothers in September 2008, German banks have significantly reduced their asset positions and there was a slowdown of lending enterprises and self-employed. Besides, Bank Lending Survey also point toward a difficulty in lending. However, the downward course of credit growth might also be due to weak demand of loans stemming from recession. Therefore, we attempt to disentangle credit supply from demand with our disequilibrium model. Our data is quarterly from 2000q1 to 2009q3.

Our conclusions suggest that before the economic and financial crisis in 2005 and before the third quarter of 2008, an excess supply of credit is observed. With the outbreak of the financial crisis in the fourth quarter of 2008, we observe a supply dependent credit crunch. The slowdown in lending is not only a result of weak demand. However, there is also evidence that at the moment, credit markets are at equilibrium in Germany. The results do not reflect a "current" credit crunch. To detect the potential risk of a credit crunch during the forecast period from 2009q4 to 2010q4, we further anticipate the impact of various scenarios on lending. Our analysis offer that any deterioration of equity capital of banks results in a supply driven credit crunch. This would delay the economic recovery; hence it is crucial for policy makers in Germany to take necessary measures.

We would like to note that, this is a work in progress. We intend to run a few robustness checks in the near future. An extension of the model for different bank groups and for different sectors could also be done to see whether it is a problem of certain banks or sectors, i.e. trade, manufacturing, etc. For further research, we are interested in a EU-wide study for credit markets.

References

[1] Financial stability review. Technical report, European Central Bank, Frankfurt/Main, 2009.

[2] Ben S. Bernanke. How important is the credit channel in the transmission of monetary policy? : A comment. *Carnegie-Rochester Conference Series on Public Policy*, 39(1):47–52, December 1993.

[3] Ben S Bernanke and Alan S Blinder. Credit, money, and aggregate demand. *American Economic Review*, 78(2):435–39, May 1988.

[4] Ben S. Bernanke and Mark Gertler. Inside the black box: The credit channel of monetary policy transmission. NBER Working Papers 5146, National Bureau of Economic Research, Inc, June 1995.

[5] Ben S. Bernanke and Cara S. Lown. The credit crunch. *Brookings Papers on Economic Activity*, 22(1991-2):205–248, 1991.

[6] Ben S Bernanke, Gertler M, and Gilchrist S. The financial accelerator and the flight to quality. *The Review of Economics and Statistics*, 78(1):1–15, February 1996.

[7] Deutsche Bundesbank. Bank lending survey: an interim assessment and current developments. Monthly Report pp 15-30, 2009.

[8] Wei Ding, Ilker Domac, and Giovanni Ferri. Is there a credit crunch in east asia? Policy Research Working Paper Series 1959, The World Bank, August 1998.

[9] Atish R. Ghosh and Swart R. Ghosh. East asia in the aftermath - was there a crunch? IMF Working Papers 99/38, International Monetary Fund, March 1999.

[10] R. Glenn Hubbard. Is there a "credit channel" for monetary policy? *Proceedings*, (May):63–77, 1995.

[11] Anil K. Kashyap and Jeremy C. Stein. Monetary policy and bank lending. In *Monetary Policy*, NBER Chapters, pages 221–261. National Bureau of Economic Research, Inc, 1994.

[12] William W. Lang and Leonard I. Nakamura. 'flight to quality' in banking and economic activity. *Journal of Monetary Economics*, 36(1):145–164, August 1995.

[13] G S Maddala and Forrest D Nelson. Maximum likelihood methods for models of markets in disequilibrium. *Econometrica*, 42(6):1013–30, November 1974.

[14] H Nehls and T Schmidt. Credit crunch in germany? *Kredit und Kapital*, 37:479–499, 2004.

[15] Council of Economic Advisors. Economic report of the president. Technical report, Government Printing Office, Washingten, D.C., 1991.

[16] Ceyla Pazarbasioglu. A credit crunch? a case study of finland in the aftermath of the banking crisis. IMF Working Papers 96/135, International Monetary Fund, December 1996.

[17] Richard F. Syron. Are we experiencing a credit crunch? *New England Economic Review*, (Jul):3–10, 1991.