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# The Slowdown in German Bank Lending - Revisited

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*Abstract:*

*The rate of growth in bank loans to private households and firms in Germany has declined substantially since early 2000 and currently stands at virtually zero. In this article, we analyse whether cyclical factors ("demand-side driven") or banks' unwillingness and/or inability to lend ("supply-side driven") can be held responsible for this trend.Our preliminary results suggest that the slowdown in bank loan expansion is largely driven by a decline in the demand for loans. This result is supported by taking into account the latest tendency of corporates substituting bank loans for the issuance of money and capital market instruments. Although it cannot be ruled out that supply-side restrictions have contributed to the dampening of real bank loan expansion, to date these factors have played only a minor role.*

Key words: German bank lending, Credit rationing

JEL Classification: G20, G21

*Content:*

# 1. Introduction

There has been growing concern in the financial markets over the stability of the German banking sector. For some time, German banks have underperformed their US and continental European peers, but most importantly, German bank lending to private households and firms has declined substantially and is now virtually zero. This has given rise to concerns that the German banking sector might restrict the supply of loans to the private sector, thereby potentially dampening economic growth and, in addition, causing problems for the European monetary policy.

In this article, we aim to shed some light on the reasons for the slowdown in bank lending in Germany seen in the recent past.[1] First, we give an overview of the German bank lending growth rates in the more recent past. Thereafter, we provide and discuss various issues that might be held responsible for the decline in bank lending. In this context we take a look at the Eurosystem bank lending survey results for Germany and German borrowing costs as shown in the euro area wide interest rate statistics. We then provide the results of our empirical test procedure, which aims to address the question as to whether the decline in bank lending is due to supply- and/or demand-side factors. Lastly, we conclude with a summary and outlook.

# 2. Bank Lending in Germany

Annual growth rates of German real – that is: inflation adjusted – bank loans extended to private households and corporates has declined sharply since early 2000 (see Figure 1 (a)). The nominal bank loan supply grew by just 1.3% on average in the period Q1 01 to Q4 03. In real terms the growth rate was -0.1%. This compares with an average annual growth rate of 5.4% and 3.5%, respectively, for the period Q1 92 to Q4 03. Real bank loan growth has now reached its lowest level since the mid-1970s – the pronounced recession period related to the first oil price shock.

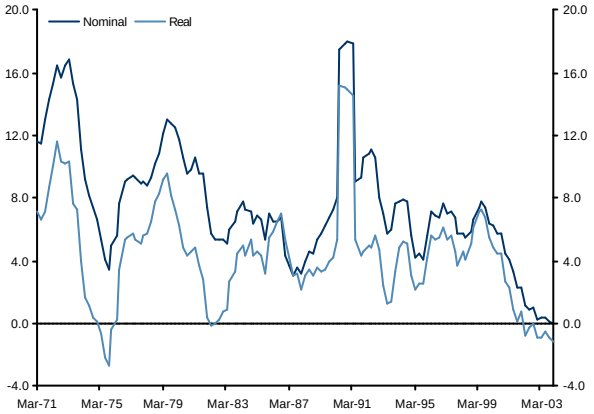
Figure 1 (b) to (d) show the annual growth rates (in nominal and real terms) of total German bank lending, bank lending to the private sector and bank lending to the public sector, respectively, according to ECB data for the period January 1995 to

[1] An earlier version of this article was presented at a workshop at the Kreditanstalt für Wiederaufbaus (KfW) on 17 October 2003 in Frankfurt. In this context, see also Barclays Capital, Den deutschen Unternehmen geht der Bankkredit aus, 22 May 2003; Deutsche Bundesbank, The development of bank lending to the private sector, in: Deutsche Bundesbank Monthly Bulletin, October 2002, pp. 31-46. Also Sachverständigenrat, Niedriges Kreditwachstum in Deutschland – ein Risiko, Gutachten 2002/2003, pp. 108 – 118.

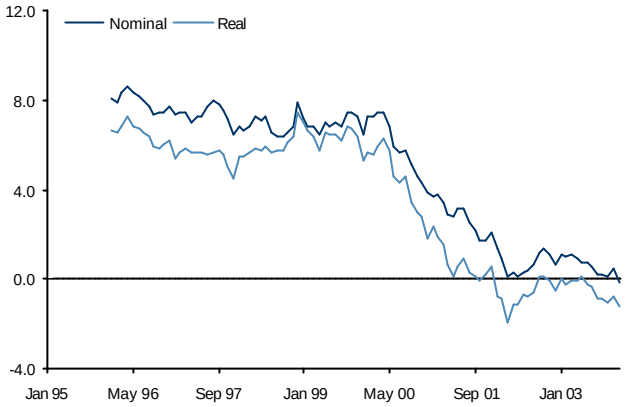
December 2003. The latter reveal also a sharp slowdown in bank lending when compared to Bundesbank data.

Figure 1: Annual Growth Rates of German Bank Lending (%)

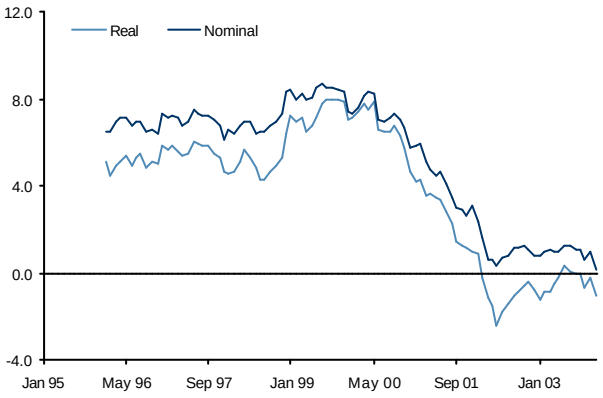
(a) Lending to Private Households and Firms



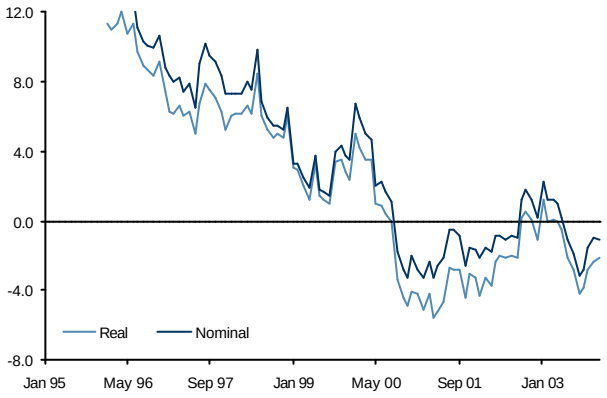

(b) Total Bank Lending




(c) Lending to the Private Sector




(d) Lending to the Public Sector




*Source: Deutsche Bundesbank, Thomson Financial, ECB; own calculations. For graphs (b) to (d): ECB data definitions. Real growth rates were calculated by subtracting the annual rise in the consumer price index. For Fig. 1 (a) latest data point available Q4 03, for the rest December 03.*

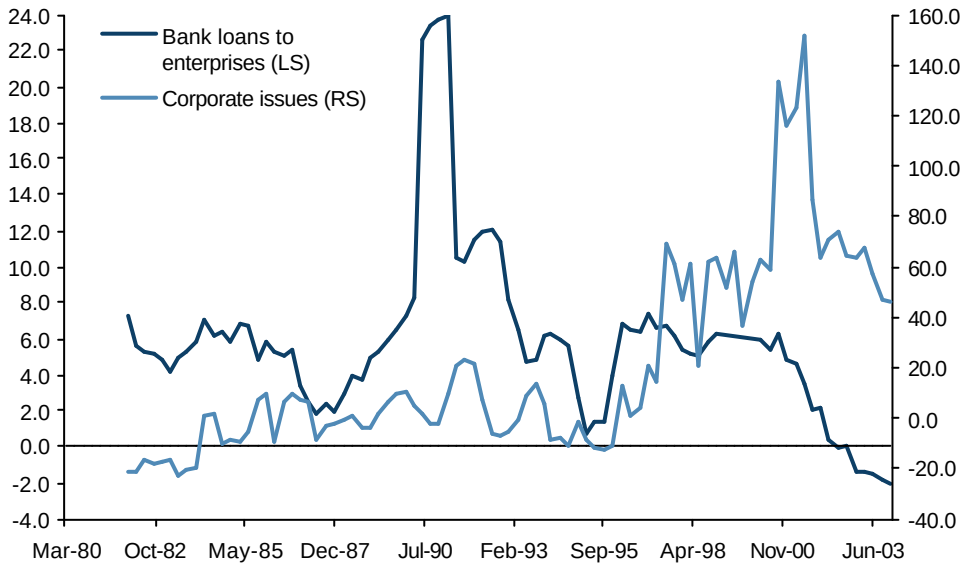
# 3. Potential Causes of the Slowdown in Bank Lending

At least three factors could provide a plausible explanation for the slowdown in German bank lending witnessed in the recent past: (1) the substitution of bank credit by the issuance of money and capital market instruments; (2) the cyclical slowdown; and (3) a "credit crunch" or "credit rationing". In the following we will take a closer look at each of these factors.

## 3.1 Substitution of Bank Credit by Money and Capital Market Instruments

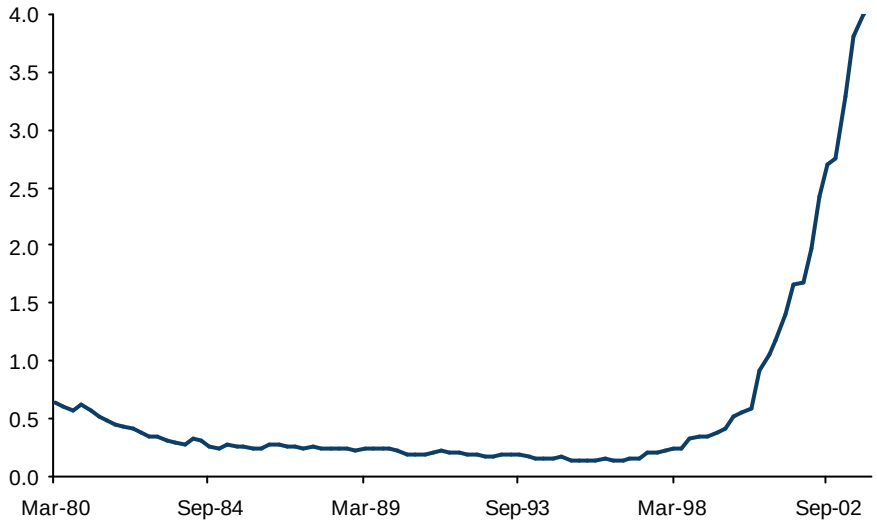
The slowdown in German bank lending to the private sector might be due to firms having substituted bank loans through the issuance of money and capital market instruments ("structural change in corporate financing"). Figure 2 shows the growth rates of bank lending to enterprises and corporate issues for the period Q1 81 to Q2 03. Since 1997, the growth rates of corporate issues have increased markedly (especially in the period Q3 00 to Q2 01, which should have been strongly influenced by the financing of UMTS-licence purchases and M&A activities). Whereas corporate issuance growth has remained fairly stable since Q4 01, bank lending growth has declined considerably since then.

Figure 2: Corporate Issues and Bank Loans to Corporates in Germany (%, Y/Y)




*Source: Deutsche Bundesbank; own calculations. For the period Q1 99 to Q4 99, data points were interpolated (as there was a "break" in the time series of bank loans to enterprises due to statistical changes in definitions of credit aggregates related to the start of the Third Stage of EMU).*

Figure 3: Corporate Issues as Proportion of Bank Loans to Corporates Plus Corporate Issues Outstanding in Germany (%)




*Source: Deutsche Bundesbank; own calculations. Bank loans are defined as lending to domestic enterprises minus lending to employees and other individuals.*

Figure 3 shows the ratio of corporate issues to total bank loans to those to non-banks in Germany from Q1 80 to Q4 03. As implied by Figure 2, since the end of 1997, the ratio has increased strongly from around 0.2% to nearly 4.0% in Q4 03. It may well be that the impressively growing volume of corporate issues will make up for the slowdown in bank loan growth.[2] (This will be analysed later, especially so as the bulk of German corporates does not (yet) have access to money and capital markets, which would allow them to substitute bank loans through the issuance of debt capital market instruments.)

### 3.2 Cyclical Slowdown

The pronounced cyclical slowdown in Germany, accompanied by a very strong decline in investment spending, might have contributed to a decline in bank loan demand, which, in turn, has translated into lower bank credit growth extended to the private sector. For instance, firms may have increasingly sought to lower their debt levels ("deleveraging") and, at the same time, reduced their net investments. Also, in view of the poor economic outlook, private households could have increasingly refrained from taking up additional loans to finance real estate, consumer goods, etc.

[2] Note that the total volume of outstanding corporate issues was €52.2bn at the end of July 2003, whereas the outstanding stock of bank loans extended to nonbanks amounted to €2,240.0bn.

### 3.3 "Credit Crunch" vs "Credit Rationing"

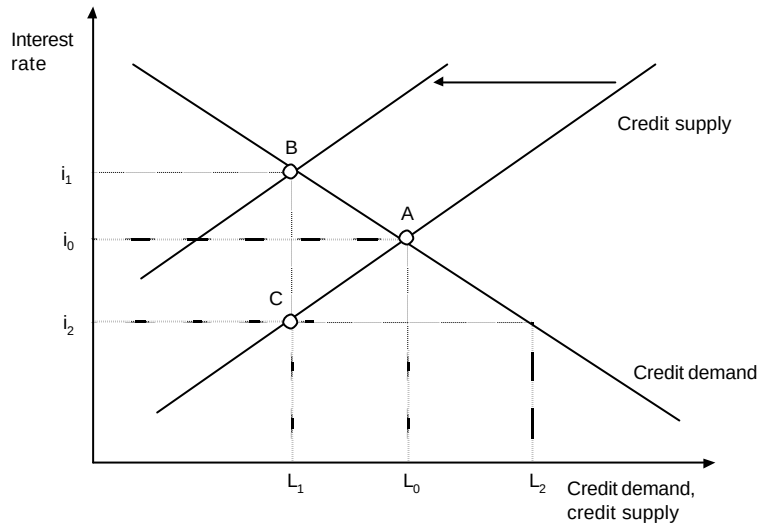
The slowdown in German bank lending might also be ascribed to supply-side restrictions on the part of commercial banks. An increase in bad loans, low margins and a heightened degree of risk aversion on the part of banks' management might have led to banks refraining from extending additional loans to the private sector. Such a situation is often described as a "credit crunch" or "credit rationing".[3] Although these terms are frequently used interchangeably, the developments they represent differ substantially in economic terms and deserve a closer look (for further explanation see the Appendix).

To cut a long story short, Figure 4 shows a simple diagram depicting the supply of and demand for bank loans as a function of the interest rate. The market clears in point A, where the interest rate is $i_0$ and the loan volume $L_0$. Taking the market equilibrium as a point of reference, in a credit crunch banks contract their loan supply sharply (due to, for instance, an unexpected rise in loan provisions that induces banks to reduce portfolio risk) and, as a consequence, the bank supply curve moves to the left, with point B marking the new equilibrium. The market clearing interest rate is $i_1$ – which is higher than the original rate of $i_0$ – whereas the loan volume declines from $L_0$ to $L_1$.

Under a "credit rationioning", in contrast, risk-reward considerations on the part of banks lead to an equilibrium as represented by point C: the loan volume declines, whereas the interest rate does not rise (it may even fall, as in our example, to $i_2$). Such a situation might occur when there is an asymmetrical distribution of information among the lending banks and their clients which, in turn, leads to "negative selection". To analyse whether a credit rationing or credit supply has been at work in the German banking sector recently, we will, in a first step, take a closer look at the euro area bank lending survey for Germany which has been established at the beginning of last year.

[3] See Stiglitz, J. E., A. Weiss (1981), Credit rationing in markets with imperfect information, in: American Economic Review 71 (3): 393-410. Also Greenwald, B., J. Stiglitz (1993), New and Old Keynesians, in: Journal of Economic Perspectives 7, 23-44; Greenwald, B., J. Stiglitz (1993), Financial Market Imperfections and Business Cycles, in: The Quarterly Journal of Economics 108, 75-114.

Figure 4: “Credit Crunch” vs “Credit Rationing”




## 4. German result of the euro area bank lending survey for Q3 03

In January 2003, the Eurosystem introduced a quarterly bank lending survey of the euro area, based on a questionnaire containing 18 questions regarding past and expected credit market developments (see Box 1).[4] The survey distinguishes between the demand-side determinants and supply-side determinants of changes in lending, thereby ascertaining the relationship between bank lending policy and the economic cycle. The survey shall provide the Eurosystem with better information on banks' lending policy.

According to the results of the fourth German bank lending survey from Q3 03, the respondent institutions in Germany continued to tighten slightly their credit standards as applied to some loans and credit lines to enterprises. This was unrelated to the size of the enterprises or the loan maturity. Essentially, the credit institutions again pointed to higher risk assessment as the cause, especially given the general economic outlook and sector-specific or company-specific factors; however, the responses suggested that, to an extent, increases in banks’ cost of capital had also played a role. However, “the survey did not provide any indication of a credit crunch.”[5]

The trend towards a sustained broadening of margins for riskier loans continued in all areas of credit business covered by the survey, indicating a wider risk-

[4] See Deutsche Bundesbank, German result of euro area bank lending, in Monthly Bulletin June 2003, pp. 67 – 76. Also European Central Bank, A bank lending survey for the euro area, Monthly Bulletin April 2003, pp. 65 – 69.

[5] Deutsche Bundesbank, The results of euro area bank lending survey, Monthly Bulletin June 2003, p. 76.

differentiated spread of banks' loan margins. During the past quarters, there was a steady decline, however, in the tendency for the margins on average loans to widen; in the case of housing loans, the data supplied by the banks in the third quarter suggest that, to an extent, there was actually a narrowing of the margins on average loans. With regard to the other lending conditions, the respondent banks also indicated that they were applying somewhat stricter criteria to loans or credit lines to enterprises – partly in respect of credit volume but also of collateral.

**Box 1: Eurosystem bank lending survey, questions asked**

| | |
|---|---|
| 1. | Over the past three months, how have your bank's credit standards as applied to the approval of loans or credit lines to enterprises changed? |
| 2. | Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans or credit lines to enterprises (as described in question 1 in the column headed "Overall")? |
| 3. | Over the past three months, how have your bank's conditions and terms for approving loans or credit lines to enterprises changed? |
| 4. | Over the past three months, how has the demand for loans or credit lines to enterprises changed at your bank, apart from normal seasonal fluctuations? |
| 6. | Please indicate how you expect your bank's credit standards as applied to the approval of loans or credit lines to enterprises to change over the next three months. |
| 8. | Over the past three months, how have your bank's credit standards as applied to the approval of loans to households changed? |
| 9. | Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans to households for house purchase (as escribed in question 8)? |
| 10. | Over the past three months, how have your bank's conditions and terms for approving loans of households for house purchase changed? |
| 11. | Over the past three months, how have the following factors affected your bank's credit tandards as applied to the approval of consumer credit and other lending to households (as described in question 8)? |
| 12. | Over the past three months, how have your bank's conditions and terms for approving consumer credit and other lending to households changed? |
| 13. | Over the past three months, how has the demand for loans to households changed at your bank, apart from normal seasonal fluctuations? |
| 14. | Over the past three months, how have the following factors affected the demand for loans to households for house purchase (as described in question 13)? |
| 15. | Over the past three months, how have the following factors affected the demand for consumer credit and other lending to households (as described in question 13)? |
| 16. | Please indicate how you expect your bank's credit standards as applied to the approval of loans to households to change over the next three months. |
| 17. | Please indicate how you expect demand for loans to households to change over the next three months at your bank (apart from normal seasonal fluctuations). |
| 18. | Over the past three months, have there been any other issues of importance for bank lending behaviour in the euro area or in your country which are not covered by this survey? |

*Source: ECB.*

The survey showed a further slight decrease in loan demand from enterprises, whereas for consumer credit the demand was unchanged and for housing loans to households it was edging slightly upwards. According to the data supplied by the

respondents, the main factor contributing to the further slight reduction in loan demand from enterprises was lower financing needs for fixed investment, whereas debt restructuring again generated positive demand effects.

With regard to households, uncertainty as to the future of the government grant to home buyers among other things increased demand for housing loans. Depressed consumer confidence was meanwhile still having a dampening effect, although this was not as strong as it had been. Compared with the aggregate results for the euro area, the replies from the respondent German institutions more frequently express expectations of an increase in loan demand from both enterprises and households in the fourth quarter. Overall, however, the German survey results were more or less in line with the aggregate results for the euro area.

As far as actual data on bank lending costs are concerned, it has to be taken into account that the new MFI (monetary financial institutions) interest rate statistics have been collected in a uniform manner in all euro-area countries since January 2003 (see Box 2). The German results include data submitted by a representative sample of around 200 banks, with all interest rates being weighted with the respective lending or deposit volumes. The new MFI interest rate statistics supersede the Bundesbank's statistics on lending and deposit rates, which were discontinued after June 2003. The old method recorded the unweighted interest rates on new business in standardised deposit and lending products most frequently agreed by German banks with their retail customers. Thus, the results produced by the two methods are extremely difficult to compare because the new MFI interest rate statistics are conceptually very different from the previous statistics.

**Box 2: The new MFI interest rate statistics**

The German contribution to the MFI interest rate statistics covers the interest rates applied by MFIs in Germany and the related volumes of euro-denominated deposits and loans to households and non-finanical corporations domiciled in the euro area. The lending and deposit categories were redefined and harmonised in order to represent the new business of all euro-area banks adequately.

The MFI interest rate statistics include not only interest rates and volumes of new business but also the corresponding data for outstanding amounts by lending and deposit category; for the latter, the end of the month is the cut-off date. When the books are closed at the end of the month, reporting institutions calculate the effective interest rates and volumes of all outstanding deposit and lending business and calculate a weighted average interest rate for each reporting category.

Banks use two different procedures for capturing new business. In the case of deposits with an agreed maturity and of all loans excluding overdrafts, new business encompasses all new agreements between customers and banks. These

include all financial arrangements in which terms have been agreed for the first time in the reporting month as well as all outstanding contracts newly negotiated with active involvement by the customers. The interest rates are calculated as volumeweighted average rates, with account being taken of all new agreements concluded during the reporting month. In the case of overnight deposits, deposits redeemable at notice and overdrafts, however, new business is collected (like outstanding amounts) at the end of the month in question.

Effective interest rates are calculated either as annualised agreed rates or as narrowly defined effective rates, which cover interest payments but no other related costs (such as for enquiries, administration, preparation of documents, guarantees and credit insurance). In addition, for the overarching categories of "consumer credit" and "housing loans" to households, the annual percentage rate of charge as defined in Directive 87/102/EEC, which comprises the total costs to the customer, is also to be reported.

*See Deutsche Bundesbank, Monthly Bulletin November 2003, p. 27.*

That said, we took a closer look at the new statistics. Figure 5 gives an overview on effective interest rates of German bank loans ("new business") extended to firms (that are non-financial corporations) and the swap spreads for various volumes. Even though the time period under review is rather limited, the data suggest that borrowing costs have declined for all maturities under review in 2003. In addition, swap spread levels have also declined (presumably from an elevated level), in line with the general market trend. This result might be somewhat surprising in view of the latest bank lending survey results. And indeed even the Eurosystem appears to be unsure as to what the new statistics actually suggest. One explanation put forward could be that balance sheet adjustments have let to improvements in the banks' portfolio risk, thereby inducing a dampening effect on credit margins for new lending. A more technical explanation might be seen in role of weights used to calculate the average lending rates. The relative large weight of, for instance, big volume low risk loans might have translated into a decline in risk premiums for the average lending rate. Be that as it may, the statistics do not indicate an undue relative credit cost increase which suggests a supply side restriction. Given the relative short data period under review and the yet unsolved problems with the new statistics, however, further analysis is required to answer the question as to whether supply side restrictions are prevailant.

Fig. 5: Interest rates, swap spreads and volumes for German bank loans to non-financial corporations, January 2003 to November 2003

| Survey period | Overdraft | | Other loans up to € 1.0 mn, including those with fixed maturity | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Up to 1 year | | | Over 1 year up to 5 years | | | Over 5 years | | |
| | Effective interest rate, % p.a. | Volume, € mn | Effective interest rate, % p.a. | Spread over swap rates, % p.a. | Volume, € mn | Effective interest rate, % p.a. | Spread over swap rates, % p.a. | Volume, € mn | Effective interest rate, % p.a. | Spread over swap rates, % | Volume, € mn |
| Jan-03 | 6.7 | 96.6 | 5.4 | 2.8 | 8.7 | 5.3 | 1.8 | 1.4 | 5.4 | 1.1 | 1.6 |
| Feb-03 | 6.8 | 96.8 | 4.9 | 2.6 | 8.2 | 5.3 | 2.1 | 1.1 | 5.3 | 1.2 | 1.5 |
| Mar-03 | 6.8 | 94.1 | 5.0 | 2.6 | 8.7 | 5.3 | 1.9 | 1.5 | 5.3 | 1.1 | 2.6 |
| Apr-03 | 6.7 | 91.5 | 5.1 | 2.7 | 8.3 | 5.2 | 1.8 | 1.5 | 5.3 | 1.0 | 1.6 |
| May-03 | 6.6 | 90.3 | 4.8 | 2.7 | 7.6 | 5.1 | 2.1 | 1.2 | 5.2 | 1.3 | 1.7 |
| Jun-03 | 6.6 | 93.2 | 4.5 | 2.4 | 7.8 | 4.9 | 1.9 | 1.0 | 5.1 | 1.2 | 1.5 |
| July-03 | 6.5 | 88.2 | 4.4 | 2.2 | 7.9 | 4.9 | 1.3 | 1.8 | 4.9 | 0.6 | 1.6 |
| Aug-03 | 6.5 | 86.0 | 4.4 | 2.0 | 5.8 | 4.9 | 1.3 | 1.6 | 4.9 | 0.6 | 1.7 |
| Sep-03 | 6.6 | 88.5 | 4.5 | 2.4 | 7.2 | 5.0 | 1.7 | 1.2 | 5.0 | 0.9 | 1.7 |
| Oct-03 | 6.5 | 85.9 | 4.5 | 2.1 | 7.3 | 5.0 | 1.2 | 1.5 | 5.1 | 0.7 | 1.9 |
| Nov-03 | 6.4 | 88.3 | 4.5 | 1.9 | 7.0 | 5.2 | 1.3 | 1.2 | 5.0 | 0.4 | 1.2 |

| Survey period | *Continued:* loans to non-financial corporates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Other loans of more than € 1.0 mn with fixed maturity | | | | | | | | |
| | Up to 1 year | | | Over 1 year up to 5 years | | | Over 5 years | | |
| | Effective interest rate, % p.a. | Spread over swap rates, % p.a. | Volume, € mn | Effective interest rate, % p.a. | Spread over swap rates, % p.a. | Volume, € mn | Effective interest rate, % p.a. | Spread over swap rates, % p.a. | Volume, € mn |
| Jan-03 | 4.1 | 1.4 | 42.1 | 4.3 | 0.8 | 3.7 | 5.4 | 1.1 | 4.9 |
| Feb-03 | 3.9 | 1.5 | 33.4 | 4.6 | 1.4 | 4.0 | 5.3 | 1.2 | 4.3 |
| Mar-03 | 3.9 | 1.5 | 37.8 | 4.9 | 1.5 | 3.3 | 5.3 | 1.1 | 4.6 |
| Apr-03 | 3.9 | 1.5 | 35.9 | 4.1 | 0.7 | 2.9 | 5.3 | 1.0 | 5.8 |
| May-03 | 3.6 | 1.5 | 31.6 | 3.8 | 0.8 | 3.6 | 5.2 | 1.3 | 6.2 |
| Jun-03 | 3.3 | 1.2 | 38.8 | 3.9 | 0.8 | 3.6 | 5.1 | 1.2 | 6.2 |
| July-03 | 3.3 | 1.1 | 33.1 | 3.9 | 0.3 | 2.9 | 4.9 | 0.6 | 6.3 |
| Aug-03 | 3.4 | 1.0 | 27.7 | 3.8 | 0.2 | 2.5 | 4.9 | 0.6 | 4.9 |
| Sep-03 | 3.2 | 1.1 | 34.0 | 3.8 | 0.5 | 3.2 | 5.0 | 0.9 | 4.9 |
| Oct-03 | 3.3 | 0.8 | 34.6 | 4.1 | 0.3 | 3.3 | 5.1 | 0.7 | 5.1 |
| Nov-03 | 3.2 | 0.6 | 35.6 | 3.9 | 0.0 | 3.7 | 5.0 | 0.4 | 4.4 |

*Data source: Deutsche Bundebank; Bloomberg; own estimates. – The swap spreads were calculated by substracting the respective swap rate from the lending rate.*

## 5. Explaining Bank Lending in Germany

To analyse the factors responsible for the decline in German bank lending, we made use of a model which – directly or indirectly – incorporates all supply and demand side factors influencing bank lending. In fact, we calculated an "equilibrium" growth rate of real bank loans and compared it with the actual developments. Deviations between the two might then signal "irregular restrictions" on the supply side. We applied a two-step procedure following the "error correction model" technique in the tradition of R Engle and CWJ Granger (for further details see the Appendix).

- In a first step, we estimate a long-run (cointegrated) demand function for real bank loans – that is, we establish a reliable relationship between the real stock of bank loans on variables that can be held responsible for determining the demand for loans (such as real GDP and interest rates).

- In a second step, we estimate the short-run dynamics of bank lending (which might differ from the long-run relations) for the same period, taking into account the long-run relationship that was established between real loans and the variables determining its demand in the first step.

Figure 6 shows the regression results of the long-term bank credit demand function from Q3 81 to Q4 03. The real credit demand is a positive function of real GDP (lnGDP) and depends negatively on the long-term interest rate (lnLR) and the three-month money market rate (lnI3M). We have also included two dummy variables (D902 and D911), which take the value of 1 after the second and first quarter in 1990 and 1991, respectively, adjusting for the structural breaks in the data related to the German reunification. A time trend for Q3 81 to Q4 90 (D8190) is also included to account for the "kink" in the velocity of bank credit around the beginning of the 1990s.[6]

[6] With inflation declining strongly in the 1980s, rising in the early 1990s and declining slowly thereafter, the demand for nominal bank credit relative to nominal income was obviously higher in the 1990s compared to the 1980s. This may, inter alia, have contributed to a stronger decline in the velocity of bank credit in the 1980s compared to the 1990s.

Figure 6: Estimating the Demand for Real Bank Loans in Germany from Q3 81 to Q4 03

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LNGDP | 2.009709 | 0.063769 | 31.51566 | 0.0000 |
| LNLR | -1.980433 | 0.345502 | -5.732038 | 0.0000 |
| LNI3M | -0.460467 | 0.167132 | -2.755110 | 0.0072 |
| DUM911 | -0.873756 | 0.054590 | -16.00590 | 0.0000 |
| DUM902 | 0.071776 | 0.015492 | 4.632954 | 0.0000 |
| D8190 | -0.003861 | 0.000429 | -8.991771 | 0.0000 |
| C | -8.489877 | 0.352877 | -24.05906 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.996234 | Mean dependent var | 2.689842 |
| Adjusted R-squared | 0.995962 | S.D. dependent var | 0.293423 |
| S.E. of regression | 0.018646 | Akaike info criterion | -5.051789 |
| Sum squared resid | 0.028857 | Schwarz criterion | -4.857359 |
| Log likelihood | 234.3305 | F-statistic | 3659.469 |
| Durbin-Watson stat | 1.000977 | Prob(F-statistic) | 0.000000 |

Legend: LN = natural logarithm, GDP = real gross domestic product, LR = long-term interest rates, I3M = 3-month interest rate (until end 1998 D-mark, thereafter euro), D = dummy variable (in this case the dummies take account of the structural breaks in the time series related to the German reunification. The dummies take a value of 1 as from Q1 91 and Q2 90, respectively, and zero before that), T = time trend for the period Q3 81 to Q4 90, C = constant. The residuals of the regression are stationary according to the ADF-Test. Included variables = 90.

*Source: Deutsche Bundesbank; Thomson Financials; own calculations.*

Figure 7: Estimating the Change in the Growth of Real Bank Loans in Germany from Q1 82 to Q4 03

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D1D4LNL(-4)-D1D4LNCPI(-4) | -0.430351 | 0.073990 | -5.816313 | 0.0000 |
| D1D4LNGDP(-1) | 0.096596 | 0.034568 | 2.794388 | 0.0066 |
| D1D4LNGDP(-3) | 0.076154 | 0.018733 | 4.065224 | 0.0001 |
| D1D4LNI3M | 0.255515 | 0.091952 | 2.778796 | 0.0069 |
| ECT(-2) | -0.168817 | 0.041300 | -4.087527 | 0.0001 |
| D912 | -0.082111 | 0.009208 | -8.917662 | 0.0000 |
| D902 | 0.086184 | 0.006768 | 12.73347 | 0.0000 |
| D864 | -0.016500 | 0.006935 | -2.379355 | 0.0198 |
| C | -9.00E-05 | 0.000734 | -0.122689 | 0.9027 |

| | | | |
|---|---|---|---|
| R-squared | 0.842243 | Mean dependent var | -0.000251 |
| Adjusted R-squared | 0.825853 | S.D. dependent var | 0.015842 |
| S.E. of regression | 0.006611 | Akaike info criterion | -7.101369 |
| Sum squared resid | 0.003365 | Schwarz criterion | -6.844519 |
| Log likelihood | 314.3589 | F-statistic | 51.38670 |
| Durbin-Watson stat | 1.762471 | Prob(F-statistic) | 0.000000 |

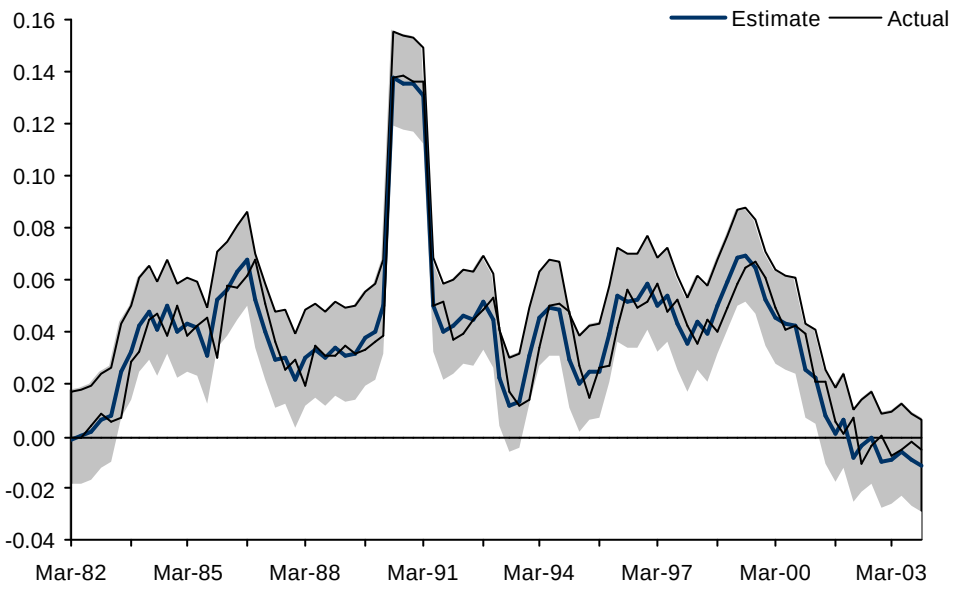
Legend: LN = natural logarithm, GDP = real gross domestic product, LR = long-term interest rates, I3M = 3-month interest rate (until end 1998 D-mark, thereafter euro), D = dummy variables (In this case the dummies take account of the breaks in the time series related to the German reunification. The dummies take a value of 1 in Q2 90 and Q2 91, respectively, and zero otherwise. D864 takes on the value of 1 in Q4 1986 and zero otherwise.), C = constant, D1 (D4) = first (fourth) difference of the logarithm. ECT = error correction term. 90 observations. Test statistics are as follows: LM(1) = 1.094 (0.298), LM(4) = 1.280 (0.286), ARCH(1) = 0.021 (0.883), ARCH(4) = 0.674 (0.612), WHITE = 0.988 (0.471), JB = 5.071 (0.079), RESET(4) = 2.483 (0.051). The t ratios for the ECT are statistically significant in view of the asymptotic critical values for the ECM test t ratio as shown in Banerjee, A., Dolado, J. J., and Mestre, R. (1998).

*Source: Deutsche Bundesbank; Thomson Financials; own calculations.*

Figuer 7 shows the results for changes in the annual growth rates for real loans regressed on a number of contemporaneous and time-lagged variables from Q1 82 to Q4 03. The regression includes the time-lagged residuals of the regression shown in Figure 6 – that is, the "error correction term" (ECT), which was lagged by two quarters (-2). The coefficient of the ECT is negative, indicating that short-term deviations from the long-term credit demand are corrected in the following periods. The regression meets the statistical requirements and explains around 84% of the total variance of changes in the growth rates for real bank loan demand.

Figure 8 shows the actual and estimated growth rates for real bank loans from Q1 81 to Q4 03, based on the regression shown in. The estimated growth rates track the actual values fairly well, suggesting that the marked slowdown since the end of 1999 can be more or less explained by the long-run credit demand function – that is, the slowdown does not suggest any "irregularities".

Figure 8: German Bank Real Loan Expansion, Annual Growth Rates, Q1 82 to Q4 03




*Source: Deutsche Bundesbank, Thomson Financials; own calculations. The shaded area represents two standard errors of the estimate.*

However, estimating the credit demand function until the end of Q4 03 could be problematic: it might incorporate "irregularity" in the long-run demand function, which may have occurred recently. Thus, we estimated the demand function until the end of 1999 and, on the basis of this finding, calculated the "equilibrium" growth rates according to the long-run credit demand function and compared these findings with the actual development.

Figure 9 shows the demand function for real bank loans in Germany from Q1 81 to Q4 99. Using this long-run equation, we calculated the demand for bank loans until Q4 03, which would have materialised had the demand developed in line with the factor identified in Figure 9. As Figure 10 shows, the actual stock of bank loans has fallen below the "equilibrium" level from Q1 00, suggesting the supply of bank loans might have been less than "equilibrium" demand.

Figure 9: Estimating the Demand for Real Bank Loans in Germany from Q1 81 to Q4 99

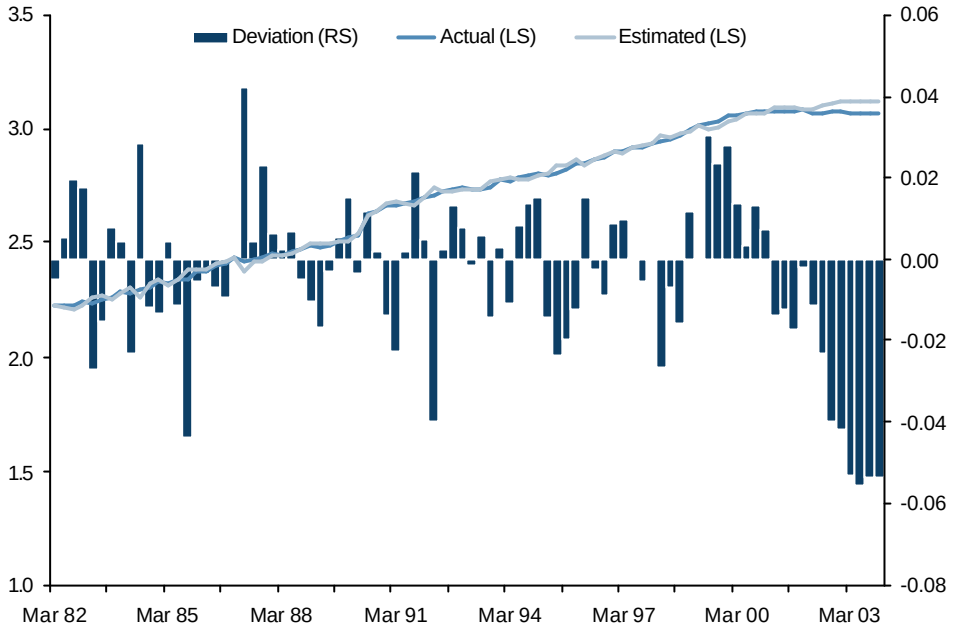
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LNGDP | 2.117544 | 0.079243 | 26.72203 | 0.0000 |
| LNLR | -2.316360 | 0.317155 | -7.303560 | 0.0000 |
| LNI3M | -0.391344 | 0.153249 | -2.553653 | 0.0129 |
| DUM911 | -0.982518 | 0.065277 | -15.05141 | 0.0000 |
| DUM902 | 0.072633 | 0.014076 | 5.159963 | 0.0000 |
| D8190 | -0.004623 | 0.000474 | -9.755339 | 0.0000 |
| C | -9.021586 | 0.426289 | -21.16307 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.995517 | Mean dependent var | 2.591033 |
| Adjusted R-squared | 0.995128 | S.D. dependent var | 0.261720 |
| S.E. of regression | 0.018269 | Akaike info criterion | -5.079664 |
| Sum squared resid | 0.023029 | Schwarz criterion | -4.864992 |
| Log likelihood | 200.0272 | F-statistic | 2553.964 |
| Durbin-Watson stat | 1.470779 | Prob(F-statistic) | 0.000000 |

Legend: LN = natural logarithm, GDP = real gross domestic product, LR = long-term interest rates, I3M = 3-month interest rate (until end 1998 D-mark, thereafter euro), D = dummy variable (in this case the dummies take account of the structural breaks in the time series related to the German reunification. The dummies take a value of 1 as from Q1 91 and Q2 90, respectively, and zero before that), time trend for the period Q1 81 to Q4 90, C = constant. The residuals of the regression are stationary according to the ADF-Test. Included observations = 76. The residuals of the regression are stationary according to the ADF-Test.

*Source: Deutsche Bundesbank; Thomson Financials; own calculations.*

Figure 10: Real Bank Loans in Germany, Actual and Estimated*, Q1 81 to Q4 03




Legend: Values in logarithms. – For the period Q1 00 to Q4 03 estimated on the basis of the long-run demand for bank loans as shown in Figure 8. The residual is calculated as the actual stock of bank loans minus the estimated equilibrium stock of bank loans.

*Source: Deutsche Bundesbank; Thomson Financials; own calculations.*

Using the long-run relationship for Q1 81 to Q4 99, we estimated a difference equation for the period Q3 80 to Q4 03. Figure 11 shows the results. The regression meets the statistical requirements. Figure 12 shows the actual and estimated annual growth rates for the real bank loans in Germany. As can be seen, the actual expansion of bank loans has been somewhat smaller than suggested by the "equilibrium" rates. From Q1 00 to Q4 03, the actual expansion has been, on average, 0.6 percentage point below the equilibrium rate; this "gap" widened to 1.0 percentage points until Q2 03. So, most of the slowdown in German bank lending appears to be due to cyclical factors, although some supply side restriction might have played a role, albeit to a smaller extent than a simple look at the recent growth trends in German bank loans might suggest.

Figure 11: Estimating the Change in the Growth of Real Bank Loans in Germany from Q1 82 to Q4 99

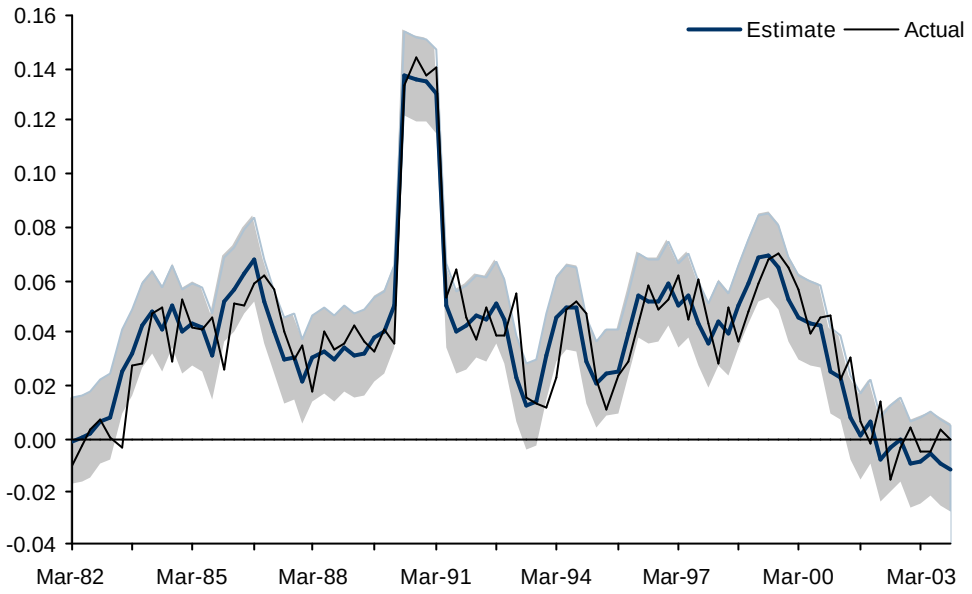
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D1D4LNL(-4)-D1D4LNCPI(-4) | -0.492396 | 0.074383 | -6.619749 | 0.0000 |
| D1D4LNGDP(-1) | 0.114974 | 0.034276 | 3.354396 | 0.0014 |
| D1D4LNGDP(-3) | 0.077355 | 0.018229 | 4.243593 | 0.0001 |
| D1D4LNI3M | 0.247581 | 0.093785 | 2.639886 | 0.0104 |
| ECT(-2) | -0.193622 | 0.046087 | -4.201204 | 0.0001 |
| D912 | -0.083253 | 0.008969 | -9.282684 | 0.0000 |
| D902 | 0.086346 | 0.006623 | 13.03801 | 0.0000 |
| D864 | -0.015652 | 0.006743 | -2.321112 | 0.0235 |
| C | 0.000585 | 0.000778 | 0.751523 | 0.4551 |

| | | | |
|---|---|---|---|
| R-squared | 0.875903 | Mean dependent var | 0.000450 |
| Adjusted R-squared | 0.860145 | S.D. dependent var | 0.017144 |
| S.E. of regression | 0.006411 | Akaike info criterion | -7.145077 |
| Sum squared resid | 0.002590 | Schwarz criterion | -6.860494 |
| Log likelihood | 266.2228 | F-statistic | 55.58368 |
| Durbin-Watson stat | 2.002083 | Prob(F-statistic) | 0.000000 |

Legend: LN = natural logarithm, GDP = real gross domestic product, LR = long-term interest rates, I3M = three month money market rate, (-1) = variable lagged by one quarter, D = dummy variable (in this case the dummies take account of the breaks in the time series related to the German re-unification. The dummies take a value of 1 in Q1 91 and Q2 90, respectively, and zero otherwise), D864 takes on 1 in 1986:4 and zero otherwise), d4 = fourth quarter change, CPI = consumer price index, C = constant, Time = time trend. Included observations: 72. Test statistics: LM(1) = 0.358 (0.552), LM(4) = 0.811 (0.553), ARCH(1) = 0.137 (0.712), ARCH(4) = 0.609 (0.657), WHITE = 0.581 (0.860), JB = 3.127 (0.209), RESET(4) = 1.722 (0.156). The t ratios for the ECT are statistically significant in view of the asymptotic critical values for the ECM test t ratio as shown in Banerjee, A., Dolado, J. J., and Mestre, R. (1998).

*Source: Deutsche Bundesbank; Thomson Financials; own calculations.*

Figure 12: German Bank Real Loan Expansion, Annual Growth Rates Q3 80 to Q4 99, Then Estimated Until Q4 03




*Source: Deutsche Bundesbank; Thomson Financials; Bloomberg; own calculations. The shaded area represents two standard errors of the estimate.*

In a final step we constructed a "total credit aggregate", consisting of bank loans extended to firms and private households plus bonds issued by German corporations. By doing so, we included the potential "substation effect". Following the previous approach we estimated, in a first step, a long-term demand function for total credit for the period Q1 81 to Q4 99. The results are shown in Figure 13. In a second step, we estimated a model in first differences, taking into account the long-run stability of the demand function for total private sector credit, and extended the estimate to Q4 03. The results are shown in Figure 14.

Figure 13: Estimating the Demand for Total Private Sector Credit Germany from Q1 81 to Q4 99

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LNGDP | 2.149693 | 0.059108 | 36.36912 | 0.0000 |
| LNLR | -1.601174 | 0.321276 | -4.983801 | 0.0000 |
| LNI3M | -0.786123 | 0.158349 | -4.964485 | 0.0000 |
| DUM911 | -0.948070 | 0.050904 | -18.62480 | 0.0000 |
| DUM902 | 0.054140 | 0.014512 | 3.730693 | 0.0003 |
| T8090 | -0.004200 | 0.000393 | -10.67413 | 0.0000 |
| C | -9.265081 | 0.325788 | -28.43901 | 0.0000 |
| R-squared | 0.996520 | Mean dependent var | | 2.668571 |
| Adjusted R-squared | 0.996269 | S.D. dependent var | | 0.298756 |
| S.E. of regression | 0.018249 | Akaike info criterion | | -5.094773 |
| Sum squared resid | 0.027643 | Schwarz criterion | | -4.900343 |
| Log likelihood | 236.2648 | F-statistic | | 3961.486 |
| Durbin-Watson stat | 1.225393 | Prob(F-statistic) | | 0.000000 |

Legend: LN = natural logarithm, GDP = real gross domestic product, LR = long-term interest rates, I3M = 3-month interest rate (until end 1998 D-mark, thereafter euro), D = dummy variable (in this case the dummies take account of the structural breaks in the time series related to the German reunification. The dummies take a value of 1 as from Q1 91 and Q2 90, respectively, and zero before that), T = time trend for the period Q1 80 to Q4 90, C = constant. The residuals of the regression are stationary according to the ADF-Test. Included observations = 76. The residuals of the regression are stationary according to the ADF-Test.

*Source: Deutsche Bundesbank; Thomson Financials; own calculations.*

Again, the specification provides statistically sufficient results. Fig. 15 shows the actual and estimated real growth rates of total private sector credit for the period Q1 82 to Q4 03. The shaded area represents two standard errors of the estimate. As can be seen both time series are closely related with the actual decline in bank loan growth rates accompanied by our estimate. In view of the previous findings, this result supports the notion that the substitution effect of bank loans through debt capital market instruments provides an additional useful explanation of the decline in German bank loan growth.

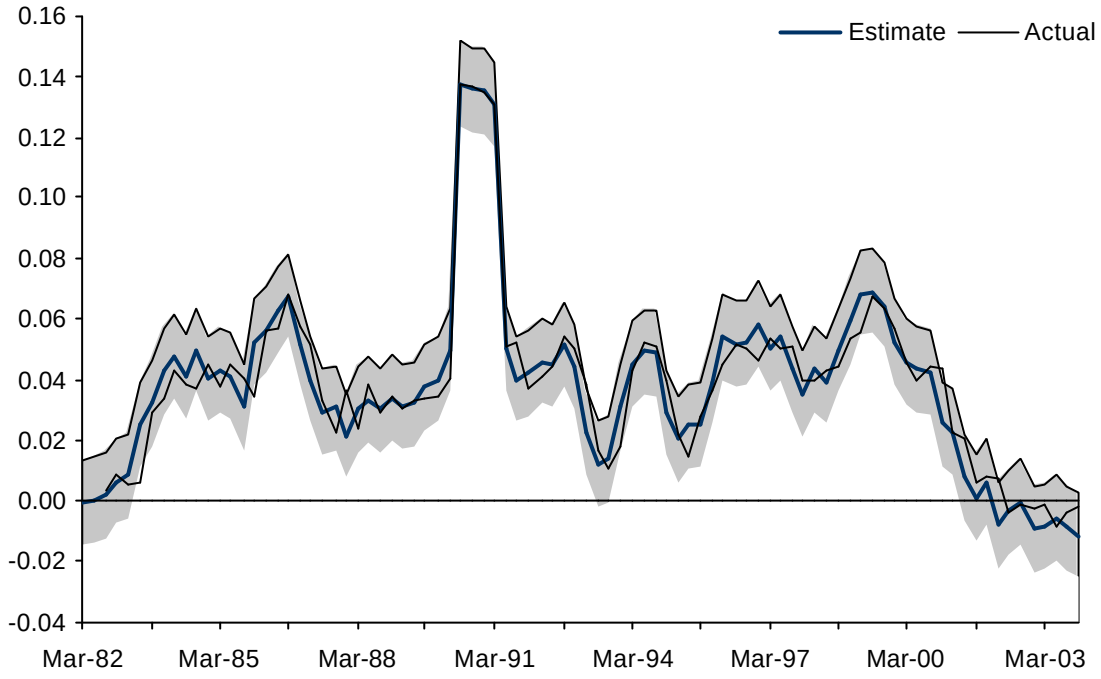
Figure 14: Estimating the Change in the Growth of Total Private Sector Credit in Germany from Q2 81 to Q4 99

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D1D4LNL(-1)-D1D4LNCPI(-1) | 0.147411 | 0.048675 | 3.044206 | 0.0028 |
| D1D4LNL(-4)-D1D4LNCPI(-4) | -0.221701 | 0.060183 | -3.702896 | 0.0004 |
| D1D4LNGDP(-3) | 0.081439 | 0.019962 | 4.100924 | 0.0001 |
| ECT(-1) | -0.154111 | 0.044908 | -3.449508 | 0.0010 |
| DUM902 | 0.077173 | 0.007169 | 10.82075 | 0.0000 |
| DUM912 | -0.074512 | 0.008762 | -8.547818 | 0.0000 |
| D864 | -0.023345 | 0.007274 | -3.226117 | 0.0020 |
| C | -0.000242 | 0.000771 | -0.315963 | 0.6496 |
| R-squared | 0.813961 | Mean dependent var | | -0.000554 |
| Adjusted R-squared | 0.797884 | S.D. dependent var | | 0.015674 |
| S.E. of regression | 0.007047 | Akaike info criterion | | -6.986910 |
| Sum squared resid | 0.004022 | Schwarz criterion | | -6.763213 |
| Log likelihood | 318.9175 | F-statistic | | 50.62751 |
| Durbin-Watson stat | 1.733770 | Prob(F-statistic) | | 0.000000 |

Legend: LN = natural logarithm, GDP = real gross domestic product, LR = long-term interest rates, I3M = three month money market rate, (-1) = variable lagged by one quarter, D = dummy variable (in this case the dummies take account of the breaks in the time series related to the German re-unification. The dummies take a value of 1 in Q1 91 and Q2 90, respectively, and zero otherwise), D864 takes on 1 in 1986:4 and zero otherwise), d4 = fourth quarter change, CPI = consumer price index, C = constant, Time = time trend. Included observations: 72. Test statistics: LM(1) = 0.79 (0.38), LM(4) = 0.64 (0.63), ARCH(1) = 0.31 (0.57), ARCH(4) = 0.85 (0.49), WHITE = 0.581 (0.860), JB = 3.127 (0.209), RESET(4) = 1.722 (0.156). The t ratios for the ECT are statistically significant in view of the asymptotic critical values for the ECM test t ratio as shown in Banerjee, A., Dolado, J. J., and Mestre, R. (1998).

*Source: Deutsche Bundesbank; Thomson Financials; own calculations.*

Figure 15: Total Private Sector Credit Expansion, Annual Growth Rates Q2 81 to Q4 99, Estimated Until Q4 03




*Source: Deutsche Bundesbank; Thomson Financials; Bloomberg; own calculations. The shaded area represents two standard errors of the estimate.*

## 6. Summary and Outlook

Our analysis suggests that the slowdown in German bank lending is largely due to the slowdown in economic activity rather than to supply side restrictions (such as credit rationing). Most of the decline in real bank loan growth can be explained by the factors incorporated in the long-run demand function for bank credit. The expiry of special developments, such as the government promotion of investment in eastern Germany or the decline in the large volume of foreign direct investment by German enterprises (which stimulated lending in the 1990s), is also likely to be contributing to the slowdown in credit growth.

In addition to demand side developments, banks are likely to have become more cautious about taking additional credit risk, which should have contributed to the slowdown in bank lending. However, our estimates suggest that supply side factors seem to be much less important for explaining the slowdown in bank loan growth when compared to demand side developments. This conclusion seems to be supported if the substitution of bank loans through the issuance of debt capital market instruments is explicitly taken into account.

# 7. Appendix

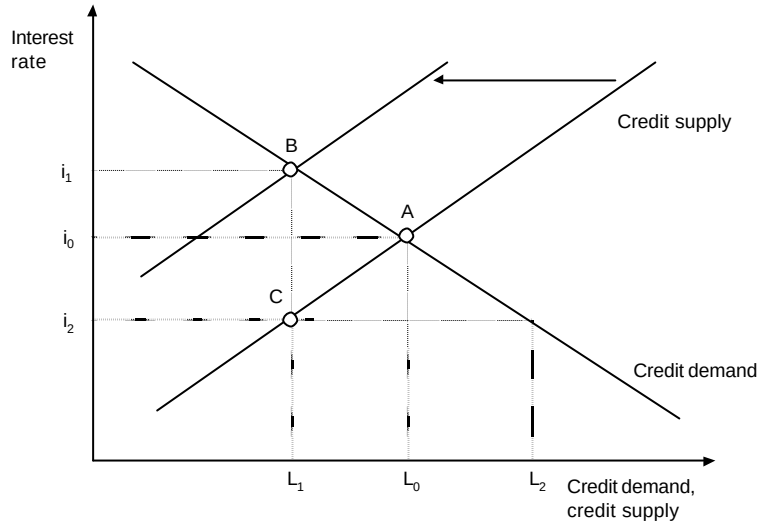
## 7.1 "Credit Crunch" vs "Credit Rationing"

The slowdown in German bank lending might also be ascribed to supply-side restrictions on the part of commercial banks. An increase in bad loans, low margins and a heightened degree of risk aversion on the part of banks' management might have led to banks refraining from extending additional loans to the private sector. Such a situation is often described as a "credit crunch" or "credit rationing".[7] Although these terms are frequently used interchangeably, the developments they represent differ substantially in economic terms and deserve a closer look. Those readers pressed for time can skip the following section, moving to the empirical test procedures in "Explaining Bank Lending in Germany".

To shed more light on the notions of credit crunch and credit rationing, Figure 4 shows a simple diagram depicting the supply of and demand for bank loans as a function of the interest rate. The market clears in point A, where the interest rate is $i_0$ and the loan volume $L_0$. In a first step, we outline a typical credit crunch. Taking the market equilibrium as a point of reference, let us consider a case in which banks contract their loan supply sharply (due to, for instance, an unexpected rise in loan provisions that induces banks to reduce portfolio risk). As a result, the bank supply curve moves to the left, with point B marking the new equilibrium. The market clearing interest rate is $i_1$ – which is higher than the original rate of $i_0$ – whereas the loan volume declines from $L_0$ to $L_1$. The sharp contraction in loan volume, accompanied by rising funding costs, is usually termed as a credit crunch.

[7] See Stiglitz, J. E., A. Weiss (1981), Credit rationing in markets with imperfect information, in: American Economic Review 71 (3): 393-410. Also Greenwald, B., J. Stiglitz (1993), New and Old Keynesians, in: Journal of Economic Perspectives 7, 23-44; Greenwald, B., J. Stiglitz (1993), Financial Market Imperfections and Business Cycles, in: The Quarterly Journal of Economics 108, 75-114.

Figure 4: “Credit Crunch” vs “Credit Rationing”




Now let us turn to the more complex issue of credit rationing. To cut a long story short, under a credit rationing, loan demand is not fully met by loan supply; the interest rate does not clear the market and is *not* set to rise. In figure 4, this situation will arise in point C. At the interest rate of $i_2$, the loan demand $L_2$ is higher than loan supply $L_1$, so that a loan volume in the amount of $L_2 – L_1$ remains unsatisfied. Such a situation might be temporary or persistent in nature. A *temporary* credit rationing might be brought about by, for instance, a monetary policy impulse. A lowering of interest rates might increase the demand for loans. As banks would need time to analyse the credit quality of incoming loan applications, loan supply may not respond immediately to the changes in the monetary environment but with a time lag.

However, credit rationing might become persistent due to the existence of costs that are due to “imperfect information” in loan markets. The emergence of a persistent credit rationing may be explained as follows:

- In a first step, let us assume that banks are (much) less well informed about the probability of an investment project being successful than an investor who seeks funds from the bank. This is an important aspect because banks’ willingness to supply credit depends on both expected return and risk.

- The interest rate charged on loans does not only affect an individual bank’s return but also the probability of the investor defaulting on its loan. A bank has to expect that the higher (lower) the interest rate charged, the higher (smaller) the probability of investor default. This conclusion is based on two factors:

    - *Negative selection*. A rising interest rate charged on loans can be expected to lead to a deterioration of average quality of the credit portfolio. This is because rising interest rate costs make risk averse in-

vestors retreat from the market. In contrast, investors pursuing relatively risky investment projects can be expected to continue to seek funds from the banks.

- *Risk-incentive effect*. Rising interest rate costs can be expected to induce investors to pursue investment projects that are associated with higher expected returns and thus a higher risk.

- The interest rate charged on loans exerts counterbalanced effects on banks' profits. On the one hand, a rising interest rate increases the expected return on the loan. On the other hand, a rising interest rate charged should give rise to the expectation of an increase in loans defaulting as investors chose more risky investments.

- If banks base their loan making decisions on a risk-return oriented calculation, an "optimal situation" occurs in which it is no longer rationale from a bank's point of view to satisfy the credit demand in full even if the borrower is willing to pay a higher interest rate. Instead, banks will choose an interest rate that optimises the expected return of the loan portfolio (the "optimum interest rate").

- The existence of the optimum interest rate might imply a situation in which credit rationing emerges. Banks might decide to supply loans at their individual optimum interest rate, which does not necessarily guarantee that the loan demand will be fully satisfied. If the demand for loan exceeds the supply at the optimal interest rate, the market is said to be subject to a "credit rationing".

To analyse whether a credit rationing or credit supply has been at work in the German banking sector recently, we will, in a first step, take a closer look at the euro area bank lending survey for Germany which has been established at the beginning of last year.

## 7.2 Error Correction Model

Creating and estimating econometric models of German credit growth has encountered some methodological difficulties. Many factors have shaped lending behaviour, such as those linked to German reunification, which, for example, are difficult to measure empirically. Therefore, robust procedures such as Engle-Granger were used for the econometric estimation methods because the conditions necessary for using the Johansen procedure were not in place.

The basis for the estimates presented here is quarterly data, adjusted for breaks and seasonal and calendar effects, of actual lending (deflated with the consumer price index), real GDP and nominal capital market rates (the yield on domestic bearer bonds outstanding).

In our analyses, we made use of the Error Correction Model (ECM) in the tradition of Engle-Granger (1969). In a first step, we calculated a long-run relation between the dependent variable and the independent variable(s). In a two factor model, X is the dependent and Y and Z represent the explanatory variables:

(1) $X_t = a + bY_t + gZ_t + e_t$,

where $a$, $b$ and $g$ are the parameters to be estimated and $\varepsilon$ is the identically normal distributed error term. If X, Y and Z are not stationary, and if the error term ($e = X - a - bY - gZ$) is integrated of the order null (I(0)), the variables X, Y and Z are said to be cointegrated. Cointegration means two or more variables are on the same "wavelength", that is, the variables have a tendency to move together. To put it differently, short-term deviations from, or shocks to, any equilibrium between cointegrated variables have a tendency to correct themselves, that is they are trending together so the system returns to equilibrium.

In a second step, the long-run relation between the cointegrated variables is incorporated into a (first) difference equation, which shows the short-term dynamic of the independent variable. In such an equation, all variables are stationary and the error term of the long-run equation (1), that is, the error correction term (ECT), is included with a time lag:

(2) $\Delta X_t = a + b\Delta Y_t + g\Delta Z_t + fECT_{t-1} + u_t$

Equation (2) can be estimated by ordinary least squares (OLS) with the usual t and F tests valid. If the parameter of ECT is smaller than zero, it shows that deviations from the equilibrium are corrected later on with the magnitude of $\phi$ indicating the speed of adjustment.

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