

German banks' lending to the domestic private sector since summer 2009

Credit growth continued to decelerate up to and into the first quarter of 2010, bucking the economic recovery, which had already begun in spring 2009. Annual growth of lending to the domestic private sector fell by around five percentage points – from 3.8% to -1.3% – between its peak in July 2008 and its nadir in March 2010. The subsequent recovery was muted and uneven. This was caused chiefly by weak growth of loans to enterprises, especially loans to non-financial corporations. On the other hand, loans to households were already net contributors to credit growth beginning in autumn 2009.

In the light of the financial crisis, this raises the question of whether credit growth during the economic upturn, especially growth of loans to enterprises, may be classified as exceptionally weak. However, a detailed analysis of the available data, supported by the use of various statistical and econometric procedures, provides barely any signs of this being the case. One reason is that, since the beginning of this year, credit growth has returned to a level corresponding to that of average growth since 2002 and therefore is not unusually low by German standards. Another is that the lag of growth in loans to enterprises behind that of gross domestic product (GDP) and investment in equipment observed during the current upturn is largely consistent with historical patterns. One crucial cause of this lag is apparently that, at the beginning of an upturn, firms' improved profitability enables them to meet their funding needs increasingly out of their own resources to start with.

The results of the Bank Lending Survey (BLS) for Germany, as well as those of other surveys, indicate that muted lending growth during the economic upswing is due largely to demand-side factors. Although econometric studies show that the tension which struck the financial markets in summer 2007 and banks' subsequent financing and liquidity problems made a significant contribution to the deceleration in the growth of loans to non-financial corporations, particularly in the year 2009. It is not possible, however, to identify a dampening of credit growth by the effects of the financial crisis past the first quarter of 2010. This state of affairs has continued to the present: according to BLS data, which are available up to the second quarter of 2011, the sovereign debt crisis, too, has so far failed to leave any noticeable mark on German banks' lending behaviour.

Introduction

Lending is a key component of the monetary transmission process

The bank loan has exceptional macroeconomic importance in Germany, for two reasons. First, it has traditionally been domestic enterprises' key source of external funding. Second, households borrow almost exclusively from domestic banks. In addition, bank lending to the private sector is a key component of the monetary transmission process. One of the main objectives of the non-standard monetary policy measures taken by the Eurosystem in the aftermath of the financial crisis is therefore to safeguard the provision of liquidity to banks in order to shield their lending to private-sector enterprises and individuals from the fallout of tension in the financial markets.

Muted recovery in growth of credit to domestic private sector despite economic upswing

Developments in lending to the private sector in Germany during the global financial crisis were already the topic of an article in the September 2009 edition of the *Monthly Report*. The main concern at the time was that, in the early stages of the budding economic recovery process in Germany, the supply of bank credit could fall short of corporate borrowing needs, thus hindering the upturn. Given the surprising speed and strength of Germany's economic recovery from its severe slump in the 2008 Q4-2009 Q1 period, this concern proved unfounded. However, unsecured loans to the domestic private sector did not show any visible signs of recovery until autumn 2010. This shifts the discussion about the existence of a credit crunch to the question of what caused weak credit growth during the upswing.

Annual growth of lending to the domestic private sector in Germany fell by around five percentage points – from 3.8% to -1.3% – between its peak in July 2008 and its nadir in March 2010. The subsequent recovery of credit growth was muted and uneven. Only as 2010 was coming to a close did the annual rate of credit growth leave negative territory, returning to the corridor of between 0% and 2% in which it had fluctuated between the beginning of 2002 and the end of 2007. At around 1%, credit growth is currently largely a reflection of average growth since 2002 and thus cannot be regarded as being exceptionally low by German standards.

In the euro area, too, loans to the private sector lagged the economic recovery somewhat; the credit cycle (in terms of annual growth rates) bottomed out as early as October 2009, six months earlier than in Germany. In addition, credit growth recovered more strongly in the euro area than in Germany. At around 2½% since the beginning of 2011, euro-area credit growth, however, currently remains well below its average from 2002 to the present (just over 6%).

It was primarily loans to households – most notably loans for house purchase, which already began to make noticeable positive contributions again as early as autumn 2009 – that caused the earlier and stronger recovery of credit growth in the euro area. By contrast, loans to non-financial corporations made a perceptibly negative contribution to growth until well into 2010 – a development which was visible in Germany, too.

Accelerated recovery of credit growth in the euro area, ...

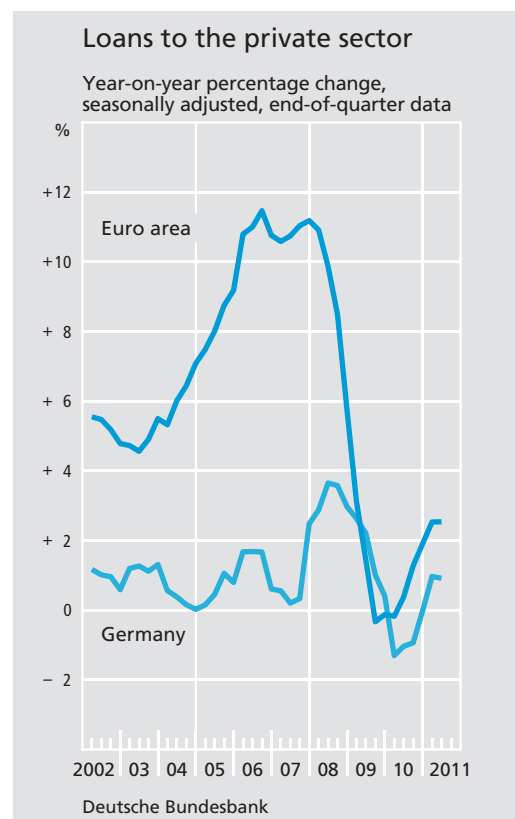
... especially through loans for house purchase

Tentative recovery of loans to the private sector overall caused by heterogeneous sectoral developments

Heterogeneous sectoral developments were behind the tentative recovery of loans to the domestic private sector in Germany. Unlike loans to non-financial corporations, which contributed less and less to credit growth from as early as the third quarter of 2008, loans to non-monetary financial institutions continued to grow dynamically up until the end of 2009. This caused loans to financial corporations – driven by short-term loans to other financial intermediaries¹ – to increasingly become a determinant of the continuing positive credit growth rates. However, this development reversed itself in 2010 and, amidst high short-term volatility, loans to financial enterprises amplified, on balance, the downward pressure on aggregate credit growth imposed by loans to non-financial corporations.

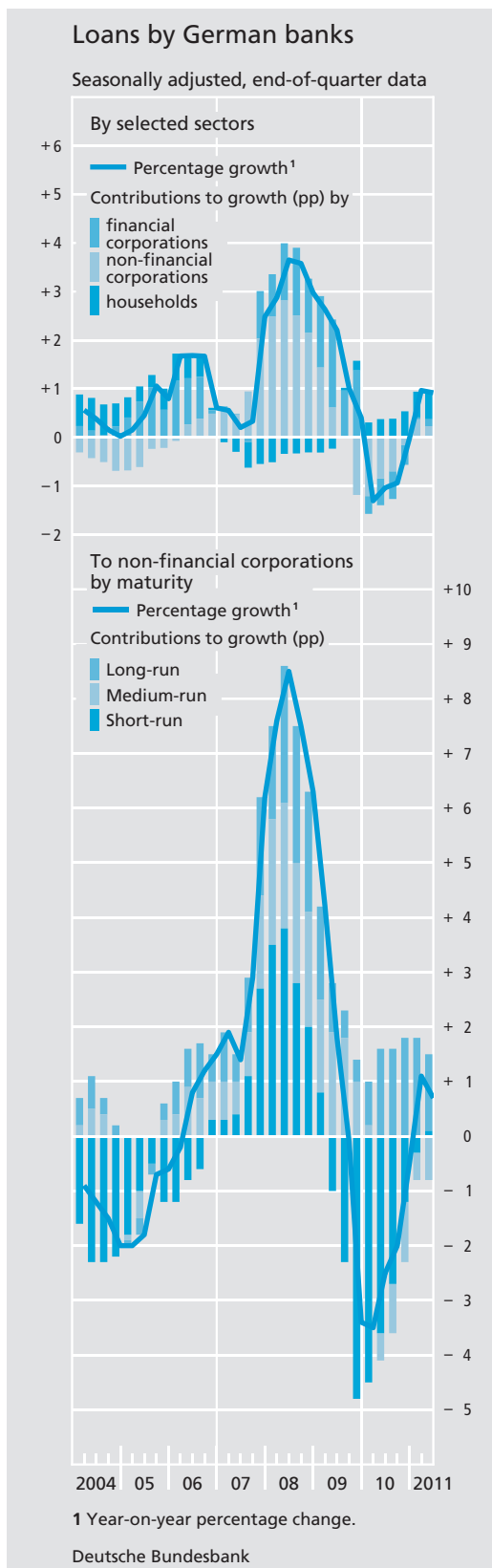
Loans to households were a near-perfect mirror image: from early 2007 to mid-2009 their contributions to growth were negative throughout but then did an about-face into positive territory, thus counteracting the negative trend in loans to enterprises. Whereas it was consumer credit which was initially responsible for the positive stimulus, from autumn 2009 loans for house purchase, too, showed an increasingly positive development. Their contribution to aggregate credit growth rose continuously and stood at one-half percentage point as this report went to press.

However, the significance of loans to households for aggregate credit growth considerably lagged that of loans to enterprises until well into 2010. Loans to non-financial corpo-



rations were the main reason for the decline in credit growth which lasted until March 2010 and for the sluggish pace of the subsequent recovery. This sub-category's contribution to growth fell to -1.2 percentage points by end-2009, began a slow recovery from as late as May 2010 and remained negative until the beginning of 2011.

¹ Loans to other financial intermediaries, which are extremely volatile on a monthly basis, consist largely of reverse repo transactions, in which banks grant collateralised loans to financial service providers from the area of other financial intermediaries; these financial service providers then take the liquidity and lend it to other banks against collateral. Since these are actually interbank transactions, this type of lending therefore does not per se entail a provision of credit to the private non-banking sector.



Loans to non-financial corporations

The sharp decline in loans to non-financial corporations in 2009 and the ensuing tentative recovery did not affect all maturities, categories of banks and sectors equally. This development was driven in key measure by short-term loans with a maturity of one year or less, which became increasingly mired in a slump from the spring of 2009 onwards and have only recently started to show signs of recovery. This is likely to be due less to flagging funding needs than to the fact that enterprises, given the rapid recovery of aggregate output, were capable of meeting their funding needs increasingly out of their own resources. For medium-term maturities (between one and five years), the decline was much less pronounced and has not yet come to an end. Only long-term loans with a maturity of over five years have shown continuous growth; the historically low level of interest rates in this maturity segment is probably one of the main reasons for this.

Slump in lending to non-financial corporations centred on short-term loans ...

A breakdown of loans to non-financial corporations by economic sector reveals diverging sector-specific developments. One factor to blame for the negative growth of aggregate loans was lending to the export-oriented manufacturing industry, the growth contributions of which have remained negative through to the present. The decline affected all sub-sectors of manufacturing but was particularly pronounced in the manufacture of machinery and equipment and in car manufacturing. Aggregate credit growth was curbed not only by loans to the manufacturing sector but also by loans to service indus-

... and on export-oriented sectors

Loans to non-financial corporations and sole proprietors in Germany by sector *

End-of-period data

Period	Annual percentage growth	Growth contributions (in percentage points)						
		Manu- facturing	Electricity, gas and water supply, mining and quarrying	Construc- tion	Wholesale and retail trade; repair of motor vehicles and motorcycles and durable goods	Agriculture, hunting and forestry, fishing	Transport and commu- nication	Services (including the self- employed)
2002	-1.69	-1.0	0.0	-0.3	-0.7	0.0	-0.1	0.3
2003	-3.19	-0.8	0.0	-0.5	-0.8	0.1	0.3	-1.4
2004	-3.29	-1.1	0.0	-0.4	-0.7	0.0	0.1	-1.1
2005	-1.94	-0.5	0.0	-0.3	-0.6	0.0	0.2	-0.6
2006	-0.66	0.2	0.2	-0.2	-0.3	0.1	0.3	-0.9
2007	2.70	1.1	0.2	0.0	0.4	0.1	0.4	0.6
2008	3.73	1.2	0.6	0.1	0.3	0.1	0.7	0.7
2009 Q2	0.96	0.4	0.7	0.3	-0.4	0.1	0.5	-0.6
Q3	-0.73	0.0	0.6	0.2	-0.7	0.1	0.1	-1.2
Q4	-3.18	-0.8	0.6	0.2	-1.4	0.2	0.0	-2.0
2010 Q1	-2.99	-1.4	0.5	0.0	-0.8	0.2	0.2	-1.9
Q2	-1.68	-1.4	0.6	0.0	-0.7	0.4	0.6	-1.2
Q3	-1.42	-1.4	0.7	0.0	-0.5	0.3	0.4	-0.9
Q4	-0.02	-0.9	0.6	-0.1	-0.2	0.3	0.4	-0.1
2011 Q1	0.51	-0.4	0.6	-0.2	0.0	0.3	0.0	0.2
Q2	-0.33	-0.4	0.6	-0.3	0.1	0.2	-0.4	0.0

* Data are taken from the borrowers statistics, which, unlike the overall monetary survey, also assign sole proprie-

tors to the corporate sector. In addition, these statistics are subject to different adjustment procedures.

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tries and to all sub-sectors that fall under wholesale and retail trade. By contrast, loans to enterprises engaging in energy and water supply, agriculture and forestry, transport and construction rose – not least as a result of the German Federal Government’s economic stimulus programmes. Their contribution to annual growth remained positive until autumn 2010.

from September 2009 – not least owing to restructuring conditions² imposed by the European Commission in the wake of the crisis. This reduced the contribution of Landesbank lending to loan growth by 1.4 percentage points since October 2009. Around half a year earlier, branches of foreign banks had already begun to reduce their activity in this segment, with big banks and regional banks following suit in mid-2009. The annual credit growth rate of this category of banks fell by slightly over 13 percentage points between March 2009 and March 2010. Whereas regional banks have been increasingly lending

... whereas other categories of banks scaled it back

Savings banks and cooperative banks expanded their lending continuously during the crisis ...

A breakdown of loans to non-financial corporations by category of bank likewise reveals clear differences (see table on page 64). Whereas savings banks and cooperative banks made positive contributions to annual growth rates of loans to non-financial corporations from as early as mid-2006 throughout the reporting period, Landesbanken continuously scaled back their activity in this area

2 The restructuring conditions on account of financial assistance granted by SoFFin and the respective owners included, in particular, the requirement to shrink balance sheets through greater concentration on core business areas, the sale of participating interests and divestment of entire business lines.

Loans to non-financial corporations in Germany by category of bank

End-of-period data									
Period	Annual percentage growth	Growth contributions (in percentage points)							
		Big banks	Regional banks and other commercial banks	Branches of foreign banks	Landesbanken	Savings banks	Credit co-operatives	Mortgage banks	All other banks
2002	-1.60	-1.7	0.3	-0.2	0.2	0.2	0.0	0.0	1.2
2003	-3.00	-2.1	-0.4	-0.2	-0.5	-0.2	-0.2	0.7	3.0
2004	-3.10	-1.4	0.1	-0.1	-0.6	-0.2	-0.1	-0.4	2.7
2005	-1.40	-1.0	-0.4	0.9	-0.4	-0.2	-0.1	0.3	0.9
2006	0.70	0.0	0.2	0.1	0.6	0.1	0.3	-0.6	-0.7
2007	5.50	0.7	0.8	1.1	1.4	0.9	0.5	-0.2	-5.3
2008	6.50	0.6	1.1	0.6	1.8	1.4	0.5	-0.3	-5.8
2009	-4.10	-0.8	-0.3	-1.1	-1.5	0.6	0.4	-0.6	3.3
2010 Q1	-4.20	-1.2	-0.3	-1.1	-1.7	0.5	0.4	-0.5	3.9
Q2	-2.50	-0.7	-0.3	-1.0	-1.3	0.6	0.5	-0.2	2.4
Q3	-2.30	-0.8	-0.1	-0.7	-1.5	0.6	0.5	-0.3	2.3
Q4	-0.50	-0.7	0.4	-0.3	-1.1	0.8	0.6	-0.4	0.6
2011 Q1	0.60	-0.2	0.7	-0.1	-1.2	0.9	0.7	-0.3	-0.4
April	0.20	-0.3	0.7	-0.2	-1.5	0.9	0.7	-0.3	-0.1
May	-0.20	-0.3	0.7	-0.2	-1.8	0.9	0.7	-0.3	0.4
June	-0.40	-0.2	0.7	-0.4	-1.6	0.9	0.7	-0.5	0.3
July	0.60	0.2	0.8	-0.2	-1.5	0.9	0.8	-0.4	-0.5

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to non-financial corporations since the end of 2010, big banks have remained in negative territory in 2011.

A breakdown of loans to households by category of banks shows a similar picture with regard to their activities during the crisis. Here, too, loans were propped up by savings banks and cooperative banks, whereas big banks and mortgage banks scaled back their lending.

Credit growth in the business cycle

The weak and tenuous recovery of loans to the private sector during the economic upturn raises the question of whether this can be regarded as an aberration. A comparison of the current situation with earlier upturn

phases may serve to answer this question. Time series methods – for instance, the estimation of dynamic cross-correlations and cross-spectra – can be used to identify historical patterns in the lead/lag structure of credit aggregates relative to GDP growth. Since the correlation analysis and the spectral analysis provide different and complementary information, the results obtained using both procedures are presented below. These results, of course, cannot be applied one-to-one to current developments, since the econometric procedures are restricted to developments in the two observed variables, while the impact of other factors is disregarded. Nonetheless, the results can serve as valuable indicators of potential deviations from the credit growth that can be expected on the basis of historical experience.

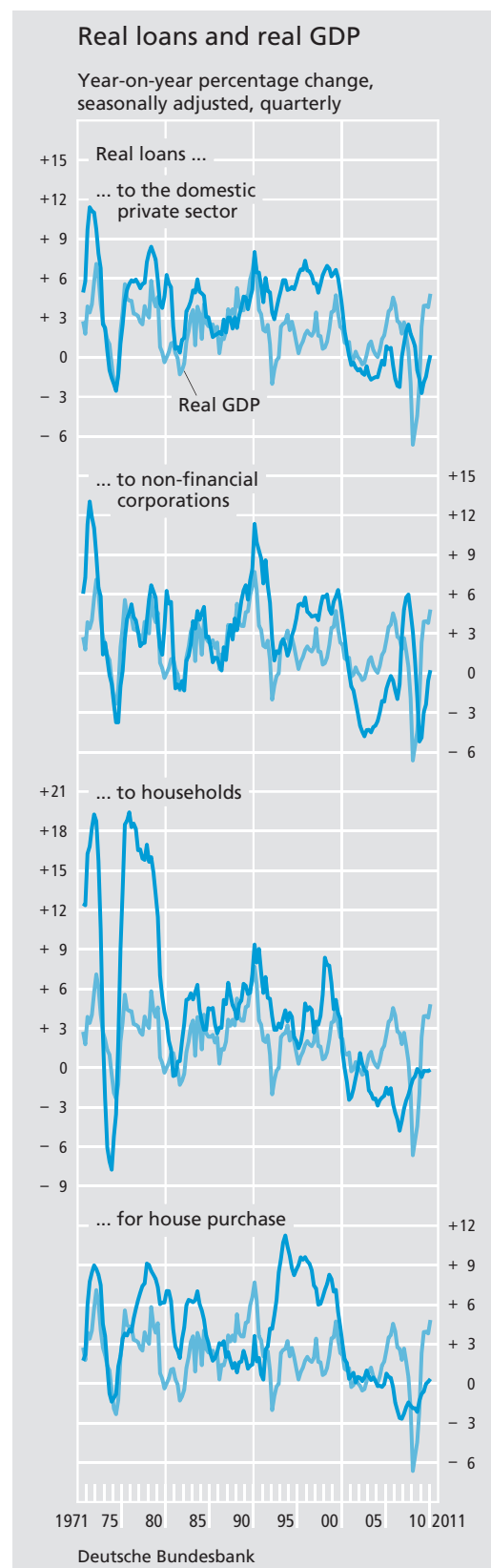
*Credit growth
largely pro-
cyclical*

At first glance, the (real) growth rates for loans to the entire private sector show a similar pattern to the GDP growth cycle.³ The same applies – though the specifics differ – to loans to non-financial corporations (excluding loans for house purchase), loans to households (excluding loans for house purchase) and loans for house purchase.⁴ A formal analysis of the correlation structures, however, reveals considerable differences between types of loans in terms of the intensity and the time structure of their correlation with the business cycle. Loans to non-financial corporations show a very similar pattern to the business cycle and are highly correlated with GDP growth. By contrast, growth of both loans for house purchase and consumer loans is only weakly correlated with GDP growth – in the case of consumer loans, this has become clear especially recently. Growth of loans to financial enterprises has even been evidencing countercyclical movement. Owing to the opposing features of its sub-components, it comes as no surprise that there is only a weak correlation between the overall aggregate – loans to the domestic private sector – and GDP growth.

The individual components of loans to the private sector differ not only in terms of the

³ Loans were deflated with the GDP deflator in order to make growth rates comparable over time, avoiding potential distortion caused by differences in inflation rates.

⁴ The components are defined in accordance with the borrowers statistics, from which the data are taken. By merging loans for house purchase to non-financial corporations and those to households in one category, the borrowers statistics take account of the fact that loans for house purchase in Germany are often settled through property developers. Loans to households (excluding loans for house purchase) are largely consumer loans, since loans to self-employed persons are assigned to the enterprise sector for the purposes of the borrowers statistics.



Results of the correlation analysis

Maximum correlation

[Lead(+)/lag(-) in quarters; * indicates a significant lead or lag (relative to comovement)].

Item	1971-2011	1981-2011	1991-2011
Loans to the private sector			
relative to gross domestic product	0.47 [0]	0.33 [- 4]	0.37 [- 5]
Loans to households (excluding loans for house purchase)			
relative to gross domestic product	0.54 [+ 1]	0.40 [+ 2]	0.28 [0]
relative to consumer spending	0.71 [- 1]	0.69 [+ 1]	0.68 [0]
Loans for house purchase			
relative to gross domestic product	0.29 [+ 1]	0.15 [+ 2]	0.24 [+ 2]
relative to gross fixed capital formation in the private sector	0.23 [- 1]	0.07 [+ 1]	0.18 [+ 1]
relative to housing investment in the private sector	0.40 [- 2]	¹ 0.35 (-)	¹ 0.53 (-)
Loans to non-financial corporations (excluding loans for house purchase)			
relative to gross domestic product	0.56 [- 2]	0.63 [- 3*]	0.52 [- 3*]
relative to gross fixed capital formation in the private sector	0.58 [- 3*]	0.60 [- 3*]	0.47 [- 3*]
relative to investment in equipment in the private sector	0.45 [- 3*]	0.51 [- 3*]	0.42 [- 3*]

¹ There is no maximum in the investigated time period (maximum lead and lag: eight quarters).

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Loans to non-financial enterprises lag GDP

strength of correlation to GDP growth but also in terms of their time profile, ie the extent of their lead/lag. The overall aggregate and loans to non-financial corporations both visibly lag GDP. Loans for house purchase and consumer loans, by contrast, both tend to lead GDP. However, the only statistically significant gap is in the case of loans to non-financial corporations, which lag GDP by three quarters.⁵

Longer business cycles often associated with financial crises

Whereas only the average correlation across all credit and business cycles during an estimation horizon can be modelled using correlation analysis, spectral analysis methods are able to identify cycles of differing lengths and thus present long-run relationships (low frequencies) separately from short-run (high-frequency) movements. The longer a cycle,

the longer it takes to complete (upswing, boom, downswing, recession). There are numerous economic theories which postulate a strong correlation with GDP growth cycles, especially in the case of longer credit cycles.⁶ Over shorter business cycles (three to five

⁵ An analysis of correlations for the individual GDP components largely confirms this picture, with the correlation between loans to non-financial corporations and gross fixed capital formation as well as investment in equipment in the private sector similarly strong to that between loans to non-financial corporations and GDP. Loans for house purchase are likewise roughly as weakly correlated with gross fixed capital formation in the private sector and housing investment as they are with GDP overall. Only consumer loans are much more closely correlated to consumer expenditure than to GDP.

⁶ See eg G Haberler (1938), *Prosperity and Depression*, League of Nations, Geneva; J Schumpeter (1939), *Business Cycles. A Theoretical, Historical, and Statistical Analysis of the Capitalist Process*, McGraw-Hill Book Company, Inc; H Minsky (1995), *Financial factors in the economics of capitalism*, *Journal of Financial Services Research* 9: 197–208; C A E Goodhart (2010), *Is a less procyclical financial system an achievable goal?*, *National Institute Economic Review* 211: R17–R26.

years), financial imbalances develop, whereas longer business cycles (seven to nine years), which often feature severe recessions and financial crises, are associated with a drastic drop in credit growth. Spectral analysis can be used to determine the length and shape of credit cycles and GDP growth cycles, the strength of their correlation and any relative cycle shift.⁷

Credit growth higher and more volatile than GDP growth

For Germany, a simple comparison of average real annual growth rates of loans and GDP and their standard deviations over longer periods is enough to demonstrate that credit growth is much more volatile and, at the same time, is higher, on average, than GDP growth (see table on this page). This observation is not unique to Germany but is also valid for the euro area and the United States.⁸ This is confirmed by spectral estimates for loans and GDP growth (see table on page 68).⁹ Credit cycles tend to be longer and stronger than GDP growth cycles, and can be shown to be closely correlated to the latter (high coherence values). However, no credit boom has been visible in Germany in the past decade; credit growth rates have remained low – also by international standards.

Loans to households lead consumer expenditure

With regard to the time profile of the relationship between credit cycles and business cycles, the results of the spectral analysis are consistent with those of the dynamic correlation analysis: loans to households are closely correlated to consumer expenditure over medium-length cycles (five years), significantly leading the latter by three quarters. By contrast, the sluggish growth of consumer loans in the past two years has tended to

Descriptive statistics for real lending and real GDP

Average annual percentage growth rate
[standard deviation]

Item	1971-2011	1981-2011	1991-2011
Gross domestic product	2.1 [2.2]	1.8 [2.1]	1.3 [2.1]
Loans			
to the private sector	3.4 [3.2]	2.8 [2.5]	2.6 [2.9]
to non-financial corporations	2.6 [3.8]	2.3 [3.6]	2.1 [3.6]
for house purchase	3.7 [3.6]	3.3 [3.6]	3.3 [4.3]
to households (excluding loans for house purchase)	4.4 [6.2]	2.4 [3.3]	1.2 [3.3]

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parallel the equally rather tentative recovery in consumer expenditure. However, given the particular severity of the recession, the current growth of consumer loans does not by any means run counter to historical patterns.

⁷ Since the cycle shift (phase) cannot be uniquely calculated in mathematical terms, a correlation analysis is necessary to determine the sign. On the other hand, spectral analysis is used primarily to determine the size of the shift (lead/lag) and the frequency with which this shift is significantly different from co-movement.

⁸ For the USA: D Aikman, A Haldane and B Nelson (2010), Curbing the credit cycle, Speech delivered at the Columbia University Center on Capitalism and Society Annual Conference, New York, November 2010. For the euro area: European Central Bank (2011), Recent developments in loans to the private sector, Monthly Bulletin, January 2011, pp 57-72.

⁹ As the 1970s were marked by extremely high volatility unleashed by the turmoil in the international financial and monetary system, which might lead to distortions in the identification of historical patterns, our analysis focuses on the 1981 to 2011 period. Results for the entire time period from 1971 are given in the box on pages 70-71.

Results of the spectral analysis

1981 to 2011

Item	Maximum coherence [cycle lengths with greater coherence in quarters]	Average phase shift in quarters [cycle lengths with significant phase shifts]
Loans to the private sector relative to gross domestic product	0.69 [8]	–
Loans to households (excluding loans for house purchase) relative to gross domestic product	0.38 [12]	–
relative to consumption expenditure	0.88 [42-14; 9-8]	+ 3 [21]
Loans for house purchase relative to gross domestic product	0.84 [25-11]	+ 3 [25-11]
relative to gross fixed capital formation in the private sector	0.63 [21-18]	–
relative to housing investment in the private sector	0.74 [42; 21-18]	–
Loans to non-financial corporations (excluding loans for house purchase) relative to gross domestic product	0.68 [31-21]	– 3 [18-11]
relative to gross fixed capital formation in the private sector	0.80 [42-16]	– 4 [42-14]
relative to investment in equipment and software in the private sector	0.80 [42-16]	– 3 [42-13]

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*Loans for
house purchase
lead GDP*

Loans for house purchase lead GDP significantly, by three quarters. This lead can be identified for short and medium cycle lengths of three to six years and may be regarded as a core element of the correlation of these types of loans to economic developments. For the economic upturn which began in the second quarter of 2009, however, the case for loans for house purchase leading GDP is not nearly as open-and-shut. Although the growth of loans for house purchase already halted its slide in the first quarter of 2008, it tended to move sideways until the third quarter of 2009, only beginning to show a perceptible upward trend from the fourth quarter of 2009 onwards. One reason for the relatively late recovery of loans for house purchase could be that potential borrowers and lenders only gradually revised upwards their

assessment of the outlook for economic activity and thus their income outlook.¹⁰

One reason why consumer loans and loans for house purchase led the business cycle over the 1981 to 2011 period could be that banks, in uncertain economic conditions, are more likely to lend to households, since households may be able to offer better-quality collateral – real estate – than enterprises. Household demand for consumer loans and loans for house purchase, however, is probably highly dependent on expect-

*Lead due to
banks' assess-
ment of risk*

¹⁰ In that vein, it can be inferred from the BLS responses that German banks perceptibly tightened their standards for loans for house purchase in the first and second quarters of 2009 owing to their persistently negative assessment of the economic outlook. See the May and August 2009 editions of the Deutsche Bundesbank's Monthly Report.

tations regarding future income trends and on the level of interest rates.

Lag of loans to non-financial corporations ...

Loans to non-financial corporations, unlike those for house purchase and to households, lag all studied real economic series by three to four quarters, especially for medium to longer cycle lengths (four to ten years). Loans to enterprises significantly lag GDP and investment in equipment by three quarters.

... also visible at present

The lag of real loans to non-financial corporations behind the business cycle is also visible in the current economic upturn. The credit growth cycle hit its lower turning point in the fourth quarter of 2009, exactly three quarters after GDP growth bottomed out. The belated recovery of loans to non-financial corporations in the current upswing is thus by no means an aberration but is instead consistent with historical patterns. In all previous business cycles since the 1970s, loans to non-financial corporations lagged GDP growth, but mostly only by one quarter. The reason for the longer lag in the current cycle, however, is more likely to rest in the fact that aggregate economic output recovered unusually quickly relative to earlier recessions and less in unusual behaviour on the part of loans.

Lag conceivably due to disparity between new business and redemption ...

The observed lag of loans to enterprises behind the business cycle stands in a certain contrast to the idea that enterprises need loans to finance production and investment, and thus requires explanation. One possible reason is purely statistical: that the data used here on changes in credit volume model not only new business but rather the net change

– in other words, the balance of new business, redemptions and write-downs. Besides a lagged response of new business, another reason for the lag of credit growth could therefore be that redemptions and/or write-downs are lagging real economic activity. In addition, lending is the outcome of interplay between supply and demand; weak credit growth can consequently be the result of weak credit demand or can also reflect restrictions in supply.

Demand for bank loans is not constant across the business cycle but depends not only on lending rates but also on the planned volume of production and investment and on the costs and availability of other sources of funding. One reason for credit demand lagging GDP growth is that non-financial corporations tend to be reluctant to engage in new fixed asset formation during the first stage of an upswing so as to increasingly use their available capacity at the outset. Another is that, owing to improved earnings, enterprises meet their funding needs during an upswing increasingly from their own financial resources, ie their “earned” depreciations and retained profits. Alongside the growing significance of internal financing, however, it is also conceivable that, during an upswing, enterprises initially make increased use of other forms of external financing. Alternatives to bank loans include, most notably, borrowing from domestic and foreign non-banks (intra-group or trade credits), as well as, in principle, raising funds on the capital market (by issuing corporate bonds and shares).

... or also the result of a cyclical credit demand pattern

Using spectral analysis to analyse the cyclical relationship between loans to non-financial corporations and gross domestic product (GDP) in Germany*

The relationship between two time series is typically analysed using correlation coefficients. However, if the observed time series move in cycles, this should be reflected in the econometric methodology used. Spectral analysis is one option. Not only the cycle length (duration of one fully completed cycle – similar to a sine wave) and the amplitude of the cycle but also the relationship between the cycles of two series can be identified and characterised. With regard to the relationship between credit growth and GDP growth, the following questions can therefore be answered. (1) How strong and how long are typical GDP growth and credit growth cycles? (2) How strong is the relationship between cycles of the same length for credit growth and economic growth? (3) Is there a shift between the cycles of both time series? In other words, is there a measureable lead or lag?

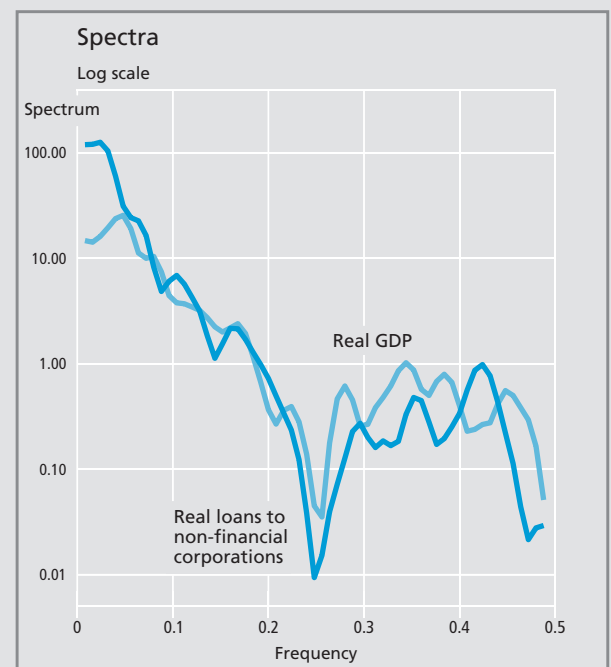
Spectral analysis measures the variance of time series for any given cycle length (or frequency). The longest cycle corresponds to the number of observations (T), and the shortest cycle covers two observations; the maximum number of cycles is $T/2$. The cycle unit depends on the frequency of the data used (monthly, quarterly or annual observations). This means that spectral analysis enables the identification and measurement of cycles without an exogenously given cycle length.¹ Further analysis hinges on the estimation of the spectrum, which indicates the distribution of the variance of the time series across the frequencies, therefore representing a smoothed variant of the variance estimate.²

If what one is looking for is the relationship between two time series, the cross-spectrum (the product of the spectra of both time series) is also estimated. From this, the strength of the relationship (coherence) and the time shift between two cycles (phase) can be determined. Coherence indicates how close the relationship is between two time series for a particular frequency. It can therefore be understood as a type of correlation coefficient for a given

frequency and is similarly defined as the ratio (which can range between 0 and 1) of covariance to the product of the individual variances for each frequency. To make a statement about the relationship between the two time series that makes economic sense, it is therefore important to only interpret the coherence for frequencies in which the time series exhibits strong cycles.

Phase indicates the relative shift of the cycles of both time series and can be understood as the cycles' lead or lag. As the sign is not definite, however, it is advisable to first check the direction of the time shift using dynamic correlations.

The figure below shows the spectrum of the annual growth rate of real loans to non-financial corporations and real GDP for the 1981 to 2011 data set. Both spectra



* For details and an empirical analysis for Germany see U Busch (2011), Credit Cycles and Business Cycles in Germany: A Comovement Analysis in the Frequency Domain, mimeo. — 1 This contrasts with bandpass filter methods, in which cycles of exogenously given lengths are fil-

tered out from the time series. Examples include the Christiano and Fitzgerald (2003) or Baxter and King (1999) filters, which are contained in popular software. — 2 The estimation results do, in fact, depend somewhat on the choice of the smoothing window, which should be

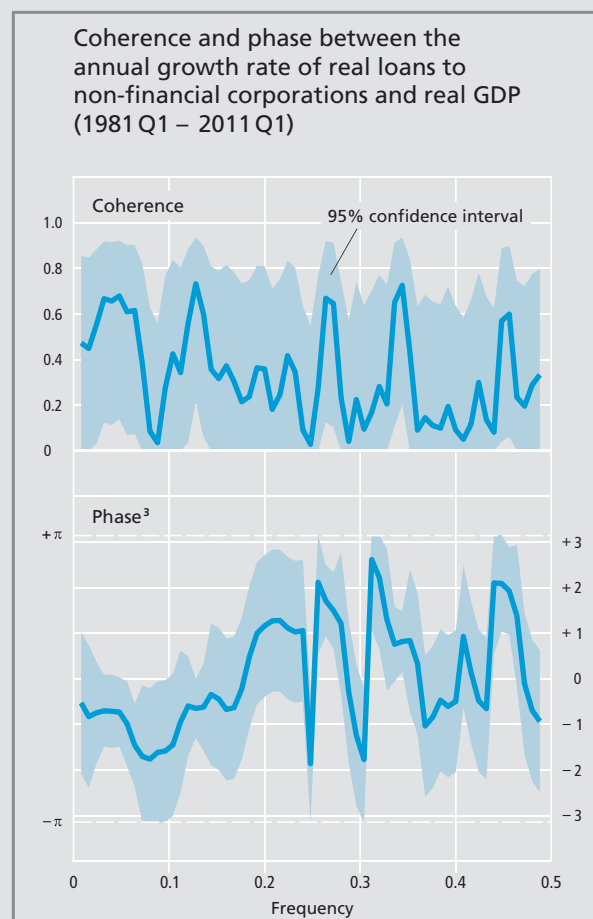
demonstrate the largest amplitude at low frequencies (0.02 to 0.1), which corresponds to a cycle length of two to ten years. Credit growth is significantly more cyclical than economic growth, however. Longer credit cycles (eight to ten years), in particular, are about five times as strong as the respective business cycles.

The spectra of the two series form the basis for estimating the cross spectrum. The resulting coherence between credit growth and GDP growth is indicated in the adjacent figure together with the 95% confidence interval for all frequencies. The frequency range to be interpreted is, as before, between 0.02 to 0.1. For medium to longer-term cycles (five to eight years) there is a very close relationship between the growth of real GDP and the growth of real loans to non-financial corporations, expressed in high levels of coherence (0.67). If the data set is expanded to include the 1970s, the coherence increases even to values of up to 0.9. This could be an indication that the correlation between GDP growth and the growth of loans to non-financial corporations has loosened over time. The main GDP components (private sector investment and private consumption expenditure) also turn out to be more loosely related to lending to non-financial corporations if the 1970s are omitted than if this decade is included.

The phase provides information about whether the cycles co-move (in the same phase) or shift relative to one another (lead/lag). When estimating the phase, however, the sequence of the time series determines their signs, which means an assessment cannot be readily made about which series leads and which series lags. Because of this lack of clarity, a previous correlation analysis can help classify the result. The phase is represented in 95% confidence intervals in the adjacent chart for all frequencies. As it is measured in radians, it must first be converted into quarters in order to be interpreted as a time shift.³

varied to some extent in order to test the robustness. As a general rule for all available windows, the more frequencies that are involved, the smoother the spectrum and therefore the more difficult it is to identify

The chart shows a significant phase shift of three quarters for medium-length cycles (four to five years). The correlation analysis shows that loans to non-financial corporations lag GDP growth by an average of three quarters. Consequently, assuming that loans to non-financial corporations lag GDP growth, the observed phase shift can be interpreted as the medium credit cycles lagging GDP growth cycles. This lag is reduced by one quarter if the expanded data set (1971 to 2011) is used.



individual cycles. Here the modified Daniell window with three components is applied. — ³ Dividing the phase by 2π yields the phase shift in terms of cycle length.

*Cyclical trend
in the relation-
ship between
enterprises'
internal and
external
financing*

There are currently no sound empirical studies for Germany on the relative importance of the various forms of corporate financing and its behaviour over the business cycle. However, an initial analysis of the available data indicates an increase in the relative significance of internal finance, ie that its share in overall corporate financing increases in cyclical upswings.¹¹ Conversely, the share of external financing significantly lags the business cycle. Of the sources of external finance, since spring 2009 it has been, in particular, intra-group loans and trade credit which have gained hugely in significance; they now represent the most important sources of external finance. Their rise has mirrored the decline in bank lending.¹² Capital market-based financing has played, if at all, a minor role.

The importance of bank-related factors

The initially weak credit growth during the upswing could be due not only to the demand for credit lagging the business cycle, but also, in principle, to supply-side constraints. This could be signified by the fact that the overall velocity of credit growth has seen a sharp decline precisely among those categories of institutions whose funding sources and capital base were hit particularly hard by the financial crisis and which therefore felt compelled to deleverage by shrinking their balance sheets and/or shifting to less risky assets. In Germany, such deleveraging has been particularly noticeable among Landesbanken.¹³ The efforts of this category of banks to shrink their balance sheets also has to be seen against the background of the

restructuring conditions imposed by the European Union in return for government guarantees or capital injections.

However, too much stock should not be placed in the observation that weak credit growth was focused primarily on hard-hit categories of banks – the demand for credit could have shifted to banks which were less affected.

Developments in credit standards

Survey data can provide information on differentiation between bank-related and demand-related factors. The Eurosystem's Bank Lending Survey (BLS), which explicitly solicits information on banks' lending behaviour, is a particularly good instrument for distinguishing whether the absence of major credit growth during the current upswing was due to supply-side constraints or other factors.

*Surveys can
help identify
supply and
demand effects*

¹¹ In addition, the amount of internal financing (based on national accounts data) appears to be on a slight upward trend which is virtually divorced from the business cycle.

¹² In the literature, the substitutional relationship between trade credit and bank lending is attributed to differences in enterprises' financing costs; owing to these differences, enterprises with relatively low financing costs borrow more than they need and forward these loans to downstream enterprises which are confronted with higher financing costs or even credit constraints. See eg H Huang, X Shi and S Zhang (2011), Countercyclical substitution between trade credit and bank credit, *Journal of Banking and Finance* 35 (2011), 1859-1878. A similar explanation will probably apply to intra-group loans, since here lenders and borrowers are also very closely connected in a relationship of mutual trust which is conducive to lending, for which the potential information advantage over a bank is just one of multiple reasons.

¹³ See Deutsche Bundesbank, Germany in the financial and economic crisis, *Monthly Report*, October 2010, p 35.

Increased tightening until end-2009 and slight easing since mid-2010

German banks' credit standards for loans to non-financial corporations, which according to the BLS had initially been tightened considerably on the heels of the financial crisis, were not tightened any further as the economy recovered from the fourth quarter of 2009 onwards. However, it was not until the second half of 2010 that the participating German banks began to report a slight easing of their credit standards. It therefore cannot be ruled out altogether that the tightening during the financial crisis, which did not begin its partial reversal until 2010, may have curbed credit growth during the upswing.

Changes to credit standards due, in particular, to cyclical factors ...

Key information is provided not only by the credit standards themselves but also the factors which banks stated as having led them to adjust their lending policies. The banks' responses to the BLS indicate that since the third quarter of 2008 it was increasingly institutions' risk assessment, particularly the "expectations regarding general economic activity", along with the "industry or firm-specific outlook", which were responsible for the tightening of standards in lending to non-financial corporations. Up until mid-2010, participating German banks were still citing expectations regarding general economic activity as the main reason for tightening their credit standards. Since the second quarter of 2010, the economic outlook has tended to encourage an easing of credit standards.

... rather than bank-related factors

Nonetheless, the impact of bank-related factors, ie banks' cost of capital, ability to access market financing and liquidity position, which had played a major role in the tightening of standards in the first stage of the financial

crisis, remained well behind that of cyclical factors from the end of 2008 on. German banks' ample liquidity, leaving all other factors aside, led institutions to ease their credit standards from as early as the second quarter of 2009. This is likely to be due not least to the Eurosystem's non-standard monetary policy measures. Unlike in other euro-area countries, in Germany the sovereign debt crisis has apparently had no adverse impact on banks' lending policy to date.

Credit standards for households, by contrast, were almost entirely unaffected by the financial crisis. Only in late 2008 and early 2009 were they then tightened considerably, also against the background of increasing risks to households' income situation; however, these tighter standards were gradually rolled back over the course of 2011. Here, too, the economic outlook was the main driver; bank-related factors were irrelevant.

Since late 2009 and early 2010 (and thus somewhat earlier than the BLS), regular surveys of non-financial corporations on their financing situation (such as the ifo credit constraint indicator and the survey conducted by the German Chamber of Industry and Commerce (DIHK)) have been indicating a considerable easing in access to bank loans. The credit constraint indicator is currently at historic lows; even in the upswing prior to the financial crisis, enterprises' access to bank loans, by their own account, was no easier than it is now.

According to our econometric estimations, the observed pre-crisis behaviour continued

Credit standards for households with a slight lag

Business surveys also currently indicate unrestricted access to bank lending

Interest rate pass-through models do not indicate changes in lending behaviour

to capably explain the interest rates on loans to non-financial corporations.¹⁴ Whereas interest rates on corporate loans were even temporarily significantly lower than could have been expected owing to wholesale funding costs, they are currently once again very consistent with the scope predicted by the models. This means that interest rates are unlikely to have curbed lending growth during the recent upswing.

Impression of demand-driven lending growth confirmed by econometric estimates

All in all, these indicators point to demand-side factors as the main reason for the sluggish lending growth during the cyclical upswing. This picture is confirmed by econometric analyses. Although panel estimates based on BLS data find that negative bank-related factors did make a significant contribution to weaker growth of loans to non-financial corporations during the crisis,¹⁵ this negative supply-side impact, according to these estimates, was confined largely to 2009. No dampening of credit growth by bank-related factors can be observed past the first quarter of 2010 even if the estimation horizon is extended to the present.

Econometric analysis

Vector autoregressive (VAR) model as a suitable analytical instrument

A more comprehensive analysis of the determinants of credit growth which at the same time takes account of several factors of influence and all conceivable interrelations between them can be performed using a vector autoregressive (VAR) model. The VAR approach used here covers the growth rate of real loans to non-financial corporations,¹⁶ the growth rate of real GDP, export expectations

of manufacturing enterprises according to the ifo business test (balance in percent), the EONIA as a proxy monetary policy variable, and an indicator of financial market tension based on responses provided by German BLS banks on the bank-related determinants of credit standards.

This model was used to simulate the responses of all model variables to a negative financial market shock (see chart on page 75). The results indicate that credit growth initially rises in response to this shock before then showing the expected negative response beginning in the second quarter, which initially amplifies further before then petering out. The initial positive response of credit growth to a negative financial market shock can be explained by enterprises' increased utilisation of previously negotiated credit lines, since other sources of funding, such as internal financing, are affected more quickly and/or more strongly by the shock.

One interesting outcome is that loans to non-financial corporations respond to turmoil in the financial markets with a lag, whereas the negative impact on the real economy occurs faster. One reason why GDP growth and export expectations respond so quickly and distinctly to the financial market shock could lie

Loans fall with a lag after negative financial market shock ...

... and lag real GDP

¹⁴ For information on the methodology, see Deutsche Bundesbank, Short-term bank lending rates since the autumn of 2008, Monthly Report, May 2009, pp 36-37.

¹⁵ See Deutsche Bundesbank, The importance of bank-related factors in lending to non-financial corporations during the crisis, Monthly Report, October 2010, pp 40-41.

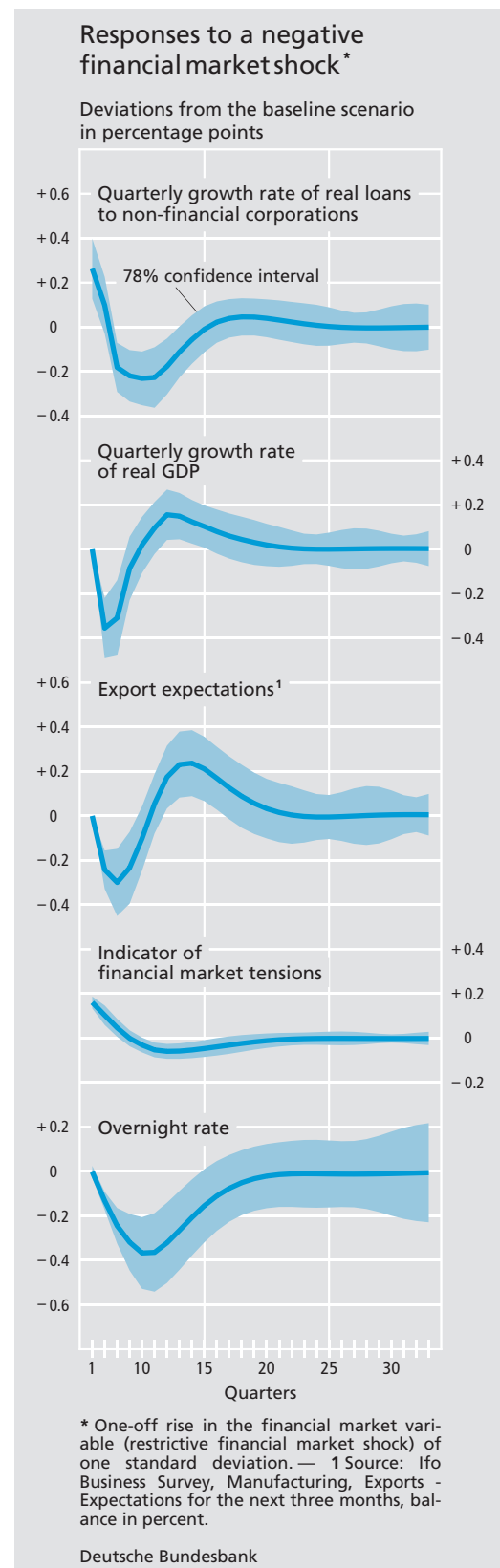
¹⁶ Unlike the annual growth rates we have looked at thus far, these are the first differences of logarithmised real loans to enterprises (from the national accounts), which correspond approximately to quarter-on-quarter growth rates.

in the fact that uncertainty about the (global) consequences of the shock for the real sector directly leads enterprises to behave with greater caution. At all events, this finding is consistent with the lag of loans to enterprises behind GDP already established by the correlation and spectral analyses.

Analysis of contributions by individual variables to change in credit growth

The results of the VAR model also permit a “historical shock decomposition” (see chart on page 77). Each time series’ deviations from its long-term average are decomposed into the contributions of the various shocks identified in the model. Based on the estimate, this then states how strongly the individual model variables have driven growth of real loans to enterprises in the past.

The results appear to indicate that the identified financial market shocks contributed markedly to a decline in loans to non-financial corporations, particularly in the first two quarters of 2009. According to the estimates, they accounted in total for around 90% of the negative deviation from trend growth. However, the impact of financial market shocks on lending diminished continually starting from the third quarter of 2009. From that time on, the negative effects, as they gradually peter out, merely reflect the lagged impact of earlier financial market shocks. In the fourth quarter of 2009, when credit growth was at its lowest point, financial market shocks contributed just 0.4 percentage point to the slowdown in growth, accounting for only slightly less than 20% of the deviation from the long-run average. The other 80% were caused by shocks in real GDP growth, export expectations and growth of



Specification of the VAR model

The VAR approach used here contains five endogenous variables: the growth rate of real loans to non-financial corporations (first difference of the logarithmic values), the growth rate of real GDP, export expectations in the next three months (ifo business survey, manufacturing, balance in percent), the overnight rate EONIA as a proxy for the monetary policy variable, and an indicator for financial market tensions. This indicator is constructed using data provided by German banks participating in the Bank Lending Survey (BLS) on bank-related determinants of credit standards (cost of capital, financing conditions and liquidity situation) with the help of econometric factor extraction techniques. The BLS variables on which the factor extraction is based suggest that the estimated factor represents a good indicator of financial market tensions.

The VAR model estimations are based on quarterly data and are performed for the period from the fourth quarter of 2002 to the second quarter of 2011. The relatively short estimation period is due to the availability of BLS data; the survey was not introduced until the end of 2002. All model variables are included in the model with two lags; the lag structure is based on the standard information criteria. The explanatory content of the individual estimation equations is good despite the relatively short estimation period.

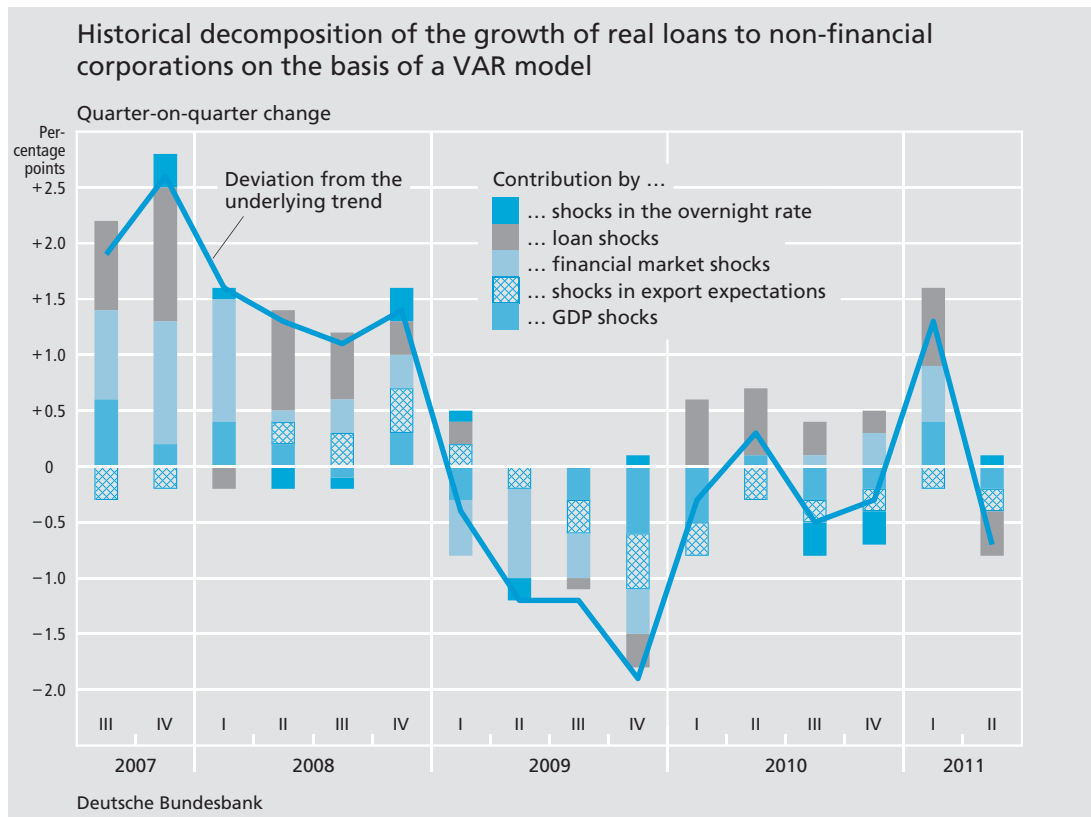
The shocks are identified using a Cholesky decomposition by assuming that the financial market shocks will impact on the growth rate of real loans as well as EONIA

in the same quarter, whereas the effects on real GDP growth and export expectations will not be felt until the next quarter. The resulting impulse response functions are robust to alternative recursive structures of economic shocks.

In order to estimate the impulse response functions, we simulate an unexpected increase of one standard deviation in the indicator for financial market tensions (negative financial market shock). The 78% confidence intervals for the impulse response functions are calculated using a standard bootstrap procedure with 1,000 replications.

The historical decomposition looks at the contributions made by the shocks in the individual model variables to the growth rate of real loans over time. In concrete terms, the deviations of real loan growth from its determinist component or, to be more precise, from its long-run average at each point in time are broken down into the contributions made by the individual VAR model variables' cumulated shocks, ie shocks from the quarter under review as well as the lagged effects of shocks from previous quarters. Formally, the historic decomposition represents a function of previously simulated impulse response functions and structural shocks.

To test for robustness, further estimations were carried out with alternative specifications (for instance, the ifo export expectations were replaced by an alternative indicator of external demand for German goods); this did not alter the main results.



real loans in itself. In subsequent quarters, the influence of financial market shocks on credit growth, according to this estimate, was actually increasingly positive. The growth of loans to enterprises in 2010 also already corresponded largely to the longer-run trend, which means that it is not possible to diagnose any exceptionally weak credit growth.¹⁷

Conclusions

The study results presented in this article provide no indication that the sluggish and tentative recovery of loans during the economic upswing may be described as unusual or even worrisome. One reason is that, since the beginning of this year, the annual growth of loans to the domestic private sector has re-

turned to a level corresponding to that of average growth since 2002, which – by German standards – cannot be described as unusually low. This is particularly true of the growth rates for loans to non-financial corporations, which were the main reason for the decline in credit growth which lasted up until March 2010 and for the sluggish pace of the subsequent recovery. Another is that the lag in the growth of loans to enterprises behind GDP growth observed during the current upswing is consistent with historical patterns established for the 1981 to 2011 horizon using correlation and spectral analyses.

¹⁷ Positive shocks also appear in the credit equation from the first quarter of 2010 onwards. This indicates the existence of supporting factors for credit growth which are not explicitly captured by the variables included in the model.

The results of the BLS for Germany, as well as those of other surveys, indicate that muted lending growth during the economic upswing is due largely to demand-side and cyclical factors. Although econometric studies based on BLS data show that the tension which first struck the financial markets in summer 2007 and banks' subsequent financing and liquidity problems made a significant contribution to decelerating the growth of loans to non-financial corporations, the neg-

ative impact of these factors was largely confined to 2009. It was not possible to identify a dampening of credit growth by the effects of the financial crisis on German banks past the first quarter of 2010. This state of affairs has continued to the present: according to the BLS, the latest results of which are available up to and including the second quarter of 2011, the sovereign debt crisis has likewise failed to leave any noticeable mark on German banks' lending behaviour.