The upswing in loans to enterprises in Germany between 2014 and 2019

Over the past few years, there has been a sustained increase in loans granted by German banks to non-financial corporations in Germany across all maturities, economic sectors and categories of bank. The ongoing economic recovery and the reduced costs of credit financing were material factors behind this upswing. However, these two variables alone cannot fully explain the steep growth in loans to enterprises.

Other potential determinants can be found on both the loan demand and loan supply sides. On the demand side, the main factors of relevance were the persistently low interest rate level as well as shifts in enterprises' funding structure and in the investment activity of individual economic sectors. Due to brisk construction activity as well as the associated upward pressure on prices for construction work and real estate, financing needs increased mainly in the construction and real estate sector. This economic sector typically has a relatively high ratio of loans to value added, which meant that loans to the sector became a driving force behind the upswing in lending. On the supply side, it is noted that banks once again eased their lending policies in recent years, an action they attributed primarily to tight competition in the banking sector.

An additional role was played by the Eurosystem's non-standard monetary policy measures introduced from 2014, which had a positive impact on loan dynamics over and above their purely interest rate-lowering effect. Empirical analyses conducted by the Bundesbank on the basis of bank-level data indicate that banks in Germany which participated in targeted longer-term refinancing operations and the expanded asset purchase programme reported higher growth in loans to enterprises between 2014 and 2019 than banks which did not participate. Moreover, survey data suggest that the negative deposit facility rate in and of itself did make for lower net interest income among banks, but has not yet led to any constraints on their lending.

The microeconometric analyses, which model only partial effects of the non-standard measures, are supplemented by macroeconometric estimations. Here, too, to arrive at a quantitative estimation of the impact of monetary policy on loan growth, a series of assumptions have to be made which have a significant effect on the results. All in all, though, the macroeconomic analyses also show that the unconventional policy measures implemented from 2014 have had a positive overall effect on growth in loans to enterprises in Germany.

Current situation

Prolonged upswing in loans to enterprises in Germany, …

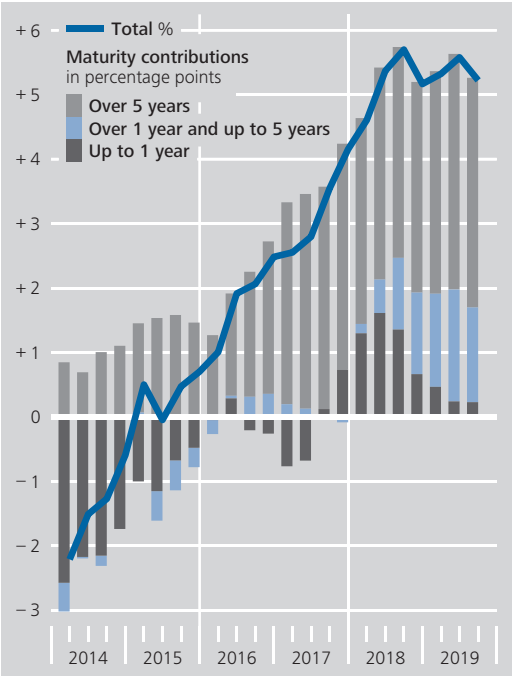
There has been a steep and sustained increase in German banks' loans to non-financial corporations in Germany (also referred to as "loans to enterprises" in the following) over the past few years. The rise began in 2014, after the annual growth rate for loans to enterprises had reached its lowest point of -2½%. In the years that followed, it picked up speed continuously, reaching a temporary high of 5.9% in June 2018. Despite the slowing pace of economic activity in Germany, the annual growth rate for loans to enterprises has since remained at an elevated level. Thus, growth in these loans is still substantial, even now.

… which was broadly based across sectors, categories of bank and maturities

The dynamic expansion in loans was broadly based. Regardless of whether loans to enterprises are broken down by loan maturity, economic sector or category of bank, their respective contributions to loan growth were mostly positive in the past two to three years.

Loans* by German banks to domestic non-financial corporations by maturity**

Year-on-year change, end-of-quarter data, seasonally adjusted



* Adjusted for loan sales and securitisation. ** Non-financial corporations and quasi-corporations.

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When broken down by loan maturity, it is particularly interesting to note the persistent dynamic growth in loans with a maturity of over five years. These often serve to finance longer, usually larger-scale, investment projects (see the adjacent chart). By contrast, short-term loans, which are typically more responsive to the business cycle, increased only moderately or not at all over extended periods. From the perspective of the bank managers questioned in the Bank Lending Survey (BLS), demand for loans among enterprises has risen persistently since 2014.

Loans to enterprises a key variable for monetary policy transmission

Loan growth is interesting from a monetary policy standpoint because bank loans are an important source of external finance. This is particularly true of enterprises in Germany and the euro area, which traditionally raise less funding on the capital markets than firms from English-speaking countries, say. Bank lending to the corporate sector is therefore a key variable in the monetary policy transmission process.

This article describes the upswing in loans to German enterprises, building on previous Bundesbank analyses.[1] It examines the causes of the elevated level of loan growth observed since 2014 and discusses points of note by historical standards.

Loan growth in a cyclical context

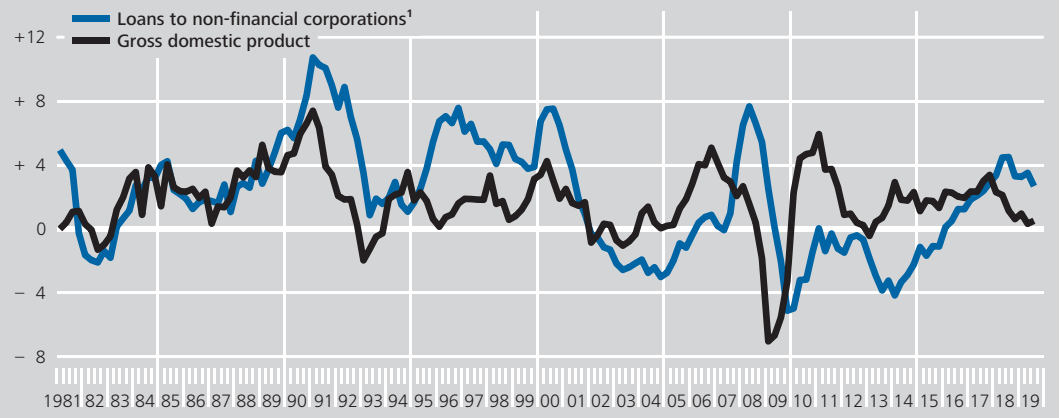
Lending shaped by developments in real sector

Current economic conditions and the outlook for the real economy generally have a material impact on both loan demand and loan supply. For example, in periods of economic recovery, the risks inherent in lending decrease as corporate profitability improves and valuations of loan collateral pick up. As a result, banks are more willing to expand their loan supply. At the same time, enterprises have a greater need for

1 See Deutsche Bundesbank (2015a, 2011, 2009).

GDP growth and loan growth in Germany

Real year-on-year percentage changes, seasonally adjusted



1 Non-financial corporations and quasi-corporations, adjusted for loan sales and securitisation, deflated with the GDP deflator, end-of-quarter data.

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funding to finance ongoing production and make investments during an upturn.

For Germany, too, empirical analyses indicate that the relationship between growth in real loans to non-financial corporations and cyclical developments (measured by growth in real gross domestic product (GDP) or real investment) is close overall and relatively stable over time. For the most part, loan growth lags behind GDP growth by between two and six quarters.[2] This loan lag is commonly explained by the role of internal financing: during an economic upturn, enterprises can cover their financing needs with internally generated funds to begin with, meaning that their demand for loans often comes with something of a delay.[3] During a downturn, on the other hand, they have reduced scope for internal financing, which boosts their need for (short-term) bank funding.[4]

Compared with earlier upswings in lending, …

The above chart plots the development of annual growth rates for real GDP and loans to non-financial corporations since 1981. Loans (normally shown in nominal terms) have been deflated using the GDP deflator to aid comparison. The period under analysis includes several "classic" upswings in lending which essentially demonstrate how real loan growth lags behind growth in real GDP:

– In 1988, growth in loans to enterprises picked up pace owing to the economic upturn in West Germany. German reunification, the reconstruction of the east and dynamic demand for housing construction in the eastern federal states subsequently gave demand for loans new momentum.

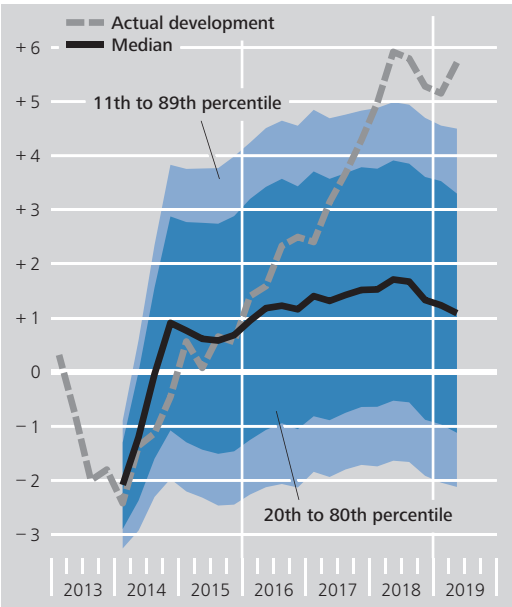
– In 2005 as well, the incipient growth in loans to enterprises tracked the robust economic recovery in Germany. This was shaped by lively investment activity among enterprises. The real estate market did not become overheated during this upturn, however, unlike in other parts of the euro area.

– In early 2010, growth in loans to enterprises accelerated again, roughly three quarters after the turnaround in the real economy. However, this upswing was interrupted shortly afterwards by the negative repercussions of the sovereign debt crisis.

– Resurgent loan growth in 2014 then followed on from the economic recovery that

2 See Deutsche Bundesbank (2015b, 2011). The wavelet analysis in Deutsche Bundesbank (2015b) indicates that the lag in loans to non-financial corporations in Germany lengthened between the end of the 1980s and the mid-2000s.
3 See Deutsche Bundesbank (2011).
4 See European Central Bank (2013).

Conditional forecast of annual growth rate for loans to non-financial corporations*



* Simulated posterior forecast distribution on the basis of the BVAR model. Estimation period: Q2 1996 to Q4 2013. Forecast period: Q1 2014 to Q2 2019. Forecasts based on actual developments in real GDP, the GDP deflator and the lending rate in Germany; level forecasts converted into annual growth rates.
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began in 2013; it continued to pick up pace subsequently.

… the strength and scale of the current upswing are not unusual

The strength and scale of the current upswing in lending is consistent with past episodes. Although the highest annual growth rate for real loans – 4½% in the third quarter of 2018 – was lower than the relevant figures for the 1980s and 1990s, this was proportionate considering that the growth rate for real GDP was also below the peak levels seen in earlier upturns.

But signs that GDP growth was not the only driver of loan growth

The current upswing in loans is unique in that the annual growth rate for loans to enterprises continued to rise even though GDP growth was somewhat weaker for a time. This is different to past episodes, in which both growth rates rose together with a certain lag. The two rates only returned to a parallel upward trajectory once the German economy entered a boom phase in 2017 and early 2018. In addition to this, loans to enterprises were exhibiting a relatively long lag behind economic developments at the end of the period under analysis. While the economic slowdown started in early 2018, loan growth remained elevated for another six quarters, until mid-2019. Thus, the comparison of the two annual rates signals that there were other factors besides economic developments which drove loan growth.

Financing costs another key determinant of loan growth

At this point, it makes sense to consider not only enterprises' financing needs, but also their financing costs, because loan demand is also contingent on movements in lending rates, in particular. Interest rates on loans to enterprises dropped significantly after the global financial crisis began, and also fell distinctly after 2014; this coincided with the increase in loans to enterprises (see the chart on p. 17).

Analysis based on an empirical model …

The box on pp. 18 f. contains a more detailed analysis of how loan growth from 2014 onwards can be assessed relative to business cycle dynamics and interest rate movements. The "normal" interactions between dynamics in loans to non-financial corporations, the business cycle and lending rates are captured by an estimated empirical model, which approximates the dynamic interaction between these and other macroeconomic variables. The model contains nominal loans and the associated lending rate, as well as real GDP and its deflator for Germany and for the rest of the euro area, plus a set of financial market variables, including an indicator for monetary policy.[5] Using the model, simulations of loans are calculated conditional on the actual business cycle and lending rates, and compared with the developments that were actually observed. The model is estimated for the period from the second quarter of 1996 to the fourth quarter of 2013; the starting point for the simulations is the first quarter of 2014. In the simulations, real GDP, the GDP deflator and the lending rate for loans to enterprises in Germany are kept at the actually observed values, whereas the loans

5 A more detailed description of the model can be found in the box on pp. 18 f.

and other variables change endogenously according to the model, under this assumption.

… indicates markedly elevated level of loan growth relative to business cycle and lending rate

Comparing the actual rate of loan growth with the simulated distribution allows for an assessment at any point in time of whether the observed level of loan growth is noteworthy relative to the historical correlations with GDP, the GDP deflator and the lending rate. As shown by the chart on p. 16, the actual rate of loan growth (grey line) rises more rapidly than the median of the simulations (black line) and moves into the upper range of the simulated probability distribution. From the fourth quarter of 2017, the actual rate of loan growth is greater than the simulated growth rate, with a probability ratio of at least 4:1.[6] This means that growth in loans to non-financial corporations was substantially elevated at the end of the period under analysis, compared with the usual patterns before 2014.

This result rests on a series of assumptions, such as the estimation period chosen and the starting point for the simulations (see the box on pp. 18 f.). But all things considered, the analysis suggests that loan growth in Germany over the past few years was more dynamic than can be explained by the estimated correlations with GDP and movements in prices and lending rates.

Loan demand

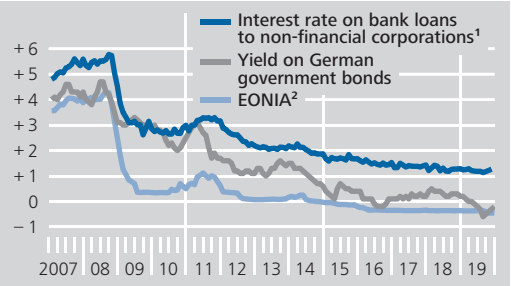
This then raises the question of what might be driving this loan growth, which is especially dynamic by historical standards. Potential explanations are provided by the following compilation of more granular loan data as well as information from the BLS, the financial accounts and economic data.

BLS evidence that supply and demand-side factors are at play

Observed lending is the outcome of the interplay between supply and demand. Thus, the upward deviation from the usual pattern of loan growth described above may, on the one hand, be the result of unusually brisk loan demand. On the other hand, it may reflect a historically notable easing of lending policies. Indications of particularly significant supply or demand-side factors can be found in the BLS. Its results suggest that both forces had a discernibly positive impact over the past few years.

Selected interest rates in Germany and the euro area

% p.a., monthly averages



1 Loans granted by banks in Germany to non-financial corporations and quasi-corporations in the euro area. New loans, according to harmonised MFI interest rate statistics. Interest rate aggregated across volumes and maturities. **2** Unsecured overnight rate on the interbank money market in the euro area. From 1 October 2019, EONIA calculated as €STR + 8.5 basis points.

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Low interest rate environment

Ongoing increase in loan demand due to low interest rate setting …

Where the demand side is concerned, the bank managers surveyed for the BLS have perceived a persistent increase in demand for loans among enterprises since 2014 (see the above chart on p. 20). One of the key reasons for this, according to their responses, was the low general level of interest rates. This is a broad term, which does not just cover the bank lending rate incorporated into the empirical model described above. Rather, it can be regarded as synonymous with the exceptionally favourable financing costs of enterprises, particularly in the past few years. Money market rates and capital market rates fell across the board, reaching historically low levels. In short-term and low-risk segments, especially, some inter-

6 This results from the 80th percentile being exceeded, meaning that more than 80% of the simulated growth rates are smaller, and fewer than 20% are greater, than the actual rate.

A comparison of lending developments using conditional forecasts from a BVAR model

The acceleration in the growth of loans to non-financial corporations in Germany that has been observed since 2014 raises the question of whether this development lines up with the relationships that have already been observed between lending developments, the business cycle and movements in lending rates.

To analyse this issue, a vector autoregressive (VAR) model with nine variables is employed.[1] This model covers the loans of German monetary financial institutions (MFIs) to domestic non-financial corporations, the average interest rate for these loans, real gross domestic product (GDP) and the GDP deflator for both Germany and the rest of the euro area excluding Germany, and the yields on five-year government bonds in Germany. A shadow short rate (Geiger and Schupp (2018)) is used as an indicator of the Eurosystem's monetary policy and is extended back for the time prior to 1999 with an interest rate on overnight loans in the German interbank market. The five-year US Treasury yield is intended to help control for any potential influences from the US or the global capital market. The model is estimated using quarterly data from the period starting in the second quarter of 1996 and ending in the fourth quarter of 2013, with five lags in the variables. All of the variables except for interest and yield enter the model in log-levels. The estimation is carried out using the Bayesian approach proposed by Giannone, Lenza and Primiceri (2015).[2]

Using the estimated model, forecasts are generated for the variables from the first quarter of 2014 up to the second quarter of 2019, but in these forecasts real GDP, the GDP deflator and the average interest rate for loans to enterprises in Germany are forced to track the values that were actually observed over the forecast period (conditional forecasts).[3] The first two variables are intended to represent business cycle conditions in Germany and lending rates are meant to represent financing costs. To make things clearer, the forecasts for the levels of loans to enterprises are then converted into annual growth rates.

The choice of estimation period and starting point places the focus of the analysis on the period following the bottoming out of the lending growth rate. By comparing the probability distribution of the conditional forecasts of credit growth with the actual growth rate observed, it is possible to assess whether credit growth over the forecast period has noticeably deviated from the empirical relationships in the estimation

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1 The model is based on the multi-country BVAR model found in Deutsche Bundesbank (2015c). Unlike the multi-country model used in that case, which includes variables of the four largest euro area countries, the analysis presented here focuses solely on Germany. The rest of the euro area is only taken into account through aggregate variables.

2 For a description of the estimation approach, see Giannone et al. (2015). The prior distribution is of the Minnesota type, for which the hyperparameters are set in a data-driven manner. In this application, the hyperparameters are fixed at the mode of their posterior distribution, i.e. the estimates ignore the uncertainty about the hyperparameters (see Mandler and Scharnagl (2019a)). Models drawn in the context of the MCMC algorithm where the maximum eigenvalues of the companion matrix exceed 1.01 are discarded.

3 The conditional forecast is computed by means of the state-space representation of the VAR model using the Kalman filter and the Carter-Kohn algorithm. See Bańbura et al. (2015). Whilst all other variables are forecast dynamically using the model equations, they deviate from the unconditional dynamic forecast. The reason for this is that the adjustments required to keep GDP, the GDP deflator and the lending rate on the prescribed path also cause adjustments in the endogenous variables in accordance with the estimated correlation of their residuals with those of the two determining variables, and these adjustments are then carried forward over time through the model dynamics.

period. On the other hand, the analysis does not permit any direct inferences to be made regarding the economic causes of these deviations, as the reduced form of the model has been used for the forecast.[4]

In the chart on p. 16, the grey dashed line represents the actual annual growth rate of loans to non-financial corporations. The black line represents the median of distribution of the conditional forecasts, while the various shaded areas represent the intervals between selected percentiles of the distribution.[5] The wide ranges between the percentiles reflect the considerable estimation uncertainty. While the loan growth rate initially hovers near or below the median of the forecast distribution, it moves closer to the upper edge of the forecast distribution towards the end of the forecasting horizon. At the end of 2017, the actual growth rate exceeds the forecast distribution's 80th percentile, meaning that the probability ratio that the actual growth rate exceeds the forecast is 4:1 or higher. The result is qualitatively robust to the model being expanded to cover alternative external sources of funds for enterprises or gross fixed capital formation and to the use of the alternative shadow short rate following the approach in Wu and Xia (2016).

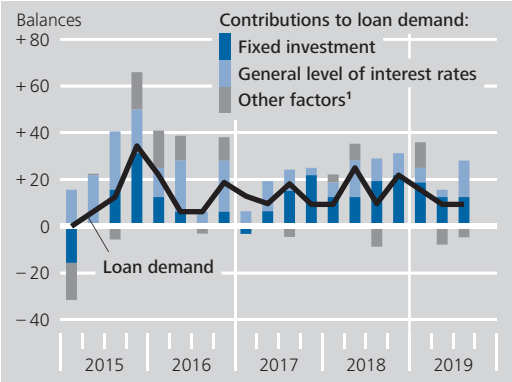
That said, the results are affected by the choice of the forecasts' estimation period and starting point. For example, if the model is only estimated up to the second quarter of 2008, as in Deutsche Bundesbank (2015c), and the forecasts start immediately afterwards, the loan growth rate in the first quarter of 2014 lies in the lower part of the conditional forecasts' distribution. The faster acceleration afterwards could thus be interpreted as a recovery process, at least for a certain period of time. However, over time, the loan growth rate moves into the upper tail of the forecast distribution as in the basic model.

4 The elements of the covariance matrix of the model's residuals are very important in terms of the impact the prescribed paths of the determining variables have on the endogenous variables in the forecast as they determine how these endogenous variables react to an adjustment to the prescribed values of the determining variables. However, the elements of the covariance matrix depend on the average structure of the economic shocks over the estimation period. The covariance matrix depends in part on the relative importance of the various shocks. If this differs markedly in the forecast period compared to the estimation period because, say, economic developments are being driven more strongly by monetary policy while they were dominated in the estimation period by demand shocks, for instance, then the conditional forecast may differ from the actual developments. This problem can be solved by constructing the conditional forecasts with identified shocks. The issue of whether certain structural shocks definitely lend themselves to such an exercise depends on the research question of the analysis. One example of this is the estimation of the effects of the Eurosystem's asset purchase programme (APP) using scenario analyses given in Mandler and Scharnagl (2019b).

5 The distribution is the posterior distribution of the conditional forecasts and reflects the uncertainty about both the coefficients of the model equations and the elements of the covariance matrix of the residuals.

Change in demand* for loans to enterprises and explanatory factors in Germany**

As a percentage of responses given



Sources: Bank Lending Survey and Bundesbank calculations. * Difference between the sum of the percentages of banks responding "increased considerably" and "increased somewhat" and the sum of the percentages of banks responding "decreased somewhat" and "decreased considerably". ** Difference between the sum of the percentages of banks responding "contributed considerably to increasing demand" and "contributed somewhat to increasing demand" and the sum of the percentages of banks responding "contributed somewhat to decreasing demand" and "contributed considerably to decreasing demand". 1 Average of balances for the factors inventories and working capital, mergers/acquisitions and corporate restructuring, debt refinancing/restructuring and renegotiation, internal financing, loans from other banks, loans from non-banks, issuance/redemption of debt securities, and issuance/redemption of equity.

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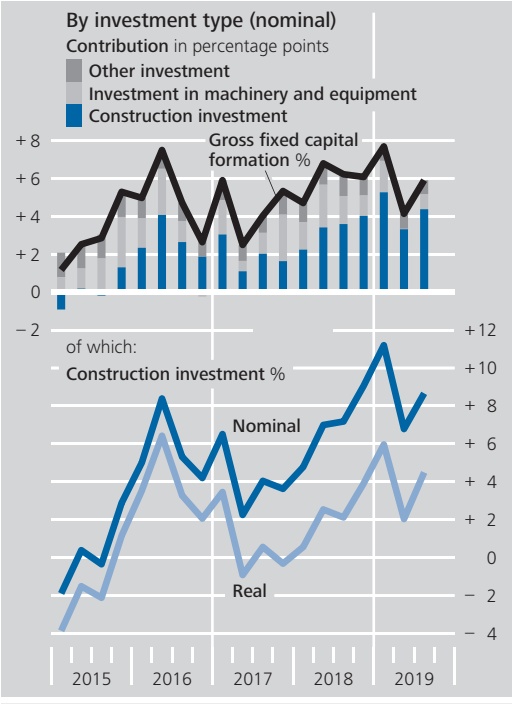
Gross fixed capital formation by the private sector* in Germany

Year-on-year change



Source of unadjusted figures: Federal Statistical Office. * Non-government sectors.

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est rates in Germany have long since reached zero or lower. German banks passed on the decrease in market rates for corporate lending since the onset of the global financial crisis (see the chart on p. 17).[7] This is true of loans with both short and longer interest rate fixation periods. According to BLS data, enterprises responded to this low interest rate environment by increasingly taking up long-term loans and thus securing the very low lending rates into the long term.

Enterprises in the construction and real estate sector

… and greater financing needs for fixed investment

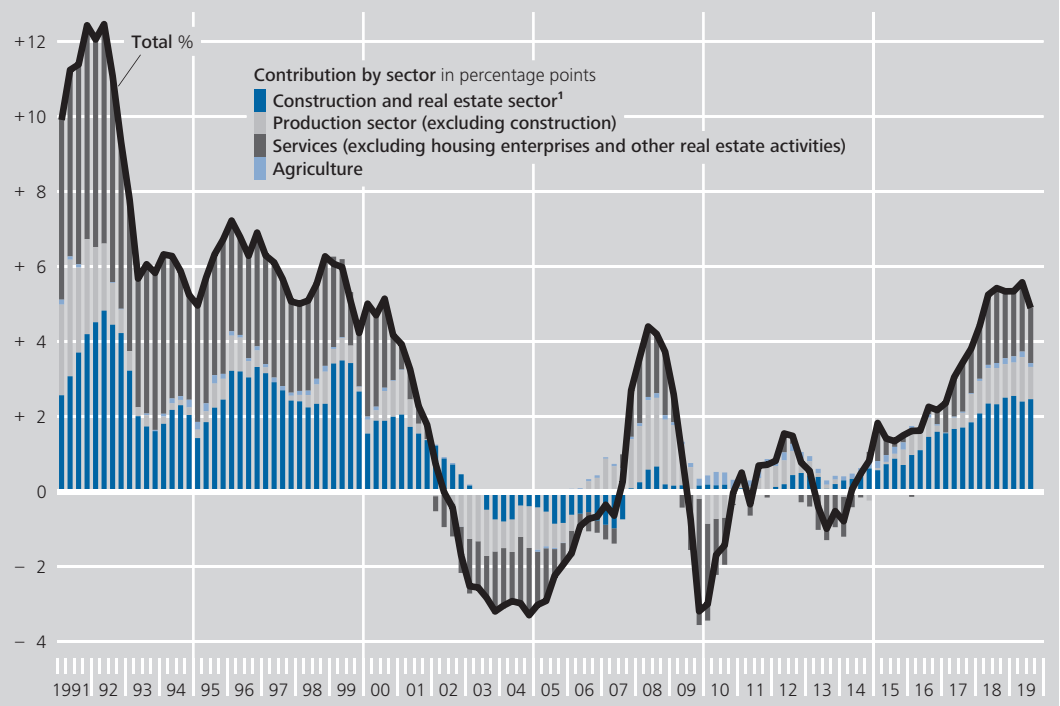
Besides locking in interest rates, the banks surveyed in the BLS also cited the need for funds to finance fixed investment as another key motive for the continued increase in loan demand. However, the perception of investment-driven loan demand is only partially supported by the data on actual private gross fixed capital formation. Nominal gross fixed capital formation in Germany, which is relevant to loan demand, rose steeply at the start of the economic upturn, but the increase progressed at a rather muted pace from there, as compared with previous upturn phases. In particular, investment in machinery and equipment, which forms part of gross fixed capital formation and is mainly conducted by the production sector, grew only moderately. By contrast, construction investment made a weighty contribution to growth from 2016 onwards, which was increasing until the end of the period under analysis (see the lower chart on this page). This investment is predominantly attributable to enterprises belonging to the construction and real estate sector.[8]

The diverging growth trends of the individual types of investment are reflected in data from the borrowers statistics, which are broken

7 See Deutsche Bundesbank (2019c).
8 In this article, the construction and real estate sector refers to the following economic sector: construction, housing enterprises and other real estate activities. The latter two sectors belong to the services sector.

Lending by German banks to domestic non-financial corporations* by sector

Year-on-year change, end-of-quarter levels



***** The data are taken from the borrowers statistics, which, unlike the MFI balance sheet statistics, also assign self-employed persons to the corporate sector (here, excluding financial intermediation and insurance). The borrowers statistics series are not adjusted for loan sales and securitisation. **1** Construction and housing enterprises and other real estate activities.

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Loans to construction and real estate enterprises make up large share of loan growth: …

down by economic sector. These statistics comprise loans to the corporate sector; loans to households for house purchase are largely excluded from these statistics.[9] According to the borrowers statistics, loans to enterprises assigned to the construction and real estate sector have been driving loan growth since 2014 (see the above chart).[10] The contributions to growth made by loans to the non-real estate services sector and to the production sector excluding construction, by contrast, began to increase only later, and to a lesser degree. Whereas those sectors' contributions are already in decline again, loans to construction and real estate enterprises have been moving sideways at an elevated level. At the current end, roughly half of the growth of total corporate lending is accounted for by loans to enterprises in the construction and real estate sector. Loans to real estate services enterprises, and in this case particularly housing enterprises, made especially large contributions to growth.

… a particular feature of the current upswing in loans

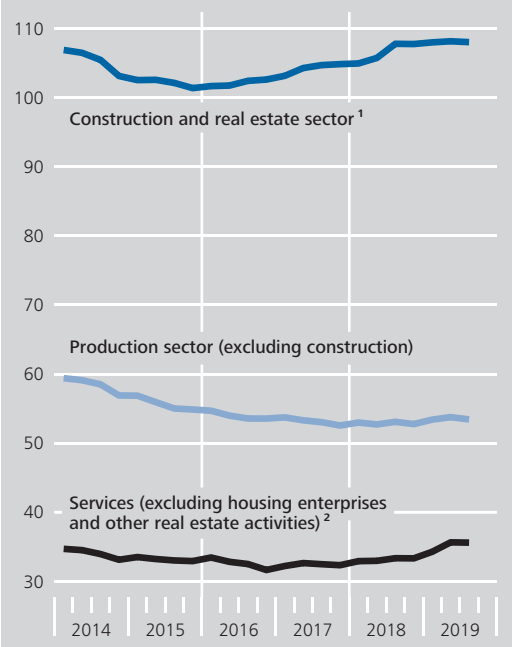
The high share of loans to construction and real estate enterprises in total loan growth is a particular feature of the current upswing in loans. This is illustrated by a comparison with the loan growth observed between 2005 and 2008, a period during which loan growth was largely driven by the non-real estate services sector and the production sector excluding construction (see the above chart). Even during the upswing in loans in the late 1980s and early 1990s, when the reunification-induced

9 Unlike the monthly balance sheet statistics, which are otherwise used in this article, the quarterly borrowers statistics also assign self-employed persons to the corporate sector. In accordance with the monthly balance sheet statistics, loans to these persons only make up roughly one-sixth of all loans to households for house purchase. In the breakdown of the borrowers statistics by sector, loans to self-employed persons cannot be shown separately. However, their housing loans are probably spread broadly across all sectors of the economy. The borrowers statistics series have been adjusted for statistical breaks and purely accounting-related transactions that are not caused by any underlying economic transactions, but not for loan sales and securitisation.

10 A similar argument for Austria is presented in Oesterreichische Nationalbank (2019).

Loan intensity* of selected sectors

%, quarterly data



Sources of unadjusted figures: Deutsche Bundesbank (loans) and Federal Statistical Office (gross value added). * Outstanding loans over the respective sector's gross value added (four-quarter sum). **1** Construction, housing enterprises and other real estate activities. **2** Excluding financial intermediation and insurance.

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construction boom gave fresh momentum to loan demand in Germany, the contribution made by loans to the non-real estate services sector was higher, on the whole.

Upward pressure on prices for construction work and real estate behind elevated financing needs of construction and real estate enterprises

This raises the question as to why financing needs in the construction and real estate sector were so high in the past few years. An increase in real economic activity is only part of the explanation for the uptick in construction investment. A more decisive factor was the continued rise in the prices relevant to construction investment since 2016 (see the lower chart on p. 20).[11] This reflects the boom in the construction sector, which has led to an across-the-board increase in the prices not only of construction work but also of the properties themselves.[12] One of the reasons for the brisk demand for real estate and real estate-related services is the persistent low interest rate setting: as a substitute for low-yielding financial investments, real estate has tended to become increasingly attractive to yield-seeking investors in the past few years.

Accelerated loan growth owing to high loan intensity of construction and real estate sector

The business model of construction and real estate enterprises entails large advance payments for both construction work and the purchase and renovation of existing properties. Coupled with the across-the-board increase in construction and real estate prices, this business model has driven up the sector's demand for funding considerably. Indeed, the construction and real estate sector obtains a relatively large percentage of its funding through bank loans (see the adjacent chart). The share of outstanding loans to construction and real estate enterprises in sector-specific gross value added, at just shy of 110% in the third quarter of 2019, was more than twice as high as the corresponding aggregate ratio for all other non-financial corporations.[13] Loan intensity as measured in this manner has been increasing since 2016, on the whole more strongly than in the other branches of economic activity. This explains the powerful influence of this sector's high credit demand on aggregate corporate lending.

Sector's high loan demand simultaneously also explains relatively long lag following a slowdown in economic activity

The supportive effect of the high loan intensity of the construction and real estate sector on aggregate loan growth is especially evident at the current end. At the aggregate level, the data indicated a relatively long loan lag after the slowdown in economic activity, the primary cause of which was the slump in activity suffered by export-oriented industry. By contrast, even after mid-2018, the domestically oriented sectors provided a boost to economic activity. The relatively strong growth in loans observed in recent times has been driven, then, by a continued boom in construction activity that has kept credit demand buoyant in the loan-intensive construction and real estate sector.

11 In the national accounts, nominal gross fixed capital formation is deflated by the price index for the given category.
12 See Deutsche Bundesbank (2019a and 2019d).
13 For more on loan intensity, see also, for example, European Central Bank (2010).

Enterprises' funding structure

Greater uptake of funding through loans and other external sources in response to reduced scope for internal financing

The relatively strong demand for loans was fuelled not only by shifts between branches of economic activity but also by trend shifts in enterprises' funding structure. One factor at play here is the distinct narrowing of non-financial corporations' scope for internal financing since the beginning of 2016. This development is reflected, above all, in a steady decline in the coverage ratio, which is defined as internal financing (corporate savings plus consumption of fixed capital) over investment. A major reason for this is that compensation of employees rose visibly faster than gross value added amid favourable labour market trends, causing growth of internal financing to lag behind investment growth, which over the years has remained relatively robust. Non-financial corporations responded to this decline in internally generated funds available for forming fixed capital by raising additional external financing – including through bank loans.[14]

Capital levels allow increased funding through debt instruments

Enterprises' funding structure also shifted because debt in external financing increased in importance at the expense of equity instruments. To wit, not only bank loans but other types of debt instruments such as non-bank loans or debt securities have attracted significantly greater inflows over the past few years. There are two factors in particular to which the growth in debt-based funding can be attributed. One is that, from the mid-1990s up until the onset of the global financial and economic crisis, non-financial corporations in Germany were able to extensively restore and grow their capital base, which had been relatively low following the reunification boom.[15] The other is that enterprises withstood the global financial and economic crisis largely unscathed, and the German economy subsequently underwent a long upturn. Both of these factors enhanced the German corporate sector's solvency, enabling enterprises to make greater use of debt instruments, which are typically less expensive than equity funding.[16] In addition, the debt financing costs for loans and debt securities have, on the whole, fallen considerably faster in the past few years than the cost of equity. For these reasons, the relatively strong inflows into bank loans can be regarded as part of a general trend towards debt playing an increasing important role.

Loan supply

The loan supply side likewise provided a significant boost. The expansion of lending was broadly spread out across categories of bank. Lending business at savings banks and cooperative banks, which has traditionally been very stable, supported the across-the-board upswing in corporate loans from 2014 onwards. Yet the categories of bank which were affected more severely by the global financial crisis, especially commercial banks,[17] also saw an increasingly evident rebound in loan growth.

Banks have loosened lending policy in past few years

Not only regarding lending rates but also in terms of lending policy have banks been accommodative to borrowers. According to the BLS, credit standards – the most important measure of bank credit supply policy – have been repeatedly eased in the past few years. Firms' access to bank lending can therefore, on the whole, be regarded as having been largely unimpeded.[18] Banks as a whole listed intensive

14 According to the "pecking order" theory, non-financial corporations first tap into their internal funds to finance investment. Only once these funds have been exhausted do they resort to external funds, especially debt. For a detailed explanation, see Deutsche Bundesbank (2018).
15 See Deutsche Bundesbank (2012).
16 According to the "trade-off theory", enterprises will also use a certain amount of equity financing, which is more expensive than debt financing, as a buffer against insolvency. If the corporate sector's solvency improves, for example because a larger capital buffer has been built up or the economy has improved, an elevated need for funding can be met largely through debt without putting solvency at risk. For a detailed explanation of the "trade-off theory", see Deutsche Bundesbank (2018).
17 This is an umbrella term which subsumes the following categories of bank: large banks, regional and other commercial banks, and the branches of foreign banks.
18 See Marjenko et al. (2019), according to whom ifo credit constraint indicator results continue to point to excellent credit financing conditions for German enterprises. In the past few years, only just over 10% of enterprises cited their banks' lending policy as being restrictive.

competition in the banking sector as by far the most important reason for easing their lending policy. Only recently have the bank managers surveyed for the BLS reported tightening up on their standards again, consistent with a more pessimistic view of the economic outlook.

Intensive interbank competition has contributed to easing of credit supply conditions

The highly competitive nature of the banking sector also needs to be seen in the context of the persistent low interest rate setting. This environment has not only spurred loan demand but also ratcheted up pressure on banks' margins and net interest income, making it another factor alongside the drop in lending rates which has been shaping credit supply policy.[19] In a quest for high-yielding investments, banks have sought to increase their maturity transformation as well as to expand their loan volumes in order to stabilise their earnings. They have been applying aggressive strategies to achieve this objective and to meet as much of the elevated loan demand as possible themselves. Competitive pressure has driven them to be more accommodative to their customers regarding margins or other credit terms and conditions. As a case in point, the banks surveyed for the BLS reported reducing their margins continuously from 2014 to 2018.[20] This behaviour put added pressure on margins and thus created further incentives to "search for yield".

Impact of non-standard monetary policy measures

Growing importance of non-standard monetary policy measures as from 2014

The foregoing considerations suggest that the growth of lending over the past few years above and beyond the known historical patterns has something to do with the persistently low interest rate level, amongst other factors. And that, in turn, is also impacted upon by the Eurosystem's monetary policy. Already in the course of the financial and sovereign debt crisis, the Governing Council of the ECB cut euro area policy rates to historical lows and took a series of unconventional measures. Beginning in 2014, the Governing Council felt compelled to take further action owing to a drop in price pressures and declining inflation expectations.[21] It responded by reducing the interest rate on its main refinancing operations from 0.25% to 0% and launching a series of non-standard monetary policy measures. These notably included the expanded asset purchase programme (APP), targeted longer-term refinancing operations (TLTROs) and the increasing use of forward guidance. In addition, the interest rate on the deposit facility was lowered into negative territory for the first time.

Various transmission channels of monetary policy

These measures were aimed at giving euro area economic activity a fillip and thereby returning inflation sustainably over the medium term to its target. The transmission channels for the individual measures have different focal points, and their interaction occurs over multiple layers.[22] Ultimately, however, all these measures were designed to reduce banks' and enterprises' funding costs, loosen potential funding and capital constraints, create incentives for balance sheet restructuring and thereby promote the granting of loans and other financial resources to the private sector. Hence, the measures were transmitted to lending not only through lending rates but also through various other channels. This could also explain why the empirical model described above, which – in keeping with the estimated historical interrelationships for the period prior to 2014 – is contingent only on lending rates (besides the business cycle), is insufficient and thus fails to capture a number of key developments from the period after 2014.

The semi-annual ad hoc questions asked in the BLS reveal initial insights into the contribution to German banks' lending made by the non-standard monetary policy measures. According

19 This issue is analysed at the level of the euro area in Deutsche Bundesbank (2019c).
20 Reduced margins arise in an environment of falling money and capital market rates when lending rates drop faster than the benchmark money or capital market rate.
21 For an overview of non-standard monetary policy measures, see, for example, European Central Bank (2019a, 2019b, 2017a and 2017b).
22 See, for example, Deutsche Bundesbank (2017b and 2016).

BLS ad hoc questions confirm positive impact of non-standard measures on lending

to the survey results, the TLTROs, in particular, but also the APP had a positive impact on corporate lending volumes. The surveyed banks reported using the extra liquidity provided by these non-standard measures, on the whole, more to increase their loans than to accumulate other financial assets or to replace existing liabilities. Moreover, the BLS provides evidence that the negative deposit facility rate, in isolation, further dampened their already beleaguered net interest income, yet did not lead them to curtail their lending. In fact, as of mid-2018, the surveyed banks appear, if anything, to have expanded the volume of their corporate lending in response to the measure.[23]

Empirical modelling difficult in principle, but …

To gain deeper insights into how the non-standard monetary policy measures have impacted on banks' lending, empirical models are called for. However, a model-based assessment of these effects is no easy task. The fact that the measures took place almost in parallel and not independently of each other makes it more difficult to isolate their respective effects. To address these challenges, it makes sense to use different model approaches to examine the impact of the non-standard measures on lending developments and to explore both the micro and the macro level.

Analyses at the micro level

… inference can be made about the impact of TLTROs and the APP using microeconometric estimations

Analyses on the basis of microdata, i.e. in this case using balance sheet items at the individual bank level, have the advantage over analyses of aggregated data of enabling the examination of average effects over time on the basis of a cross-section comparison. In this case, this means comparing lending by banks which were directly affected by a monetary policy measure, or which participated in it, with lending by the remaining banks. This allows the effects of the individual non-standard measures to be estimated in isolation from each other. However, such analyses can only be carried out if it is possible to differentiate between affected and unaffected banks. It therefore makes sense for analysis to single out the non-standard monetary policy measures that required individual banks to take action in order to participate. This is the case, in particular, for the TLTROs and the APP.

Primary objective of TLTROs is to support banks' ability to lend

TLTROs have been conducted in several tranches since September 2014. They have enabled banks to borrow money from the Eurosystem at favourable interest rates for a period of up to four years. At the same time, in order to give banks a stronger incentive to expand their loan supply accordingly, participation in these operations or the applicable interest rate have been conditional on meeting a benchmark for loan growth.[24] In aggregate terms, take-up of the total funds available under the TLTROs by banks in Germany has been relatively muted as measured against their total assets. This indicates that demand among German banks for additional funding was not especially pronounced overall, not even at attractive financing terms.

Roughly one-third of German banks participated in TLTROs, with take-up relatively broadly spread across categories of bank

The data fed into the analysis presented in the box on pp. 26 ff. were mainly sourced from the bank-level data in the monthly balance sheet statistics. These figures reveal that around one-third of banks in Germany have taken part in the TLTROs offered by the Eurosystem (see the table on p. 30). Take-up was spread relatively broadly across categories of bank. Measured in terms of the number of banks taking part in the TLTROs, savings banks and credit cooperatives participated the most. The amounts they borrowed were on the low side overall and spread relatively evenly across individual institutions. The commercial banks participating in the

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23 Consistent with this, Klein (2020) finds, on the basis of bank-level data, that the reduced net interest margin in the negative interest rate environment did not, ceteris paribus, cause euro area banks to constrain their lending.

24 In the case of TLTRO I, banks that failed to meet their lending benchmark had to repay the funds they borrowed early, and in the case of TLTROs II and III, meeting the relevant benchmark leads to a lower interest rate for the central bank loan. Further information on TLTROs I, II and III can be found in the ECB's press releases under the following link: https://www.ecb.europa.eu/mopo/implement/omo/tltro/html/index.en.html

The effects of non-standard monetary policy measures on German banks' lending to non-financial corporations[1]

It is rather difficult to separate, on the basis of aggregated data, the contributions of individual non-standard measures – especially the targeted longer-term refinancing operations (TLTROs) and the asset purchase programme (APP) – towards the recovery of loan growth in Germany and the euro area, which began in 2014. The impact of the non-standard measures is likely to have occurred at the same time, resulting in an overlap. It is therefore difficult to distinguish between the effects of the individual measures by looking at the time dimension alone. However, using microdata, i.e. information on balance sheet items at the level of the individual bank, makes it possible to analyse average effects based on a cross-sectional comparison. To this end, loans granted by banks participating in or directly affected by a measure are compared with the loans granted by all other banks. If the affected banks' loan growth differs from that of the control group, this is an indicator of the measure's effectiveness. For the German banking sector, microdata are available in the form of a total sample of the MFI balance sheet statistics and the MFI profit and loss statistics.

In the microeconometric literature, participation in a measure is referred to as "treatment" (in line with how the term is used in medicine) and modelled using a binary variable with the values one (for treatment) and zero (for non-treatment). While it is clear from the refinancing volumes taken up at the Bundesbank whether a bank participated in a TLTRO, a bank's treatment status with respect to the APP needs to be approximated. For the purpose of this analysis, we use a bank's net selling position[2] on the government bond market. A bank is considered to be "participating" in the APP if it has reduced its net holdings of government bonds to a large extent between January 2015 and May 2019.[3] Below, to sharpen identification of a bank's treatment status, we only consider a bank to be participating in either the TLTRO or the APP if its refinancing volume or sales volume exceeds the TLTRO median volume or net sales volume in the case of government bonds (always in relation to the bank's total assets).[4]

To rule out differences in loan growth rates between treated banks and non-treated banks caused by factors other than participation in the programme, the estimation takes into account a number of bank characteristics besides treatment which may also have had an impact on the bank's loan

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1 This box is based on a study by Offermanns and Blaes (2020). For a similar analysis on bank lending in the euro area, see Blaes et al. (2019).

2 Owing to the lack of available transaction data at the bank level, net changes are approximated through changes in stocks. Bonds issued by euro area governments are purchased (under certain conditions) in the quantitatively most important sub-programme of the APP, the public sector purchase programme (PSPP), and thus represent a sufficiently good approximation of the APP's impact.

3 Reductions in government bond holdings in a bank's portfolio may occur for various reasons. Besides bond sales, redemptions of the nominal amount upon maturity will also push down holdings. If the amount is not reinvested, it can be argued that this value, too, can be attributed to the APP (see Tischer (2018)). Moreover, valuation adjustments may occur in the remaining bond holdings, provided that these are entered in the balance sheet at current market prices. However, such an effect – especially one that would have led to lower valuations of government bonds over the APP horizon, causing the treatment definition to become distorted – is of little significance to banks domiciled in Germany.

4 Sensitivity analyses show that the estimated effects are not qualitatively dependent on the exact definition of this threshold value. A higher threshold value does, however, also increase the probability that a change in stocks (of government bond holdings) was, in fact, caused by net sales or redemptions (without reinvestment) above and beyond the usual volume over the observation horizon.

Treatment effects of non-standard monetary policy measures on lending by German banks*

Institutions	TLTRO			APP			N (total)
	PS	EB	N	PS	EB	N	
All banks	0.269*** (0.0596)	0.264*** (0.0597)	231	0.258** (0.109)	0.296*** (0.113)	267	1,398
Savings banks and credit cooperatives	0.219*** (0.0367)	0.226*** (0.0381)	206	0.0282 (0.0660)	0.0442 (0.0692)	194	1,244
Commercial banks	1.443*** (0.503)	0.593 (0.368)	17	2.039** (0.799)	1.789** (0.772)	46	94

* Explanation: Estimated coefficients of participation in the specified programme (treatment) in the equation of the average growth rate of loans to non-financial corporations in the euro area in the period from September 2014 to May 2019 using weighted least squares regressions (second stage). Alternative results from two estimation variants are shown, with the weights in variant PS stemming from propensity score estimations and those in variant EB from the entropy balance procedure (first stage). The brackets contain the standard error of the coefficient estimator (excluding estimation uncertainty from the first stage). ** (***) indicates that the estimated value is different from zero at the 5% (1%) significance level. N denotes the number of banks.

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growth.[5] Such characteristics include the size of the bank (measured as the logarithm of total assets) and the shares of overall securitised lending, loans to non-financial corporations, deposits from the non-financial private sector and deposits from other enterprises and public sector entities in total assets. In addition, several measures from banks' income statements are taken into account: return on equity before tax, allowances on loans, net interest income and staff costs. Furthermore, the treatment of the measure not being analysed at the time (i.e. participation in the APP when the TLTRO effect is being estimated and vice versa) is factored into the equation. The aim of taking bank characteristics into consideration is to identify the effects of banks' actual participation in the measure as opposed to other influences – including those that led them to participate. The impact estimated in this way covers both the direct and indirect effects of a measure on lending inasmuch as they are relevant to the participant bank.

To verify the reliability of the results, we use two different estimation procedures: first, the propensity score (PS) estimation and second, the entropy balance (EB) procedure.[6] The table above depicts the estimated effects of the two non-standard measures in question based on both variants. After statistical adjustment of the dataset for missing observations, this analysis uses monthly data on 1,398 banks domiciled in

5 This is performed using the regression-adjusted matching approach (see Heckman et al. (1997)). For details on the estimation procedure, see Offermanns and Blaes (2020) as well as Blaes et al. (2019).

6 The PS approach explains a bank's treatment status by using a probit function of the bank characteristics. A comparison of the probabilities of treatment projected by the model (known as the "propensity score") then provides information on which banks in the control group (i.e. the banks not participating in a measure) resemble any one bank in the treatment group in terms of key bank characteristics. The subsequent weighting of individual banks in the control group is performed on the basis of how often a bank in the control group is deemed to be similar to a bank in the treatment group (see Rosenbaum and Rubin (1983)). The alternative EB procedure does not specify a (linear) model for the treatment status and directly determines the share a bank in the control group requires when forming a weighted sample mean across all banks in the control group in order for this mean value to be as close as possible to the sample mean of the treatment group (see Hainmueller (2012)). The advantage of this procedure over the PS method is that it balances not only the one-dimensional treatment status criterion between the two groups of banks but also all bank characteristics in question using a multidimensional approach. Ultimately, both methods are designed to ensure that the weighted sample mean values of the bank characteristics are as balanced as possible between the treatment group and the control group; this is known as covariate balancing.

Germany from January 2008 to May 2019 as a starting point.

The results suggest that the banks concerned reacted to both the TLTRO and the APP by expanding their lending to non-financial corporations.[7] The estimated coefficients imply that, on average over the evaluation period, the monthly loan growth rate of a bank participating in the TLTRO is 0.26 to 0.27 percentage point higher than that of a non-participant bank with otherwise the same characteristics. The difference for the APP is within a similar range, i.e. between 0.26 and 0.30 percentage point.[8]

The identified effects differ between the analysed groups of banks. The group consisting of savings banks and credit cooperatives, which have a similar business model and occupy a leading position in the market in the field of loans to enterprises (measured by market share), exhibits a TLTRO-induced difference in the point estimate of the loan growth rate of around 0.22 percentage point and is significantly different from zero, whereas the APP-induced effect for this group is close to zero. On the other hand, the estimation suggests that the group consisting of commercial banks,[9] which have a different business model and refinancing structure to that of savings banks and credit cooperatives but likewise occupy a strong market position in the credit segment in question, reacted more strongly to the APP stimulus. The corresponding evidence on the effects of the TLTRO is mixed for this group of banks, which is why caution is warranted when interpreting these effects.

From a qualitative perspective, it can be concluded from this comparison that savings banks and credit cooperatives responded more strongly to the TLTRO than to the APP by increasing the volume of loans granted, whereas the APP contributed more decisively to commercial banks expanding their lending activity.

Another interesting insight regarding heterogeneity in the banking sector is illustrated in the chart on p. 29. It shows the effects of the TLTRO and the APP on German banks' lending to non-financial corporations over time. The effects are shown through differences in the average growth rates of loans to non-financial corporations granted by banks participating in the TLTRO and the APP and a control group of banks not participating in the respective measure.[10] According to the chart, the TLTRO exerted a positive impact on participant banks' average loan growth rates from the

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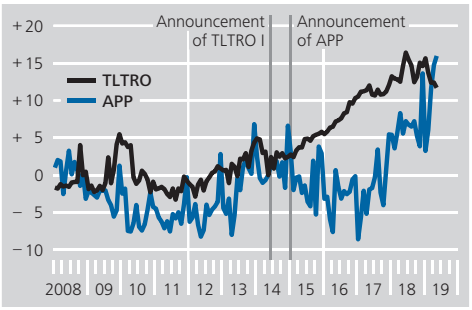
7 The results shown in the table on p. 27 remain qualitatively unchanged if, instead of lending to non-financial corporations in the euro area, the focus lies on lending to non-financial corporations domiciled in Germany.
8 The estimated effects do not change if the estimation additionally incorporates the banks' excess reserves, which have increased substantially over time. Given that these excess reserves were remunerated at negative interest rates in the treatment period, they represent one aspect – in a cross-sectional comparison of banks – of the negative interest rate policy put in place simultaneously with the quantitative non-standard measures (see also Demiralp et al. (2017)). The robustness of the depicted estimation results to the inclusion of excess reserves thus suggests that these are not attributable to any effects emanating from the negative interest rate policy.
9 The remaining 60 banks exhibit a high level of heterogeneity, making it impossible to draw conclusions on the specifics of this group. The number of observations required for the estimation is insufficient for a further decomposition into homogeneous sub-groups.
10 The average growth rates of the non-participant banks are calculated as a weighted mean, with the weights being derived from the first stage of the estimation outlined above. The aim of weighting the group of non-participating banks is to be able to compare this group of banks with the treatment group; the difference in the average credit growth rates can therefore be put down to participation in the relevant measure. To facilitate better interpretation, the calculated difference in the average growth rates is cumulated over time and normalised to zero in May 2014, i.e. the last month before the first TLTRO was announced. The vertical lines highlight the months of June 2014 (announcement of TLTRO I) and January 2015 (announcement that the existing purchase programmes would be expanded).

start, while the APP's positive influence on lending only became apparent with a certain time lag. If we take into account the estimation result which shows that the estimated positive APP effect is mainly attributable to commercial banks increasing their lending, it appears that – besides the difference in the primary monetary policy objective – the identified differences in the individual measures' impact intensity are also linked to the heterogeneity among banks. This result supports the finding for the euro area reported in the literature that a number of banks initially used the funds from the APP to clean up their balance sheets in order to increase their lending in the future.[11] It is also largely consistent with BLS data, which indicate that the expansionary stimulus of the APP – unlike in the case of the TLTRO – was only transmitted to higher lending volumes among the surveyed banks with a certain time lag.

Effects of TLTRO and APP on lending by German banks (treatment effects)*

Percentage points



Source: Results based on Offermanns and Blaes (2020). * Difference between average monthly credit growth rates among banks participating (treated) and not participating (non-treated) in the measures; normalised to zero in May 2014 and cumulated across the entire period.

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11 See Blaes et al. (2019).

TLTROs showed far greater variation in the amounts they borrowed.

TLRTOs impact positively on lending, …

The results of the microdata estimation presented in the box on p. 26 ff. suggest that, on average between 2014 and 2019, a bank in Germany participating in the TLTROs registered a higher growth rate in its loans to enterprises than a non-participating institution, all other things being equal. In addition, the results indicate that the positive impact could mainly be traced back to the expansion of lending by savings banks and credit cooperatives. These two categories of bank run fairly similar business models. In corporate banking, they traditionally cater primarily for small and medium-sized enterprises in their region; taken together, they are therefore a market leader (measured by market share) in the field of loans to enterprises.

Overall, these results are largely in line with the available microdata evidence for the euro area as a whole. Afonso and Sousa-Leite (2019), Laine (2019) and Andreeva and García-Posada (2019), in particular, find that the TLTROs have mostly positive effects on bank lending in the euro area.[25] The results presented in the box on pp. 26 ff. support the theory that the measure also buoyed loan developments in a country with less pronounced funding shortages in the banking system.

… which chimes with the microdata evidence for the euro area

While the TLTROs were designed to keep financing conditions favourable for banks as a way of supporting the flow of credit to the private

25 The first studies on the effects of non-standard monetary policy in the euro area focused on the longer-term refinancing operations (LTROs) with a three-year maturity conducted in December 2011 for the first time (and again in February 2012). The aim of these operations was to support the normalisation process and the functioning of the euro money market following the financial crisis. The LTROs were found to have positive effects on bank lending by, amongst others, García-Posada and Marchetti (2016) for Spain, Carpinelli and Crosignani (2017) for Italy, Boeckx et al. (2017) for the euro area and Andrade et al. (2019) for France, while Bednarek et al. (2018) find that there are no quantitative effects for Germany.

Participation of German banks in selected non-standard monetary policy measures of the Eurosystem

Item	Savings banks and credit cooperatives	Commercial banks	Other banks	All banks
TLTRO take-up				
Number of banks				
Total observations	1,247	101	69	1,417
of which: participated in TLTROs[1]	420	23	25	468
Share (%)				
of observations in the given banking category	34	23	36	33
of total volume of TLTROs	26	49	25	100
of the total assets of participating banks in the given banking category	1.8	2.0	1.0	1.5
of total assets in the given banking category	0.7	1.0	0.4	0.7
Reduction in government bond holdings as an indication of APP participation				
Number of banks				
Total observations	1,247	101	69	1,417
of which: government bond holdings reduced[2]	433	67	48	548
Share (%)				
of observations in the given banking category	35	66	70	39
of the total amount of the reduction in holdings	7	36	58	100
of the total assets of banks in the given banking category that reduced their government bond holdings	0.03	0.07	0.06	0.07
of total assets in the given banking category	0.01	0.04	0.06	0.05

Source: Bank-level data from MFI balance sheet statistics. **1** Number of banks which participated in TLTROs in the period from September 2014 to May 2019. **2** Number of banks which reduced their government bond holdings on balance in the period from January 2015 to May 2019.

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APP an instrument for a broad-based further loosening of monetary policy stance

non-financial sector, the APP was the prime instrument for a broad-based further loosening of the monetary policy stance from 2015 to 2018.[26] In contrast to conventional interest rate policy, the APP's primary transmission channels were via price and yield adjustments to individual asset classes and via the flattening of the yield curve.[27]

Participation of German banks in APP high when measured in terms of the reduction in their government bond holdings, …

The estimations presented on pp. 26 ff. use changes in banks' securities-based lending to general government in the euro area as a proxy for their participation in the APP. A proxy variable is needed because of the lack of microdata on direct sales of securities to the Eurosystem. A bank is considered to have "participated" in the APP if, according to the monthly balance sheet statistics, it made sizeable reductions to its holdings of government bonds between January 2015 and May 2019.

Looking at the microdata of banks in Germany, overall just under 40% of banks reduced their holdings of government bonds in this period (see the above table). Commercial banks accounted for a relatively large share of the reduction in holdings, which was distributed relatively evenly across institutions of this category of bank. Savings banks and cooperative banks, by contrast, were responsible for a relatively small share of the reduction overall, at just under 7%. German banks reduced their government bond holdings fairly substantially overall compared to banks in other euro area countries.

… but distribution across categories of bank uneven

APP impacts positively on lending, …

The estimations in the table on p. 27 indicate that banks participating in the APP expanded their lending to non-financial corporations to a greater extent than non-participating banks. The effects triggered by the monetary policy measure are unevenly spread across the individual categories of bank, just as they are with

26 See European Central Bank (2014, 2015).
27 See Deutsche Bundesbank (2016).

the TLTROs. In this case, the APP contributed to an expansion in lending primarily at commercial banks. One likely reason for this is that these banks had relatively large government bond holdings prior to the start of the APP, which meant they benefited disproportionately from the APP. The estimated APP effects on savings banks and credit cooperatives are insignificant, by contrast. The relatively small reduction in these institutions' government bond holdings are consistent with this observation.

… which is in line with microdata literature for Germany and the euro area

Overall, these results fit in with the microdata studies on APP effects that are already available for Germany. For example, Tischer (2018) and Paludkiewicz (2018) show that banks domiciled in Germany which saw the yield-reducing effects of the APP crimp returns on their securities portfolios stepped up their lending to the private non-financial sector or to non-banks significantly. At the same time, the results presented in the box on pp. 26 ff. support the existing body of evidence for the euro area. For example, Albertazzi et al. (2018) and Altavilla et al. (2018) find that loans to the private non-financial sector or non-financial corporations grew at a higher rate at banks in the euro area that participated in the APP than it did at banks that did not. However, Blaes et al. (2019) only identify this effect in the euro area for financially sound banks, which leads them to conclude that heterogeneity among banks needs to be taken into account when evaluating monetary policy.

Microeconometric analyses qualitatively consistent with macroeconometric estimations

Taken together, the microdata analyses presented above indicate that both the TLTROs and the APP had a positive impact, on average, on lending among participating banks. While these estimates computed using microeconometric approaches have to be interpreted as representing only partial effects of the individual measures on banks' lending behaviour, they nonetheless provide a nuanced picture of the effects of the individual non-standard monetary policy measures, making them a very useful source of additional information alongside macroeconomic analyses.

Analyses at the macro level

Model-based decomposition of forecast error as of 2014 into contributions of macroeconomic shocks

The comparison presented in the first part of this article (see pp. 18 f.) between the actual rate of loan growth and a forecast conditional on the business cycle and the lending rate does not allow any direct conclusions to be drawn about what contribution has been made by monetary policy and other macroeconomic factors to the unexpectedly high growth in loans to enterprises in recent years.[28]

In order to examine this question, the model needs to be expanded to include the identification of macroeconomic shocks. The fundamental idea lies in decomposing the deviations of the observed developments from a forecast into the contributions of these shocks. In this context, a shock is an exogenous change to an economic determinant, i.e. a change that cannot be explained from within the model. Unlike in the analysis on pp. 18 f., a simple dynamic forecast is taken as the baseline, which means it is not conditional on the development of certain variables (real GDP, the GDP deflator and the lending rate). This is because the prescribed path of these variables in the conditional forecast can already contain part of the effects of the shocks that are to be identified. As already explained above, (standard and non-standard) monetary policy can affect loan growth through various transmission channels. The assumptions for the identification of the monetary policy shock therefore need to be kept sufficiently general.

The analysis described in more detail on pp. 32 ff. makes a distinction between aggregate supply and demand shocks, credit supply shocks and monetary policy shocks. A "shadow short rate"

28 The conditional forecasts presented on pp. 18 f. are made via the coefficients and the covariance matrix of the reduced form of the model, without the identification of shocks being required. The economic shocks identified in the following model can be contained in both the conditional forecast and the deviation of the conditional forecast from the actual development. The conditions of the forecast are enforced with a mixture of all possible structural shocks that are in line with the conditioning information (Bańbura et al. (2015), pp. 744 ff.).

Contributions of macroeconomic shocks to the forecast error for loan growth from 2014

The following analysis decomposes the forecast error for loan growth from the first quarter of 2014 into the contributions of interpretable macroeconomic shocks. On the basis of information available as from the end of 2013, the analysis shows how an observer would have assessed the role of these shocks in explaining the forecast errors occurring from 2014.

The analysis builds on the BVAR model for Germany described on pp. 18 f. Concerning the monetary policy reaction function, it is important that the model also contains real gross domestic product (GDP) and the GDP deflator for the euro area excluding Germany in addition to the German variables. If these variables were excluded, it would be assumed that Eurosystem monetary policy reacted only to the German variables or that the development of the variables relevant to monetary policy in Germany was representative of that in the euro area as a whole. However, economic developments in Germany differed considerably from those in the other Member States in the early 2000s and during the financial and sovereign debt crises and their aftermaths. If the variables for the rest of the euro area are excluded, the monetary policy reaction function of the Eurosystem contained in the model may possibly be incorrectly specified, which would lead to an erroneous assessment of the monetary policy shocks.[1]

As described earlier, the monetary policy stance is measured using the shadow short rate proposed by Geiger and Schupp (2018). It is calculated from the yield curve and represents the notional short-term interest rate which would materialise in the absence of an effective lower bound on interest rates. This makes it possible to also take account of the impact of monetary policy measures at or close to the effective lower bound which are not or not completely reflected in changes to the short-term interest rate.[2] The use of the shadow short rate thus allows standard and non-standard monetary policy to be jointly modelled. This is, however, under the assumption that the macroeconomic effects of a monetary policy-induced change in the shadow short rate on the model variables are independent of the specific monetary policy measure which induced the change.[3] Moreover, the shadow short rate is a less accurate indicator of the monetary policy stance than, say, a short-term interbank interest rate given standard monetary policy since it is also influenced by changes in the yield curve that were not caused by the Eurosystem's monetary policy. This inaccuracy increases the uncertainty associated with the estimation.

Sign restrictions are used to identify the economic shocks.[4] They make assumptions about the direction of the immediate responses of the variables to the shocks. The assumptions used largely follow those in Mandler and Scharnagl (2019a). A total of four shocks are identified: an aggregate demand shock, an aggregate supply shock or

1 See also Mandler and Scharnagl (2019a).
2 For more information, see, for example, Deutsche Bundesbank (2017a).
3 For an empirical study of this assumption for the United States, see Francis et al. (2014).
4 These shocks are identified using the algorithm of Arias et al. (2019).

inflation shock, a loan supply shock and a monetary policy shock.[5]

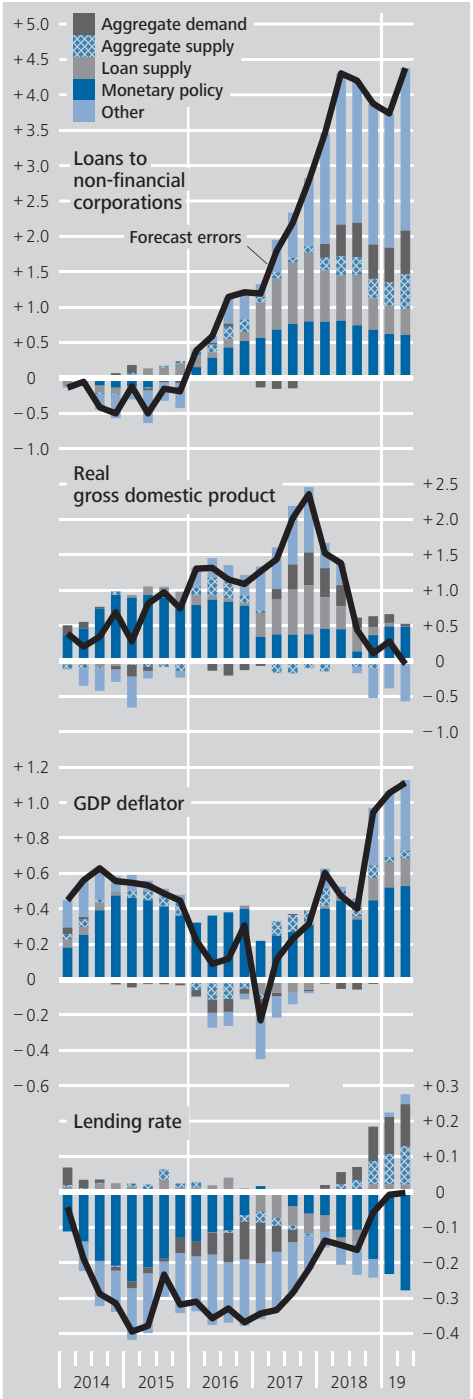
A dynamic forecast of the model variables starting in the first quarter of 2014 is used as a baseline for the shock decomposition. This forecast is not conditional on the observed values of one or more variables, since the realised values of the determining variables already show the result of economic shocks.

The forecast errors, i.e. the gaps between the dynamic (unconditional) forecast and the realised values of the variables, are then decomposed into the contributions of the identified shocks and the unidentified residual shocks. The deviations of the realised values from the forecast can, alongside the effect of temporary shocks, also be the result of changes in the model coefficients, i.e. represent structural breaks or gradual changes in the coefficients. For this reason, the term "shocks" will be placed in inverted commas below.

The adjacent chart shows the results of the decomposition of the forecast errors for the annual growth rates of loans to non-financial corporations, of GDP and of the

Decomposition of forecast errors into contributions of economic shocks*

Percentage points



* Contributions of economic shocks to the deviation of the actual development of the respective variables from an unconditional forecast, as derived from a structural BVAR model with sign restrictions. Estimation period: Q2 1996 to Q4 2013. Forecast period: Q1 2014 to Q2 2019. For each shock, the median of the posterior distribution of its contribution is shown. The category "Other" captures the contributions of the non-identified shocks. Results for real GDP, the GDP deflator and loans refer to the decomposition of the forecast error for the annual growth rates.

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5 For an interpretation of the loan supply shock, see Mandler and Scharnagl (2019a). The aggregate demand shock causes German GDP and the GDP deflator, the shadow short rate and the German government bond yield to rise. The supply shock causes German GDP to drop, and the German price level, the shadow short rate and the German government bond yield to rise. A loan supply shock has a positive effect on German GDP, the loan volume and the shadow short rate, while the lending rate falls. For a discussion of these restrictions, particularly the absence of a restriction on the price level response, see Mandler and Scharnagl (2019a) as well as Deutsche Bundesbank (2015d). The monetary policy shock leads to an increase in the shadow short rate and the German government bond yield, while GDP and the price level in Germany and in the rest of the euro area decrease. In addition, it is assumed that the contemporaneous coefficients of both gross domestic products and price levels are positive in the structural monetary policy reaction function. All sign restrictions apply contemporaneously.

GDP deflator, and for the lending rate. For this purpose, the results for the levels of the first three variables were converted into growth rates.[6]

The bars show the median of the contribution of the respective "shock" to the forecast error. The outermost light blue bar represents the contributions of the unidentified "shocks".[7] The black line is the sum of the bars.

The results show positive contributions of "monetary policy shocks" to the growth of GDP, the GDP deflator and loans, as well as negative contributions to the lending rate. While only the median of the posterior distribution of the contributions is shown in the chart, the entire distribution of the contributions of the "shocks" must be examined to assess the weight of the statistical evidence. A simple metric useful for this is the ratio between the probabilities of a positive and of a negative contribution of the "monetary policy shock" to loan growth that can be calculated based on the simulated probability distribution. This ratio exceeds a value of 2:1 from the fourth quarter of 2016. It is more pronounced for the growth rate of real GDP, for which it exceeds a value of 3:1 from 2014 up to and including 2016. For the growth rate of the GDP deflator, the results show positive stimuli provided by monetary policy over the entire forecast period. The delayed positive contributions to loan growth as compared with real GDP reflect the known lag of loans behind GDP.

According to the estimation, "loan supply shocks" associated with an increase in the loan volume, a decline in the lending rate and a rise in real GDP were major drivers of loan growth in 2017 and 2018.[8] Of the two other identified shocks, the model attributes only "aggregate demand shocks" with a certain role in explaining the increasing loan growth at the end of the forecast period. However, a probability ratio of 2:1 for a positive contribution of this shock is not provided by the model until the second quarter of 2019. Consistent with the lag of loans behind real GDP, the positive contribution of the "demand shocks" to GDP growth is evident at an earlier point in time.

Only roughly half of the comparatively large deviation of the rate of loan growth from the unconditional model forecast at the end of the forecast period is explained by the identified "shocks". This could mean that other, not explicitly identified shocks were relatively important for loan growth or that there is a structural change in the loan equation in comparison with the estimation period and the deviations caused by this do not fit the pattern of one of the specified shocks.[9]

The continued positive contributions of "monetary policy shocks" to real GDP, the price level and loans suggest a structural change in the monetary policy reaction function in comparison with the estimation period. This is supported by the posterior distribution of the "structural monetary policy shocks" extracted from the model (not shown here) for the period from 2014 on-

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6 In this context, the forecast errors contain only effects of "shocks" from the starting point of the analysis. The effects of shocks from the past are part of the baseline by way of the starting conditions of the forecast.
7 To be precise, it constitutes the sum of the medians of the five unidentified shocks.
8 For this period, the above-mentioned probability ratio for a positive contribution to loan growth is at least 2:1.
9 If one estimates the model until the second quarter of 2019 and then carries out the above-described decomposition of the (ex post) forecast error, the extent of the forecast error is reduced at the current end as expected; however, the identified shocks still explain only roughly half of the forecast error. This sensitivity analysis therefore tends to point more strongly to the first of the two explanations mentioned above.

wards, which is primarily in negative, i.e. expansionary, territory. According to the model, the Eurosystem's monetary policy stance as measured using the shadow short rate was, on average, more expansionary after 2014 than would have been expected based on the monetary policy reaction function estimated over the period before. However, when viewed in isolation, this does not necessarily mean that the monetary policy stance was excessively expansionary. A number of analyses use structural macroeconomic models and an effective zero lower bound for the policy rate to argue that the central bank should pursue a more expansionary monetary policy at or close to the effective zero lower bound than their "normal" monetary policy reaction function would imply.[10]

The model results depend upon a number of assumptions, including identification assumptions regarding the shocks' characteristics, the estimation period and the starting point of the forecast. The selection of the shadow short rate also has an impact, with various models existing for its estimation, which result in sometimes considerably divergent time series for the shadow short rate.[11] For example, using the shadow short rate proposed by Wu and Xia (2016) leads to somewhat larger contributions of "monetary policy shocks" to loan growth.

10 Nakata (2017) shows in a New Keynesian model that an increase in uncertainty surrounding macroeconomic shocks at or close to the zero lower bound leads to a decline in inflation and output growth. This is because of the asymmetry, resulting from the zero lower bound, in the central bank's capacity to counteract expansionary or restrictive shocks. In the analysis by Basu and Bundick (2015), approaching the zero lower bound and the resulting reduced capacity of the central bank to counteract future negative shocks lead to an endogenous increase in uncertainty that has a contractionary effect. They recommend that the central bank therefore keeps the monetary policy rates low for longer than would be the case in its normal reaction function. See also Evans et al. (2015). Certain risks of a highly expansionary monetary policy stance, e.g. to financial stability, are not explicitly analysed in these models. Existing work on these risks has frequently been of a partial-analytical nature, meaning that their quantitative significance is difficult to gauge.
11 Examples of differing calculation methods are: Geiger and Schupp (2018); Krippner (2013); Lemke and Vladu (2017); as well as Wu and Xia (2016).

is used in the model as an indicator for monetary policy. It serves as a composite indicator for the monetary policy stance and is responsive to both standard and non-standard monetary policy measures, provided these have effects on the yield curve.[29]

Unconditional model forecast is the baseline

The chart on p. 33 contains the results of the analysis for the annual growth rates of loans to non-financial corporations and real GDP. The starting point for the forecast is, as previously, the first quarter of 2014. The analysis shows, on the basis of information available at the end of 2013, how an observer would assess the role played by the various macroeconomic shocks in explaining the forecast errors occurring as of 2014. The median of the contributions of the respective shocks to the forecast error is shown in each case by the different coloured bars.

Deviations of shadow short rate from estimated relationship impact positively on real GDP and loans

The charts show that the monetary policy shocks made quantitatively substantial contributions to the growth in real GDP, particularly over the period 2014 to 2016.[30] The expansionary contributions of monetary policy shocks feed through to loan growth with a certain delay, which is likely to reflect the usual lag of loans behind real activity.[31] Looking at the probability distribution of the contribution of monetary policy shocks to loan growth, there is a probability ratio of at least 2:1 for a positive contribution as of the end of 2016.

Aggregate demand shocks and credit supply shocks also have positive impact

Positive contributions to loan growth were also made by aggregate demand shocks and credit supply shocks. However, the effect of aggregate demand shocks appears only as of 2018 and reflects the lagged effect of the shocks that had a positive impact on real GDP growth in 2017. Credit supply shocks, which cover a broad spectrum of shocks in the financial sector affecting the loan supply, play a role in 2017 and 2018. Overall, the contributions of the four shocks identified here explain roughly half of the forecast error at the current end. The rest of the forecast error is caused by other shocks that are not explicitly identified or may indicate a structural change in the loan equation.

However, analysis only covers monetary policy measures with an impact on the shadow short rate

The fact that the indicator for the monetary policy stance used in the model only responds to monetary policy measures to the extent that they have an impact on the yield curve is important for the results. Monetary policy instruments such as the APP, forward guidance or changes to policy rates do influence the shape of the yield curve and are consequently reflected in changes in the shadow short rate. For the TLTROs, however, a correlation with the yield curve is less clear-cut: if they did not have the effect of lowering the shadow short rate, their effect could have fed into the credit supply shocks or into the unidentified shocks rather than the monetary policy shocks.

In addition, there are various approaches to calculating the shadow short rate, each yielding different paths for the variable.[32] The results of the analysis consequently depend not only on the sample period and the starting point of the forecast, but also on the shadow short rate used.

Counterfactual analysis allows an assessment of the impact of the systematic monetary policy response, …

Overall, this macroeconomic analysis suggests that monetary policy made a moderate contribution to the deviation of loan growth from the model relationships valid prior to 2014, as seen from a 2013 perspective. However, the estimated effects of the monetary policy shocks shown in the chart on p. 33 only include the impact of deviations from the estimated monetary policy reaction function; in other words, they take no account of the effects of monet-

29 For more information, see, for example, Deutsche Bundesbank (2017a). Regarding the use of the shadow short rate as a composite indicator for standard and non-standard monetary policy, see, for example, Francis et al. (2014) and Mouabbi and Sahuc (2019).
30 As explained on p. 33, the "shocks" can also be caused by changes in the model structure between the estimation period and forecast period, i.e. structural breaks or gradual changes in the model parameters. The forecast errors this causes are interpreted by the model as the result of "shocks". For a further discussion see the box on pp. 32 ff.
31 For corresponding empirical results, see, for example, Deutsche Bundesbank (2015b) and Scharnagl and Mandler (2019).
32 Examples are Geiger and Schupp (2018); Lemke and Vladu (2017); Krippner (2013); as well as Wu and Xia (2016).

Example of a counterfactual analysis to estimate the overall effect of non-standard monetary policy measures on credit growth

The analysis on pp. 32 ff. shows the effects of the identified monetary policy shocks on credit growth. These shocks can be interpreted as deviations by the shadow short rate from the monetary policy reaction function. The reaction function describes how the shadow short rate responds to the current and lagged values of the other variables. It represents the systematic part of monetary policy, while the shocks constitute the unsystematic part. One way of examining the impact of systematic monetary policy on credit growth is to simulate a model-based counterfactual scenario positing a different systematic monetary policy which can then be compared with the actual developments observed in reality.

The highly simplified illustrative example presented here builds on the Bayesian VAR model (see pp. 32 ff.) The model is estimated up to the second quarter of 2019. The four macroeconomic shocks mentioned earlier are again identified by means of sign restrictions.[1] The simulation of the counterfactual scenario begins in the second quarter of 2014, that is to say prior to the measures adopted by the Governing Council of the ECB at its 5 June 2014 meeting.[2] From then on, dynamic simulations incorporating a lower bound for the shadow short rate are computed up to the second quarter of 2019. This lower bound is set equal to the shadow short rate at the close of the first quarter of 2014 minus 25 basis points. The 25 basis points are intended to capture the scope for conventional interest rate cuts which still existed at that time.[3] The simulation also includes all of the macroeconomic (identified and unidentified) shocks estimated for the simulation period with the exception of the monetary policy shock, which is factored out.

In this way, the counterfactual scenario is designed to model a fictitious macroeconomic development: the historic macroeconomic shocks impact on the economy while monetary policy is constrained by the effective lower bound on interest rates and no non-standard measures (beyond those already adopted up to that point) are deployed. No account is taken of the fact that alternative policy regimes would entail different model coefficients as expectations are adjusted accordingly (the "Lucas critique").[4]

In technical terms, implementing the simulation involves calculating a one-step forecast for each quarter on the basis of the initial conditions or simulated values for the preceding period. This forecast is then adjusted for the effects of the shocks estimated for the quarter in question. If this results in a shadow short rate below the specified lower bound, the shadow short rate is brought up to the lower bound by means of a restrictive monetary policy shock.[5] This also induces changes in the val-

1 The estimation now runs over the entire period from the second quarter of 1996 to the second quarter of 2019 since the purpose of the analysis is an ex post evaluation of the unconventional monetary policy.
2 These consisted of a further cut to the policy rates, TLTROs, preparations for further ABS purchases and the extension of full allotment for refinancing operations.
3 The interest rate on the main refinancing operations was 0.25% from November 2013.
4 See Lucas (1976).
5 It is assumed here that all non-standard monetary policy measures are reflected in the shadow short rate. Baumeister and Benati (2013) and Mandler and Sharnagl (2019b) employ monetary policy shocks to prevent the policy rate reacting to the expansionary effect of a central bank's asset purchase programme.

ues of the other variables. If, however, the simulated value for the shadow short rate is higher than or equal to the lower bound, no further adjustment is made. This procedure yields a hypothetical probability distribution for all the variables of the model at every point in the simulation period.

The simulated values for the level of loans are then converted into annual growth rates and compared with the annual growth rates actually observed. The difference between the growth rate observed in reality and the simulated growth rate represents an estimate for the effect of the actual monetary policy, that is to say, the estimated reaction function and the monetary policy shocks compared with the alternative scenario in which no further non-standard monetary policy measures were deployed. In the example presented here, we obtain the biggest median effect in 2018, amounting to 1.8%.[6] There is a high degree of uncertainty attached to this estimation. The 16th percentile of the estimated effect stands at -0.2% and the 84th percentile lies at 5%.

The analysis presented here is of a primarily illustrative nature. The results depend upon a number of assumptions, including (but not limited to) the shadow short rate selected, the lower bound defined, the way the lower bound is implemented in the simulations with the aid of monetary policy shocks, and modelling in the form of a vector autoregression. Applying the shadow short rate of Wu and Xia (2016) yields larger effects, for example.

Implementing the effective lower bound on interest rates using monetary policy shocks assumes that the lower bound always becomes binding for economic agents unexpectedly. However, after a major contractionary shock that takes the economy to the lower bound, the economic agents in the counterfactual scenario should, for a certain period of time, anticipate that the central bank cannot supply any further expansionary impulses.

Furthermore, the simple time series model does not incorporate any explicit modelling of expectation channels. The adjustment of expectations to a lower bound that is binding over several periods could, for instance, contribute to a further decline in output and prices. Conversely, however, the expectation that the economy will return to its balanced path of growth and inflation in the long term – i.e. once the effect of all shocks has worn off – should have a stabilising effect.

6 The estimate of Mandler and Scharnagl (2019b) puts the effect of the asset purchase programme on the growth of Germany's contribution to lending to enterprises in 2018 at 1.3%.

ary policy's endogenous, systematic response to the state of the economy.

… although this naturally involves a high degree of uncertainty

The overall effect of monetary policy measures, including their systematic components, can only be estimated with the help of counterfactual simulations, which describe how the economy would have developed had these measures not been taken. The results of such an analysis, which assumes an alternative scenario for monetary policy, are naturally associated with a high degree of uncertainty and depend on a large number of modelling decisions and assumptions regarding the alternative scenario. A simple illustrative example based on the assumption of a lower bound for the shadow short rate is described on pp. 37 f. According to this application, the contribution that the non-standard monetary policy measures made to loan growth was largest in mid-2018, at just under 2 percentage points; the uncertainty interval was between 5 and -0.2 percentage points.[33] In line with the analyses on pp. 26 ff., the example shows that non-standard monetary policy had a positive effect on loan developments in Germany, but also underscores the associated high estimation uncertainty.

Conclusion

Upswing in loans not solely the result of robust economy and low lending rates: …

The broad-based and steep upswing in German banks' loans to non-financial corporations in Germany from 2014 onwards can be explained only in part by the ongoing recovery of the German economy and the reduced costs of credit financing. Another key factor was the Eurosystem's non-standard monetary policy measures introduced from 2014, which had a positive impact on loan dynamics over and above the pure effect of lowering interest rates. There are, moreover, a number of other influences on the supply of and demand for credit that are partially related to monetary policy.

… it is also due to sectoral shifts, …

On the demand side, it is striking that the expansion in lending was driven more by construction and real estate enterprises, which are typically more loan-intensive than enterprises in other sectors, than was the case in earlier credit booms. These enterprises needed more funds as a result of lively construction activity and rising prices for construction work and real estate in recent years.

… a change in funding structure, …

Other demand aspects include shifts in enterprises' funding structure, including reduced scope for internal financing and better capital levels at enterprises. These factors drove up their demand for external finance and consequently also for loans.

… an easing of lending policies and …

On the credit supply side, repeated easing of banks' lending policies represented positive stimuli. This easing was related to intense competition in the banking sector, which in turn must be seen against the backdrop of the ongoing low interest rate environment and ratcheted up pressure on banks' margins and net interest income.

… the effects of the non-standard monetary policy measures

Empirical studies at the micro and macro level lend credence to the impression gained from all these factors that the Eurosystem's non-standard monetary policy overall had a positive effect on developments in loans to enterprises in Germany. Macroeconomic analyses, for instance, indicate that the positive overall effect of the measures carried out as of 2014 goes beyond the isolated effect of lower lending rates and the improved economic situation. An analysis based on bank-level data suggests that both the TLTROs and the APP resulted in participating banks experiencing a higher growth rate for corporate loans on average in 2014 to 2019 than non-participating banks, all other things being equal.

Very lively growth in lending in Germany is of interest from a monetary policy perspective, because bank loans represent an important

33 Mandler and Scharnagl (2019b) estimate, using counterfactual simulations, that the APP contributed some 1.3 percentage points to growth in the German contribution to corporate loans in 2018 (median of the posterior distribution) with similar uncertainty bands.

Upswing in loans could be associated with risks that financial stability policy would have to address

source of funding, making lending a significant variable within the monetary policy transmission process. Besides the finding that the non-standard monetary policy measures conducted since 2014 had a positive impact on lending, the question consequently also arises as to what risks could potentially result. In recent years, cyclical systemic risks have increasingly built up in the German financial system.[34] The Eurosystem is observing these risks from a monetary policy perspective, alongside other aspects. It is, however, up to macroprudential policy to deploy its toolkit in response to these risks. This is one of the reasons why the Federal Financial Supervisory Authority activated the countercyclical capital buffer for the first time in mid-2019.

34 For more details, see Deutsche Bundesbank (2019b).

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