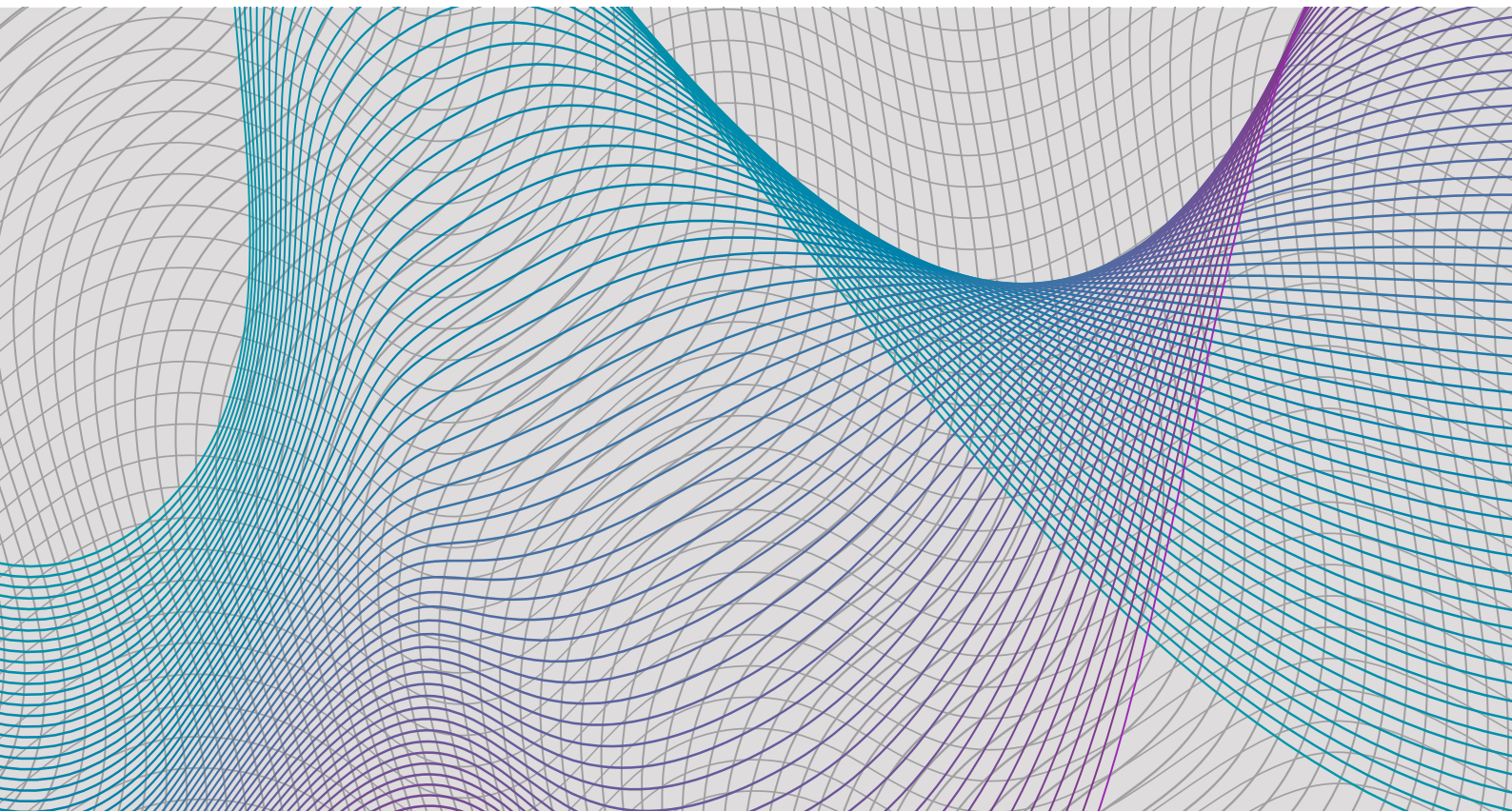




Financial Stability Review 2017



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Abbreviations and symbols

p	Provisional
e	Estimated
.	Data unknown, not to be published or not meaningful
–	Nil

Discrepancies in the totals are due to rounding.

Introduction

In terms of monetary stability, there is an inherent interest in ensuring a stable financial system. As an integral part of the European System of Central Banks, the Bundesbank has the task of contributing to the stability of the financial system.

The Bundesbank's shared responsibility for safeguarding financial stability stems, above all, from its involvement in macroprudential oversight. The Bundesbank President is a member of the European Systemic Risk Board (ESRB), which is responsible for macroprudential oversight at the European level. Bundesbank representatives also sit on the German Financial Stability Committee (*Ausschuss für Finanzstabilität*, or AFS), which discusses matters related to the stability of the financial system, based on Bundesbank analyses. When faced with threats that may harm financial stability, the Committee can issue warnings and recommendations. Moreover, the Bundesbank helps to maintain financial stability through its involvement in banking supervision and its role in operating and overseeing payment systems.

The Bundesbank defines financial stability as a state in which the key macroeconomic functions, ie the allocation of financial resources and risks as well as the settlement of payment transactions, are performed efficiently – particularly in the face of unforeseen events, in stress situations and during periods of structural adjustment. Unlike microprudential supervision and regulation, which aim to ensure the stability of individual institutions, the macroprudential perspective focuses on the stability of the financial system as a whole. Systemic risks arise when the distress of one or more market par-

ticipants jeopardises the functioning of the entire system. This can occur when the distressed market player is very large or closely interlinked with other market actors. But systemic risk may also arise when a plurality of small market participants are exposed to similar risks. Interconnectedness in the financial system may be a channel through which unexpected adverse developments are transmitted to the financial system as whole, ultimately impairing its stability. Market participants may be connected with each other through a direct contractual relationship – banks, for instance, as a result of mutual claims in the interbank market. Additionally, indirect channels of contagion may exist. This may be the case, for example, if market participants conduct similar transactions and investors interpret negative developments with one market player as a signal that other market actors, too, are adversely affected.

The ongoing analysis of the stability situation aims to identify relevant changes and risks in Germany's financial system as early as possible. This includes taking account of feedback effects within the global financial system, interdependencies between the financial sector and the real economy, and the repercussions of the regulatory framework. Also taken into consideration is the build-up of macroeconomic and financial imbalances, ie developments that are not consistent with the economic fundamentals. These harbour the risk of abrupt corrections and may increase the financial system's vulnerability to negative shocks.

Account has been taken of developments up to the cut-off date of 24 November 2017.

Overview

The German economy has grown for the eighth year in succession following the severe recession of 2009. The global economic outlook has also continued to brighten on the whole of late – unlike in previous years, the International Monetary Fund (IMF) has recently revised its growth forecast upwards. Steady improvements in the economic situation in the euro area and expectations that consumer prices will carry on rising in the medium term are nudging interest rates upwards again.

In this positive economic climate, the financing terms for enterprises and households in Germany are still very favourable. Banks currently estimate credit risk to be low. Market uncertainty has eased over the course of the year; volatility is low.

However, over the long period of low interest rates, risks have built up in the German financial system:

Over the long period of low interest rates, risks have built up in the German financial system.

the valuations of many investments are extremely high, and the share of low-interest assets on balance sheets has risen steadily. In such a situation, market participants are vulnerable to unforeseen negative macroeconomic developments.

In the current economic environment, there is a risk that market participants, lulled into a false sense of security, might form overly positive expectations and they might turn a blind eye to exactly

Market participants, lulled into a false sense of security, might form overly positive expectations.

those macroeconomic scenarios that could lead to

high losses. In an environment of low uncertainty, there is a risk of unexpectedly negative developments hitting market participants hard (see the section “Risks could be underestimated” in the chapter entitled “Risk situation of the German financial system” on pages 41 to 61).

With low interest rates, the main risk is that market participants’ debt sustainability will be overestimated. Lower interest rates make higher debt levels look sustainable, at least temporarily. As a result, there is a growing incentive to run up more debt or to defer deleveraging. If things take a turn for the worse – an unexpected economic downturn occurs, for instance – banks may see their credit risk rise. And banks might not have a sufficient buffer to cushion this blow as they have significantly cut their risk provisioning for credit risk over the previous years in light of the positive economic situation.

It is thus imperative that the currently favourable economic situation and low level of volatility in the financial markets do not obscure the fact that there are risks to the stability of the German financial system and that these could grow. Risks to financial stability could equally emerge from an abrupt rise in interest rates or from a protracted period of low interest rates.

Risks to financial stability could equally emerge from an abrupt rise in interest rates or from a protracted period of low interest rates.

There is a danger that risks from the revaluation of assets, interest rate risk and credit risk could occur simultaneously and reinforce each other (for information on the factors behind the macroeconomic scenarios, see the chapter entitled “The international environment” on pages 17 to 37).

Risks to the stability of the German financial system

Macroprudential surveillance focuses on the stability of the entire financial system. Risks to financial stability can arise, in particular, if market participants take excessive risks and do not give due consideration to the possibility that any distress that they may encounter can endanger the stability of the financial system as a whole. The way in which shocks are transmitted in the financial system is determined, not least, by the structure of this system.

Interconnectedness and structure are key for the transfer of risk

Interconnectedness within the banking system has changed since the global financial crisis. In the current environment where the Eurosystem provides ample liquidity, German banks have reduced their mutual claims in the inter-bank market. Direct contagion risk within the banking sector has tended to decline as a result. Furthermore, German banks have considerably cut back their foreign business since the global financial crisis.

German banks have reduced their mutual claims in the inter-bank market.

German insurers have scaled back their claims on the banking sector. Instead, they have invested more of their assets via investment funds. The associated shift within the intermediation chain has increased the importance of investment funds in the German financial system. At the same time, risks have migrated away from banks' balance sheets towards insurers.

Risks have migrated away from banks' balance sheets towards insurers.

In addition to interconnectedness within a financial system, the way in which individual market participants respond to shocks is also key for financial stability. If investment strategies are similar, a change in the environment could mean that responses are mutually reinforcing within the system and thus generate new vulnerabilities for the financial system. This would be the case, for instance, if many market participants are exposed to macroeconomic risks in a similar way.

Contractual arrangements of financial products are a major determinant of who bears risk in an economy. To date, life insurers, for instance, have given households fixed guaranteed returns and thus assumed investment risk in full. In the current phase of low interest rates, they are faced with the challenge of generating sufficient income for reinvestment. Many life insurers have introduced a more flexible model of guaranteed returns in new contracts. This means that, in the future, investment risk will be borne to a greater degree by policyholders – in other words, it will shift from the insurance sector to the household sector. However, insurers will still have to bear the risk arising from legacy contracts.

Investment risk will shift from the insurance sector to the household sector.

German banks usually agree long interest rate lock-in periods with their borrowers. During this period, banks bear the interest rate risk, after which it is passed on to the borrower, in case the interest rate is renegotiated. If the contractual parties underestimate the likelihood and the extent of a future interest rate rise, these contractual arrangements may pose a risk. As it happens, banks are currently tending to extend interest rate lock-in periods and, as a result, interest rate risk

Interest rate risk will increasingly shift from the household sector to the banking sector.

will increasingly shift from the household sector to the banking sector. Just how well the banking system can absorb these risks depends primarily on the banks' capital adequacy.

High interest rate risk

While it is true that the positive economic situation is helping to slowly push up the interest rate level again, the impact of an abrupt rise in interest rates or of a protracted period of low interest rates on financial stability must also be taken into consideration.

These scenarios may affect the various parties in the financial system to varying degrees. Banks typically grant long-term loans and fund these from short-term deposits. Life insurers, by contrast, have long-term liabilities in the form of guaranteed returns to their policyholders. The interest rate lock-in periods for their asset holdings tend to be shorter than for their liabilities. A further factor that is key for the stability of the financial system is whether risks that arise affect individual sectors and market participants in similar or different ways.

If positive economic developments continue in Germany and interest rates rise gradually, this should reinforce the stability of the German financial system. As a rule, life

If interest rates rise gradually, this should reinforce the stability of the German financial system.

insurers and pension institutions benefit from rising interest rates. The contractually stipulated guaranteed returns – which are, on average, above the current market interest rates (and sometimes by quite a margin) – could then be earned more easily. Banks' interest margins are likely to recover if interest rates stay out of negative territory.

On the other hand, if interest rates rise abruptly – that is, unexpectedly quickly and sharply – this could hit the German financial system hard. Vulnerabilities to such a scenario have increased in the German financial system in recent years.

For instance, German banks have distinctly expanded maturity transformation over the past few years; the interest rate lock-in periods for assets are significantly longer than those for liabilities. All in all, this results in higher interest rate risk in the banking system as a whole. This is because, in the short term, rising interest rates generally cause interest expenditure to outpace interest-based income components.

Expanded maturity transformation results in higher interest rate risk in the banking system as a whole.

Furthermore, an interest rate rise would also generate present value losses, which would cause the economic value of equity and thus the bank's resilience to fall (see the chapter entitled "Risks in the banking sector" on pages 63 to 81).

But it is not just banks that might be affected – an abrupt rise in interest rates could have a negative impact on life insurers, too, in the short term. Fixed surrender values give policyholders an incentive to lapse their policies if interest rates exceed given – enterprise-specific – critical levels.

Moreover, the risks described are not independent; they can be mutually reinforcing in the financial system. As valuations in many segments of the financial market are high, the risks associated with an abrupt revaluation of assets have also grown. An abrupt

Risks can be mutually reinforcing in the financial system.

interest rate hike in response to higher risk premiums, say, would thus be accompanied by significant price corrections and cause losses for market participants.

The alternative scenario of persistently low interest rates also harbours risk. Low interest rates at the zero lower bound give banks an incentive to take

The scenario of persistently low interest rates also harbours risk.

Banks could expand their maturity transformation even further, which would push interest rate risk higher still. This may also bring about higher credit risk.

If interest rates remain low, risk would rise in the insurance sector, too. Life insurers have long-term liabilities to their policyholders and much shorter-term asset holdings. This duration gap means that the entire sector is exposed to interest rate risk. During the term of a savings product, the asset holdings in question often need to be reinvested several times. In times of low interest rates, it is increasingly difficult for life insurers and pension institutions to honour the commitments from guaranteed returns (which are sometimes rather high) from their asset holdings (see the chapter entitled “Risks for insurers, pension institutions and investment funds” on pages 83 to 101).

Credit risk and interest rate risk can occur simultaneously

Germany is currently ahead of the rest of the euro area in terms of the economic cycle. A rise

A rise in interest rates could coincide with the economy in Germany taking an unexpected turn for the worse.

risk on German banks’ balance sheets and risk from

greater risk to stabilise profits as banks are limited in the extent to which they can pass negative interest rates on to depositors.

abrupt revaluations in the financial markets would then coincide with higher credit risk.

If all these risks were to materialise at the same time, it might not be possible to sufficiently absorb the corresponding losses.

In such a situation, resilience would take a further blow as banks have reduced risk provisioning to very low

Resilience would take a further blow as banks have reduced risk provisioning.

levels, mainly on account of the positive economic situation in which credit risk is estimated to be low.

Risk of unsustainable valuations and lending in the residential real estate market

The real estate market in Germany is of major importance to the economy as a whole, with lending for house purchase accounting for over two-thirds of household debt. More than half of all loans granted by German banks to German households and non-financial corporations are housing loans.

Experience in other countries has shown that if a real estate bubble accompanied by a strong accumulation of household debt bursts, the subsequent correction process may entail significant economic and social costs. In

order to identify and combat the potential build-up of systemic risk, the housing sector is subject to close

The housing sector is subject to close macroprudential supervision in Germany.

macroprudential supervision in Germany. Risks to financial stability can develop, in particular, from a situation in which property prices rise sharply on the back of expansionary lending and easing credit standards.

The sustained price surge in the German housing market largely reflects the fact that demand for

housing remains high relative to supply. It is being supported, among other things, by households' positive income prospects and the favourable funding conditions. However, Bundesbank model calcu-

Bundesbank model calculations point to overvaluations, especially in urban areas.

lations point to overvaluations in a number of regions, especially in urban areas. The overvaluations are calculated relative to an estimated underlying property price that is based on economic fundamentals such as income, interest rates and demographic factors. According to this, housing in 127 German towns and cities was overvalued by between 15% and 30% in 2016, after a figure of between 10% and 20% in 2015.

Compared with the increase in prices, growth in loans for house purchase is less dynamic. Moreover, the existing data do not suggest that credit standards have been eased noticeably. Overall, the risks stemming from housing loans are still relatively low, and the available information does not point to immediate risks to financial stability.

Overall, the risks stemming from housing loans are still relatively low.

However, there is a risk that lending activity in the real estate markets will prove unsustainable in the event of an increase in interest rates or a turnaround in price dynamics. Among other things, this would cause existing loan collateral to lose value. Overvaluations in the housing markets can pose a particular threat to financial stability whenever market participants systematically underestimate these types of risk when granting loans for house purchase and form overly positive expectations of future developments in debt sustainability (for more information about the German residential real estate market, see the relevant section in the chapter enti-

led "Risk situation of the German financial system" on pages 48 to 61).

■ Need for macroprudential action

Further strengthen resilience

Financial institutions must hold sufficient capital to cover the risks they take. Moreover, adequate capitalisation is essential to ensure that banks can perform their function in the financial system properly – ie lending to productive businesses, for example, and thus ultimately helping to promote economic growth.

Adequate capitalisation is essential to ensure that banks can perform their function in the financial system properly.

Especially given that the currently favourable macroeconomic environment could undergo a reversal, market participants should further strengthen their resilience and ensure that their funding models are sustainable. Owing to the prolonged period of sound economic development in Germany, the perception of risk might be too positive in many quarters at present. When making decisions, market participants should therefore give adequate consideration to precisely those scenarios that could lead to large losses.

Market participants should ensure that their funding models are sustainable.

Action is also needed when it comes to the regulation of systemically important financial institutions (SIFIs). Since the financial crisis, not only have global SIFIs had to meet additional macroprudential capital requirements, but so have other systemically important institutions (O-SIFIs), which are only systemically important to the German or European financial sys-

tem. At a conceptual level, the amount of these add-ons is measured according to the systemic risk posed by the particular institution. The add-ons are currently limited to a maximum of 2% of risk-weighted assets for O-SIIs. However, the use of this instrument has shown that the maximum possible add-ons are not

The ceiling for the O-SII buffer should be scrapped or at least raised.

sufficient in some EU member states. These countries therefore use the less targeted systemic risk buffer to impose higher add-ons, which they justify on the grounds that they would not otherwise be able to sufficiently cover the systemic risks arising from their O-SIIs. The ceiling for the O-SII buffer should therefore be scrapped or at least raised (see the section “Harmonisation of capital buffers for systemic institutions in Europe desirable” in the chapter entitled “Risks in the banking sector” on page 69).

It is also worth examining whether the regulations for measuring minimum capital ratios can be adjusted, particularly for the O-SIIs. For instance, the risk weights used to calculate the minimum capital ratios may underestimate systemic risk. Ultimately, this would mean that systemic risk would not be sufficiently factored into the capital ratios. The risk of potential underestimations is also likely to be greater if internal models are used to calculate the

Risk weights may underestimate systemic risk, particularly for O-SIIs.

risk weights, which is especially the case for the risk exposures of larger SIFIs. Owing to their risk-sensitive nature, these risk weights tend to be more responsive to macroeconomic developments. Risks arising from, say, an unexpected economic downturn may therefore be underestimated, especially in the current period of positive economic activity, which has already prevailed for quite some time now. For instance, borrowers’ default rates have fallen continuously over

the past few years as a result of the ongoing favourable economic situation. This can influence the decisions of banks and other market participants in such a way that systemic risk is collectively underestimated. The systemic risk caused by this tendency to look to past developments could then materialise and lead to large losses if the economy were to take an unexpected turn for the worse (see the section “Risk weights of systemically important institutions may underestimate systemic risks” in the chapter entitled “Risks in the banking sector” on pages 66 to 69).

Macroprudential instruments for the housing market

In June 2015, the German Financial Stability Committee (*Ausschuss für Finanzstabilität*, or AFS), recommended that the Federal Government should create the legal foundation for new macroprudential instruments for the housing market as a precautionary measure. Two of the four instruments recommended by the AFS were created when the Act on the Amendment of Financial Supervisory Law (*Finanzaufsichtsrechtsergänzungsgesetz*) came into force in June 2017. As a result, macroprudential instruments are available if signs of a significant build-up of risk in the German housing market were to emerge in future. For instance, supervisors can impose a loan-to-value requirement on the one hand and an amortisation requirement on the other.

Without implementing income-related instruments, the effectiveness and efficiency of macroprudential policy measures is likely to be reduced. This is because income-related instruments

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can help to combat the emergence of potential systemic housing crises in a target-oriented manner.

To be able to identify systemic risk at an early stage and perform impact analyses before applying instruments, macroprudential supervisors also require data on housing loans to be collected regularly. Disaggregated data are needed, in particular. However, the data in question are not yet available in the quantity or quality recommended by the AFS. Considering the possibility of a regulation coming into force at the European level, the Federal Government has refrained from imple-

Data on housing loans are not yet available in the quantity or quality recommended by the AFS.

menting a regulation at the national level for the time being. Reference should be made here, in particular, to the relevant initiatives of the European Central

Bank (ECB) and the Eurosystem resulting from the recommendation of the European Systemic Risk Board (ESRB) on closing the data gaps in the oversight of residential and commercial real estate markets (see the box entitled “Assessment of the implementation of the German Financial Stability Committee’s recommendation on new instruments in the area of housing loans” on pages 54 to 56).

Apply agreed resolution rules consistently and close gaps

As one of the major lessons from the global financial crisis, a European resolution regime for financial institutions was established, mainly because general insolvency rules did not take sufficient account of the special features of the banking sector. In the event of an insolvency, it was rarely possible for larger banks, in particular, to exit the market without creating risks to financial stability. The new res-

olution regime is intended to ensure that liability and control are aligned, even in a crisis, and that any losses are borne by the market participants that caused them. This limits banks’ incentives to take excessive risks.

The resolution regime thus plays an important role in the stability of the financial system because it allows investors to take into account and assess risk appropriately from the start. Furthermore, the application of the resolution regime can limit systemic effects, particularly if a larger institution runs into difficulties.

The new resolution regime is intended to ensure that liability and control are aligned, even in a crisis.

The existence of a resolution regime for banks also helps market mechanisms to function properly. For instance, banks with unsustainable business models need to be able to exit the market – just like enterprises in other sectors of the economy. The first cases in which the new rules have been applied show that political backing is an important factor in ensuring that shareholders and creditors are indeed bailed in in a resolution event. Only if the agreed rules are applied rigorously can the market mechanism work and the political aim of better protecting taxpayers be achieved (see the box entitled “The institutional framework for bank resolution in the EU” on pages 34 to 36).

Political backing is an important factor in ensuring that creditors are indeed bailed in in a resolution event.

Evaluate regulation and new framework conditions

The effectiveness of the implemented reforms and the macroprudential instruments that have already

Evaluation of financial market regulatory reforms

Following the global financial crisis, the world's twenty most important industrial nations and emerging market economies (G20) launched a comprehensive programme of financial regulatory reforms. The task of coordinating their implementation was entrusted to the Financial Stability Board (FSB). The aim of these reforms is to make the global financial system more resilient when confronted by negative economic developments, and, at the same time, to promote sustainable growth as well as open product and financial markets.

Implementation of these reforms is making headway, though full introduction is still some way off.¹ That said, progress in the implementation of many reforms has made it possible to move on from focusing chiefly on implementation monitoring to concentrating on an evaluation of reform effects. The purpose of such evaluations is to check whether reforms are having the intended effects, whether unintended side effects have also emerged and whether the regulations can be improved upon. This will enable any need for adjustments to be identified in good time. Then again, given the substantial economic and social toll of financial crises, the aim of strengthening the resilience of the financial system should not be called into question.

Evaluating the effects of reforms is no easy task. For one thing, it is necessary to differentiate between the effects of the aforementioned reforms and those stemming from other determinants, for instance measures introduced at the same time, structural changes in the mar-

kets or the prevailing monetary policy. Hence, it is not enough to make a simple comparison between the path followed by a given set of selected metrics and the implementation of the reforms. For another thing, the costs and benefits of the reforms need to be analysed from the perspective of society as a whole, since not all the costs being discussed in the public arena are in fact social in nature. One stated aim of the reforms is, in future, to shield taxpayers from the costs associated with crises caused by financial institutions, instead ensuring that these are borne by the relevant shareholders and creditors. Higher reform-induced fulfilment and funding costs are then primarily borne by the private sector institutions that triggered the problem, trimming their profits accordingly. In terms of how this affects society, though, these reforms – which will entail a redistribution of costs to their originators – should improve welfare. If, in addition, financial crises occur less often and are less severe when they do occur, thus carrying a lower economic and social price tag, the benefits will increase further. It is important to note that any benefits flowing from the reforms will usually only materialise over time, whereas higher direct fulfilment costs and the redistribution of costs become apparent immediately.

The FSB has set itself the goal of evaluating the impact of the key reforms of the G20 financial regulatory agenda in a structured fashion.

¹ See Financial Stability Board, Implementation and effects of the G20 financial regulatory reforms, Third Annual Report, July 2017.

With this objective in mind, the FSB developed a framework during Germany's G20 presidency. G20 leaders supported this framework at their summit in Hamburg.² This framework serves as an orientation tool for the conduct of *ex post* evaluations, and is designed to engender a shared understanding of what constitutes good evaluation and robust evidence. Such a framework is needed to enable an objective assessment of reform effects and to coordinate the evaluation of reform measures that have cross-border effects.

The framework is now being translated into reality. As part of an initial project, an analysis is currently underway of the manner in which reforms have influenced the incentives to clear derivatives via central counterparties. A second project, scheduled to commence at the end of this year, is geared to investigating the impact of the reforms on financial intermediation.

Availability of data is the pivotal factor in conducting evaluations. This is where microdata have a key role to play, since analyses using aggregate data fail to include important adjustments. Only with the help of microeconomic data is it possible to break down the effects of the reforms amongst the various individual target groups, including banks, enterprises and households. For instance, such data enable an analyst to ascertain whether the reforms have caused activities to shift from weaker market participants to stronger ones, thus making the system more robust overall.

In establishing its Research Data and Service Centre (RDSC), the Bundesbank took an important step towards meeting this need.³ The RDSC is

charged with maintaining and linking microdata and providing internal and external researchers with these datasets, subject to the relevant data protection and confidentiality provisions. Owing to the global nature of the financial system, an international perspective should also be adopted in connection with data availability. This is why the G20 set up the Data Gaps Initiative. The proposals this initiative has generated in terms of removing the barriers that hinder the international exchange of (micro) data are designed to further enhance data availability.⁴

² See Financial Stability Board, Framework for post-implementation evaluation of the effects of the G20 financial regulatory reforms, July 2017.

³ The information issued by the RDSC can be called up at: <http://bundesbank.de/fdsz>

⁴ INEXDA (International Network for Exchanging Experiences on Statistical Handling of Granular Data), the network founded by Banca d'Italia, Banco de Portugal, the Bank of England, Banque de France and the Deutsche Bundesbank, was set up to promote the sharing of experiences gathered when exchanging microdata and to observe the practical application of the G20's principles.

been applied must be evaluated, and potential side effects identified.¹ The aim of these evaluations should be to separate the short-term and long-term

Evaluate reforms in a pre-defined, structured framework.

effects of the reforms from each other, focus on the costs and benefits to society as a whole and take into account dynamic adjustments to the financial system. The best way to tackle these challenges would be to evaluate and assess reforms in a pre-defined,

structured framework. Potential improvements to the regulation should be made only on the basis of a structured evaluation that takes into account the aspects mentioned above. The evaluation of the reforms should not be used as an excuse to water them down or weaken the resilience of the financial system (see the box entitled “Evaluation of financial market regulatory reforms” on pages 14 and 15).

¹ A review such as this is a fundamental component of a structured macroprudential policy cycle. See Deutsche Bundesbank, Financial Stability Review, November 2016, pp 22-23.

I The international environment

After two years of declining global growth rates and a gradually diminishing interest rate level over the past few years, the international environment has changed in 2017. Robust global economic growth is supporting a slow resurgence in interest rates, from a low starting level, in the euro area and the United States. This development has an impact on risks that have built up in the global financial system during the long low-interest-rate phase.

In the international financial markets, a pronounced risk appetite among investors is part of the reason why valuations are high in many segments. This magnifies the risks that would stem from an abrupt repricing. Falling prices and the attendant losses for investors could be triggered by a strong rise in risk premiums, further mounting political uncertainty, or unexpectedly weaker economic activity. Risks to financial stability might also arise if the low interest rate level continues to persist, because, for instance, of an unexpected deterioration in the economy. The impact on the stability of the financial system of any risks that may arise hinges, not least, on the size of the capital buffers in the system.

A rising interest rate level would increasingly also lead to added burdens on euro area public finances. Moreover, the very high levels of government debt that still exist in many countries are elevating vulnerability to shocks. In general, very high debt ratios increase the risk of confidence in the sustainability of specific countries' public finances being lost in the event of an interest rate reversal. This could ultimately jeopardise financial stability in the euro area as well. What is more, parts of the euro area's non-financial private sector are still highly indebted. Here, too, rising interest rates could unleash added balance sheet risks and thus increase credit risk in the financial system.

Macroeconomic and financial environment

After two years of declining global growth rates and a gradually diminishing interest rate level over the past few years, the international macroeconomic and financial environment has changed in 2017. Robust global economic growth is supporting a slow resurgence in interest rates, from a low starting level, in the euro area and the United States. Participants in the international financial system are also gearing up for interest rates to continue their gradual increase over the next few years.

However, it is possible that future interest rate developments will deviate from this scenario. Depending on how framework conditions and risks in the international financial system develop, the current setting of low interest rates could persist even longer or be halted by an abrupt interest rate rise. These scenarios entail different risks to the stability of the global and German financial systems.

Robust economic growth supporting slow resurgence in interest rate level

Most advanced economies and emerging market economies (EMEs) are currently exhibiting robust economic growth. According to the International Monetary Fund (IMF) forecast, global economic growth will pick up from 3.2% last year to 3.6% this year; this positive dynamic is expected to continue next year.¹ In the euro area, the economic recovery is also continuing, with a projected growth rate of 2.1% in 2017, putting it well above the region's estimated potential growth of slightly above 1%.² For the first time in ten years, according to the IMF, all euro area member states will record positive real growth rates of more than 1%. The forecast projects that euro area economic growth will remain robust in 2018, with growth averaging 1.9%. For

Germany, a growth rate of 2.0% is projected in 2017, which is much higher than the estimated potential growth rate of 1.4%.³

The improved economic development and rising prices in the commodity markets are facilitating higher inflation rates. Consumer prices in the euro area, for instance, are projected by the IMF to rise by an average of 1.5% this year, up from 0.2% last year.⁴ Core inflation is also likely to pick up gradually in the coming years as capacity utilisation increases in the euro area economy. Consumer price inflation in the United States is also much higher at the projected level of 2.1% in 2017, as against 1.3% in 2016.

Amidst robust economic growth and rising inflation rates, the major central banks are gradually changing their monetary policy stance. The US Federal Reserve (Fed) continued its exit from expansionary monetary policy this year and raised its benchmark interest rate, the federal funds rate, in two stages to a range of 1.00% to 1.25%. Furthermore, in October the Fed began to gradually reduce its holdings of securities acquired under asset purchase programmes. By contrast, the European Central Bank (ECB) has been maintaining its accommodative monetary policy stance for the time being. In December 2016, the Governing Council of the ECB decided to initially extend the asset purchase programme until December 2017. The programme's monthly purchase volume was reduced from €80 billion to €60 billion

Amidst robust economic growth and rising inflation rates, the major central banks are gradually changing their monetary policy stance.

¹ Source: International Monetary Fund, World Economic Outlook Database (as at October 2017).

² See European Central Bank (2017).

³ See Deutsche Bundesbank (2017c), pp 12-13.

⁴ Source: International Monetary Fund, World Economic Outlook Database (as at October 2017).

starting in April 2017. Following the ECB Governing Council's decision in October of this year, the programme will be extended again from January 2018, with net monthly purchases of €30 billion to continue until at least September 2018.

Given the partial shift in the monetary policy stance of the major central banks and the expectations geared towards it, the interest rate level in the capital markets rose slightly on the year from its very low baseline. Yields on government bonds in the United States, and also in Germany at the longer-term end, were higher than last year's averages over the course of the year (see Chart 2.1).

Participants in the international financial system are gearing up for interest rates to continue rising. The projections of the Federal Open Market Committee (FOMC) on the future path of the US federal funds rate indicate four further interest rate hikes of 25 basis points each until the end of 2018. This interest rate rise is also reflected to a lesser extent in the expectations of market participants, which can be derived from futures contracts. For the euro area, too, these reveal the expectation of a gradual resurgence in the interest rate level over the coming years.⁵

Current low interest rate level could also last longer

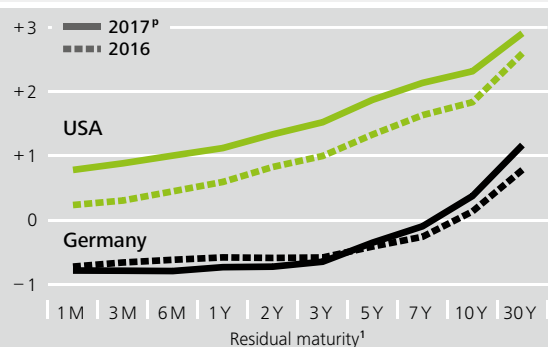
Despite the expectation of rising interest rates in the financial markets, the persistently low interest rate level still defines the state of the global financial system. If the economic setting were to deteriorate unexpectedly, interest rates could also remain low in the longer term. In

Despite the expectation of rising interest rates in the financial markets, the persistently low interest rate level still defines the state of the global financial system.

Yield curves for selected government bonds

Chart 2.1

Percentages per annum, annual averages



Sources: Bloomberg and Bundesbank calculations. ¹ Not to scale. Deutsche Bundesbank

this scenario of persistently low interest rates, the associated risks would continue to accumulate on the balance sheets of financial market participants – just as they would among German banks and insurers (see the chapters entitled “Risks in the banking sector” on pages 63 to 81 and “Risks for insurers, pension institutions and investment funds” on pages 83 to 101).⁶

All in all, a changing macroeconomic and financial environment is impacting on all areas of the global financial system. Because of the German financial system's high degree of global interconnectedness, unexpected crisis-like developments outside Germany could be transmitted directly to the German financial system. Whether the functioning of the German financial system is impaired in such a case, and how far-reaching that impairment is, will depend not only on the severity of the shock but also on the resilience of German financial institutions. This will largely be determined by their capitalisation.

⁵ See European Central Bank (2017).

⁶ A protracted low-interest-rate phase is encouraging the build-up of risks in various parts of the global financial system. See Deutsche Bundesbank (2016c), pp 15 ff.

Higher risk of abrupt repricing in the international financial markets

The international financial markets were characterised by an ongoing search for yield in the low-interest-rate environment of the past few years. This goes hand in hand with a pronounced appetite for risk among investors; partly as a result of this, valuations in key market segments have now reached a high level. This presents investors with the risk of corresponding losses, should there be an abrupt repricing of financial assets. Financial stability can be put at risk particularly if highly leveraged investors do not have sufficient buffers to bear losses.

Financial stability can be put at risk if investors do not have sufficient buffers.

Repricing could be triggered by an abrupt increase in risk premiums, which would affect all securities carrying risk. By way of example, a sustained deterioration in the relatively dynamic level of economic activity at present, the materialisation of risks in connection with high levels of government and private debt, not to mention political events, could all boost risk aversion. If such a case were to arise, it would be likely that the risk-free interest rates would remain very low over a longer period.

In principle, an unexpected rise in risk-free interest rates could also trigger a repricing in the financial markets. In 2013, for example, there was a comparatively strong increase in US Treasury yields after the Fed unexpectedly announced that it would reduce the volumes of its asset purchases. Equally, unexpected macroeconomic developments, such as higher inflation rates, could alter expectations about the future path of monetary policy and thus trigger a repricing in the financial markets.

If anything, though, the signals currently emanating from the major central banks indicate that they are exiting from their accommodative monetary policy little by little. The gradual increase in yields on long-dated government bonds since the start of the year thus also reflected market participants' expectations of a step-by-step reduction in the degree of monetary policy expansion.⁷ Provided interest rate changes are accompanied by an economic recovery and are expected by the markets, the ensuing risks posed by an abrupt repricing are relatively limited. Owing to international interest rate linkages, a further rise in the risk-free interest rate in the United States would exercise upward pressure on interest rates in Europe, irrespective of monetary policy decisions in the euro area.⁸

The following section will first look in more detail at the high valuation levels in the financial markets and then at a possible increase in risk premiums as a trigger for repricing.

Investors still exhibiting high risk appetite

Low interest rates foster an increased appetite for risk among investors. Market indicators reveal that investors will accept greater risks in exchange for generating higher returns.⁹

Last year's already high valuation levels in the global stock markets have become more entrenched. The US stock market is the world's most important by virtue of its size and international investor base. US indices such as the S&P 500 have climbed to new highs. Common valuation metrics, such as the ratio of share prices to intrinsic values such as (expected) corporate earnings (price-earnings ratio, or P/E),

⁷ See Deutsche Bundesbank (2017e), p 40.

⁸ See M Ehrmann and M Fratzscher (2005).

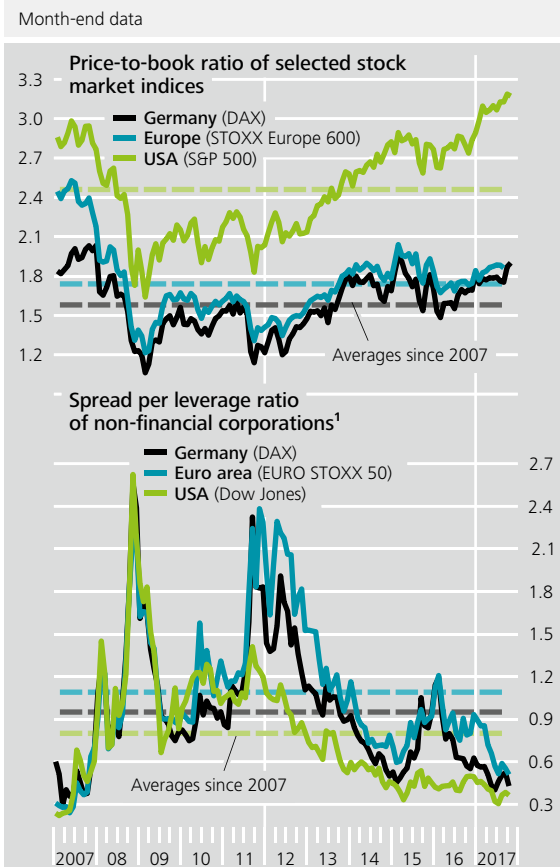
⁹ See M Feroli, A K Kashyap, K L Schoenholtz and H S Shin (2014).

average earnings of the past ten years (Shiller P/E) or book values (price-to-book ratio, or P/B), are significantly higher than their long-term averages for US indices. In the euro area, too, metrics such as the ratio of price to book value or to expected earnings suggest that the valuation level is above average. This is the case for Germany's DAX index as well as for the European STOXX Europe 600 index. However, the valuation levels are far below those of the US S&P 500 (see Chart 2.2).¹⁰

In the corporate bond markets, risk premiums have once again decreased considerably since the spell of tension in spring 2016. In particular, in both Europe and the United States, corporate bonds in the especially risky non-investment grade segment come with yield spreads that are significantly below their long-term averages.¹¹ An analysis of yield spreads for enterprises' debt relative to their leverage ratio (spread per leverage) shows that market participants are increasingly willing to provide very cheap funding to highly indebted and therefore, from an investor's perspective, relatively risky companies (see Chart 2.2). In the euro area, corporate bonds currently have high valuations relative to equities.¹²

Valuation metrics for the corporate sector

Chart 2.2



Sources: Bloomberg, Markit and Bundesbank calculations. ¹ Median ratios of five-year credit default swap premiums to the leverage ratio (ratio of debt to equity) of non-financial corporations in the respective stock market indices.
 Deutsche Bundesbank

¹⁰ Equity risk premiums, though, do not suggest a high valuation level. However, the figures calculated for the equity risk premiums are likely to still be biased owing to the persistently low interest rates. See Deutsche Bundesbank (2016a), pp 15-29.

¹¹ Yield spreads describe the difference in yield between risky bonds and government bonds, which are deemed to be risk-free. They constitute a measure for the risk premiums demanded on the markets by investors.

¹² Corporate bond prices are compared with the value of a replicating portfolio comprising the same companies' shares and secure government bonds. The assumptions of the Merton model underpin the analysis. See Deutsche Bundesbank (2017d), pp 17-32, and N Dötz (2014).

¹³ The proportion of syndicated loans issued in the US non-investment grade segment has risen from just under 52% of all syndicated lending in 2016 to 65% in 2017 (up to and including September 2017). In the euro area, this figure rose by 15 percentage points to 41% over the same period. Source: Dealogic.

¹⁴ The residual maturities of the bonds issued by European corporates included in the indices of Bank of America Merrill Lynch have risen by an average of around one year within the past five years.

Indicators of issuance and non-price conditions also suggest that investors in the corporate bond markets still have a high appetite for risk. Issuance and lending, especially of bonds and syndicated loans in the non-investment grade segment, remain dynamic.¹³ Furthermore, a large portion of bonds and syndicated loans in the non-investment grade segment have only weak investor protection clauses.

What is more, investors are increasingly willing to face greater interest rate risk in exchange for higher returns.¹⁴ Investors' pronounced risk appetite and the high valuation levels notably present the risk of

significant price corrections and losses for market participants in the event of an abrupt repricing. The

Investors' pronounced risk appetite presents the risk of significant price corrections and losses for market participants.

longer interest rates remain low, the longer investors might display a high risk appetite, keeping risk premiums low. If corresponding capital buffers are not

held against these elevated risks, the potential risk of losses in the event of an abrupt repricing may increase over time.

Fundamental values indicate elevated risks

The high valuation levels and favourable financing terms are currently being bolstered by significantly increased corporate earnings and another slight drop in corporate default rates in the United States (see Chart 2.3 for developments in the non-investment-grade segment).¹⁵ However, a host of other intrinsic metrics suggest that risks have risen considerably in the corporate sector, especially in the United States. This appears difficult to reconcile with the high valuations in the markets. Over the past few years, US non-financial corporations have exploited the low interest rates and investors' high risk propensity to considerably increase their leverage. Measured by total assets, the financial liabilities of US enterprises active in the capital markets and listed in the Russell 1000 stock market index are historically high, at just over 31%. This has made corporate earnings more vulnerable to rising financing costs and has thus increased the risk of default. This is also demonstrated by the interest coverage ratio, which measures interest payments as a percentage of corporate earnings. The share of enterprises in the US Russell 1000 index with a very low interest coverage ratio of below two¹⁶ climbed to 11% in 2016 – the highest figure since 2009.

In the EMEs, the dynamic growth in corporate debt over the past few years could also drive up default rates significantly if conditions were to change. Corporate debt has seen considerable growth in China, in particular, where it has surged by 70 percentage points since 2007 to 166% of gross domestic product (GDP) at the end of 2016. Early warning indicators, which flag an excessive increase in private debt, are signalling that credit growth has breached critical thresholds in China as well as in a host of other EMEs.¹⁷

In contrast to this, the aggregate leverage ratio of listed European non-financial corporations has declined slightly. At around 24%, it is lower than the high of 27% in 2008. Moreover, the share of companies listed in the STOXX Europe 600 index with an interest coverage ratio of below two has not risen in the past two years and, at 4%, is much lower than the figure for the United States. There are major differences within Europe, however. The level of debt in the household and corporate sectors is still high in a number of countries that were hit especially hard by the sovereign debt crisis (see the section "Risks of increasing interest rates to public and private debtors in the euro area" on pages 29 to 36). This makes these debtors more susceptible to rising financing costs.

Should financing costs go up in future, the economy deteriorate unexpectedly, or the present higher-than-average profit margins narrow sharply, default rates could see a renewed increase, especially in the United States and EMEs. This development could result in strong price drops for equities and corporate bonds and boost volatility in the interna-

¹⁵ The decline in default rates in the United States this year is primarily attributable to the stabilised oil price and the ensuing positive implications for the US energy sector. Default rates in Europe remain at a relatively low level.

¹⁶ An interest coverage ratio of less than two is considered to be critical, as this would mean that at least half of a company's earnings have to be used for interest payments.

¹⁷ See Bank for International Settlements (2017), p 45.

tional financial markets. Were these developments to transpire in the United States, it can be assumed that risk aversion would increase in the international financial markets and hence also in Europe. Since enterprises from EMEs are obtaining more and more funding in the international bond markets, the impact of rising EME default rates is thus increasingly likely to hit international investors, too.

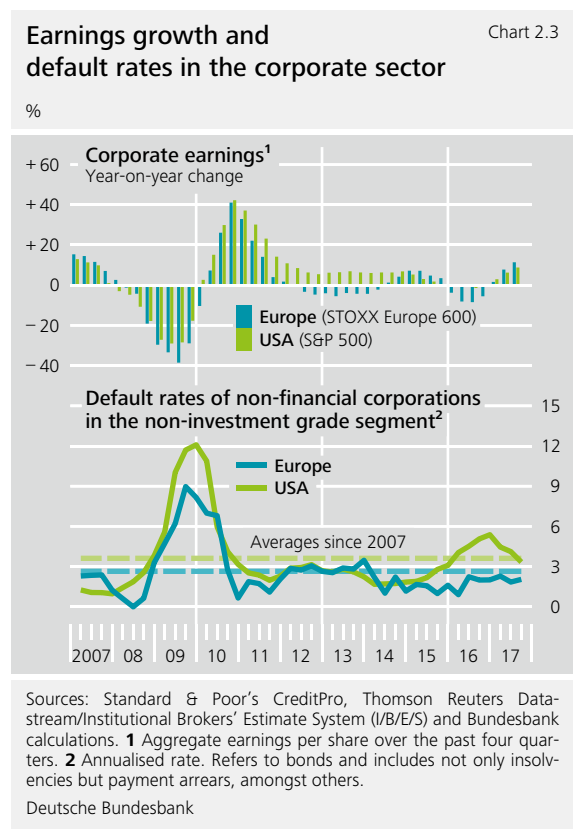
Should financing costs go up or the economy deteriorate, default rates could see a renewed increase.

Abrupt price adjustments in the financial markets could even be stronger than in the past, as the importance of investors that act procyclically, such as investment funds, has grown considerably in recent years (see the box entitled “Securities investment by banks and investment funds during periods of increased financial market stress” on pages 24 and 25 and the chapter entitled “Risks for insurers, pension institutions and investment funds” on pages 83 to 101). For corporate bonds and securitisations, market liquidity has deteriorated at times in the recent past owing to the decline in large dealer banks’ portfolios.¹⁸ As a result, the price drops and losses for investors could be especially large for these financial assets in particular.

Political risks could trigger repricing

Political events could also inspire greater risk aversion among investors and thus trigger asset repricing. Political risks should therefore be reflected in risk premiums in the financial markets,¹⁹ provided they are not obscured by other factors. If political risks are not adequately factored into market prices, the losses should those risks materialise may be higher.

The international financial system has been confronted with a series of political events over the



course of this year, the occurrence and repercussions of which have caused great uncertainty. These included, in particular, the performance of Euro-sceptic parties at the national elections of some EU member states, continued uncertainty regarding the political agenda of the new US administration and the form future contractual relations between the EU and the United Kingdom are going to take.

The political uncertainty, perceived to be particularly heightened at the beginning of the year, contrasted with very low financial market volatility. Particularly low market volatility may potentially have lulled investors into a false sense of security, leading them to take excessive risks.²⁰ This low volatility could

¹⁸ See European Systemic Risk Board (2016) and Committee on the Global Financial System (2016).
¹⁹ See N Bloom (2014) and L Pastor and P Veronesi (2013).
²⁰ See M K Brunnermeier and Y Sannikov (2014).

Securities investment by banks and investment funds during periods of increased financial market stress

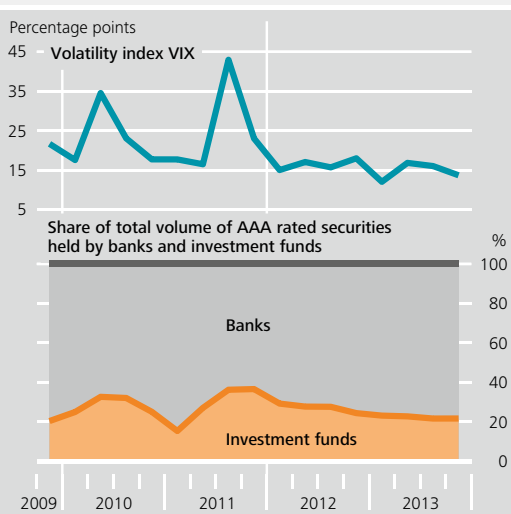
In the financial markets, intermediaries outside the banking sector are becoming increasingly important.¹ In continental Europe, too, where until recently the market was traditionally dominated by banks, non-bank financial institutions are on the ascent, with investment funds establishing a particularly strong presence.²

This poses the question as to whether, and in what manner, such entities' risk appetite differs from that of banks, especially given financial market stress, in other words during spells of heightened tension in the financial markets. When analysing financial stability, it is useful to have an understanding of how banks and investment funds adapt their asset portfolios in

response to financial market shocks. Such insight allows more accurate conclusions to be drawn regarding the distribution of risks or possible procyclical effects generated by financial market shocks (for more information on the possible contribution of the investment fund business to procyclicality, see also the chapter entitled "Risks for insurers, pension institutions and investment funds" on pages 83 to 101).

With the help of data on asset holdings, the investment behaviour of banks and investment funds in Germany is studied with a view to identifying any differences and parallels that may exist within and between sectors. These data relate to the years 2009 to 2013 and therefore span the period during which the European sovereign debt crisis unfolded. The results indicate that, in the event of increased financial market stress,³ investment funds divest themselves of riskier assets⁴ while banks step up their acqui-

Securities investment by German banks and investment funds* depending on the level of financial market stress



Sources: Bloomberg, Deutsche Bundesbank primary statistics and Bundesbank calculations. * Investment funds with a securities deposit account held with a bank domiciled in Germany.
 Deutsche Bundesbank

1 Hereinafter, non-banking sector intermediaries or non-banks should be understood as referring to financial corporations such as actively or passively managed funds and insurance companies or pension institutions.

2 See International Monetary Fund, Monetary policy and the rise of nonbank finance, Global Financial Stability Report, October 2016, as well as the chapter entitled "Risk situation of the German financial system" on pp 39-61.

3 The VIX measures the implied volatility in the US S&P 500 share index using options prices. It serves as the standard yardstick for gauging fluctuations in global uncertainty and the associated risk appetite of investors in the international financial markets. See, inter alia, H Rey, Dilemma not trilemma: The global financial cycle and monetary policy independence, NBER Working Paper No 21162, 2013, and V Bruno and H S Shin, Cross-border banking and global liquidity, Review of Economic Studies, Vol 82, No 2, pp 535-564, 2015.

4 For the purposes of this analysis, riskier assets are defined as non-investment-grade instruments.

sition of riskier instruments (see the chart on page 24).⁵ This procyclical behaviour seems to be more pronounced among those investment funds where the majority stakeholder is a financial corporation. Compared with banks, all investment funds display greater risk aversion during times of increased turmoil. Where financial market stress arises, the prices of riskier assets perform considerably worse if investment funds hold a major stake in these assets. The findings therefore suggest that, at times of tension in the financial markets, prices can go down more significantly than in the past thanks to the growing presence of investment funds.

Whether, and to what extent, additional risks to financial stability could be created by banks' behaviour depends on countervailing effects. On the one hand, the analysis reveals that, when

there is a spike in financial market stress, banks behave in the exact opposite fashion to investment funds. This could underline the significance of banks in terms of absorbing the risks that arise during periods of heightened financial market stress. On the other hand, at such times, banks tend to step up their acquisition of bank bonds, thus intensifying the degree of interconnectedness within the banking sector.

⁵ In the case of insurers and pension funds, an anticyclical effect is evident. See Y Timmer, Cyclical investment behavior across financial institutions, *Journal of Financial Economics*, forthcoming.

therefore indicate that prices in the financial markets do not adequately reflect political risks. However, this analysis neglects to consider that volatility in financial markets is influenced not solely by political risks, but also by real economic and monetary policy developments, as well as other developments.²¹ Model calculations suggest that the influence of increased political uncertainty on financial market volatility at the beginning of the year was obscured by dampening factors (see the box entitled "The relationship between political uncertainty and financial market volatility" on pages 26 to 28).²²

There is also likely to be a discrepancy between financial market volatility and political instability on account of the fact that market participants can envisage risks from predictable events significantly more clearly than risks resulting from unforeseeable or hard-to-gauge events. The latter can hardly be

insured on the market. Such events include the sudden outbreak of geopolitical conflicts or the possible implications of a rather vague political agenda on the financial system and the real economy.

In principle, it is possible to differentiate between insurable and uninsurable events. Insurable risks are definable and can be assigned a particular occurrence risk. One example would be the outcome of an election, where the candidates and therefore the

²¹ There have often been such instances of frequently used financial market indices decoupling from changes in political uncertainty in the past. See Bank for International Settlements (2017), pp 34-35.

²² In addition, methodological difficulties arise when measuring political uncertainty. The indicator conceived by Baker, Bloom and Davis, which is often used as an approximation of political uncertainty, is thus based, inter alia, on the frequency with which the topic of political uncertainty is discussed in newspaper articles. See S R Baker, N Bloom and S J Davis (2016) and Bank for International Settlements (2017), pp 34-35.

The relationship between political uncertainty and financial market volatility

Since mid-2016, the global financial markets have been characterised by a level of volatility that is extremely low by historical standards. For instance, the VIX¹ fell to an all-time low during the course of this year (see the chart below). Market observers consider this to be an important gauge of investors' risk appetite.

The low level of implied volatility in the US stock market stands in contrast to uncertainty – which is perceived as having increased strongly – about global and, in particular, US economic policy. However, it is difficult to measure and quantify this uncertainty. One possible approach is the Economic Policy Uncertainty (EPU) index developed by Baker, Bloom and Davis.² Both the global and the US EPU index rose markedly following the United Kingdom's referendum on EU membership and the US presidential election (see the adjacent chart).

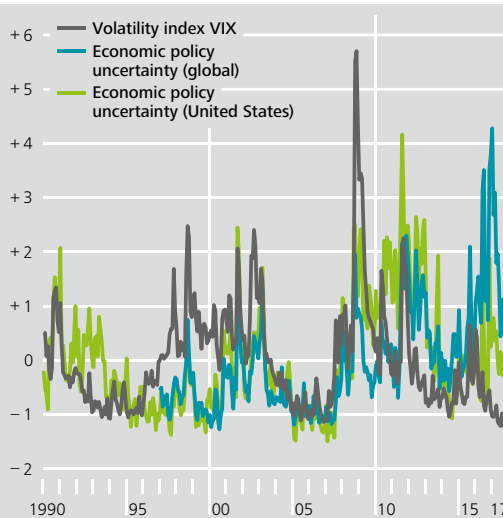
If markets were to underestimate political risks, a reassessment of the risks stemming from political

uncertainty could trigger a rise in volatility and, thus, an abrupt correction of asset prices. There is empirical evidence that a marked increase in the VIX can cause a decline in lending by international banks and in global capital flows.³ A strong increase in implied volatility could therefore entail higher risks to international financial stability.

A structural vector autoregression (SVAR) model is used to examine the driving forces of financial market volatility. The model estimations are based on monthly data for the United States in the period from January 1990 to August

Policy uncertainty and stock market volatility

Standardised monthly data



Sources: Bloomberg, S R Baker, N Bloom and S J Davis, Measuring economic policy uncertainty, The Quarterly Journal of Economics, Vol 131, No 4, pp 1593-1636, www.PolicyUncertainty.com and Bundesbank calculations.

Deutsche Bundesbank

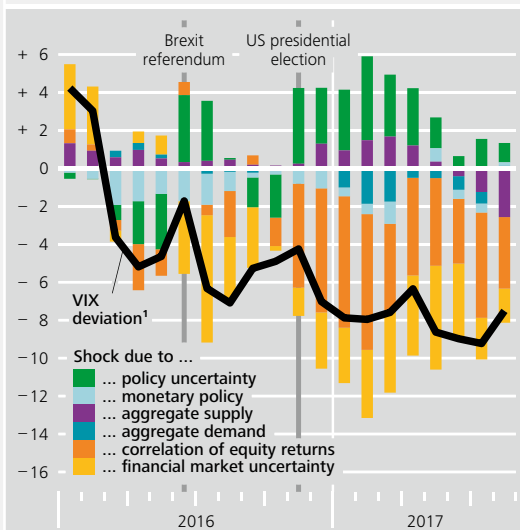
¹ The VIX uses option prices over a 30-day time horizon to depict the expected fluctuation range (implied volatility) of the US S&P 500 stock index.

² To construct the EPU index, newspapers are searched to determine how often they contain certain words expressing uncertainty. This approach is subject to a number of assumptions and simplifications. In particular, it does not distinguish between the positive and negative effects of economic policy developments. See S R Baker, N Bloom and S J Davis (2016), Measuring economic policy uncertainty, The Quarterly Journal of Economics, Vol 131, No 4, pp 1593-1636.

³ See H Rey (2013), Dilemma not trilemma: The global financial cycle and monetary policy independence, Proceedings – Economic Policy Symposium – Jackson Hole, Federal Reserve of Kansas City Economic Symposium, pp 285-333, and V Bruno and H S Shin (2015), Capital flows and the risk-taking channel of monetary policy, Journal of Monetary Economics, Vol 71, pp 119-132.

Model for estimating the decomposition of the VIX (volatility index)

Percentage points



Sources: Fama/French Data Library, Federal Reserve Bank of St Louis, www.PolicyUncertainty.com and Bundesbank calculations. ¹ Deviation from the historical mean (since 1990) of 19.5.

Deutsche Bundesbank

2017.⁴ The historical development of the VIX is explained by the contributions of shocks. These shocks refer to aggregate supply, aggregate demand, monetary policy, political uncertainty and the correlation between stock returns obtained in various economic sectors as well as financial uncertainty.⁵

The model estimations show that, in the absence of other influencing factors, uncertainty about the future course of US economic policy would have led to an increase in the VIX (see the chart above). The impact of economic policy uncertainty on volatility therefore does seem to be reflected in the VIX, but eclipsed at present by other factors. In particular, volatility is being subdued by a currently low and declining average correlation between the returns in the various US economic sectors.

According to portfolio theory, the volatility of the aggregate return on the stock market (in the case examined here, the US S&P 500 stock index) can be decomposed into the volatility of the individual stock returns and the correlation between all pairs of stocks. This implies that changes in the correlation can impact on the volatility of the aggregate return.⁶ A high correlation can, in principle, lead to substantial price fluctuations and therefore to increased volatility, as many investors behave in a similar fashion. A decline in correlation is associated with a divergent development of the individual stock returns and can thus reduce volatility.

The average correlation between returns in the various economic sectors stood at 0.86 at the end of 2008, when the financial crisis had peaked. In the period following the crisis, and particularly from November 2016, this value decreased markedly and currently amounts to 0.41 on average. The declining correlation is

⁴ For more information on the method used, see N Metiu and E Prieto, The impact of correlation shocks, Deutsche Bundesbank, mimeo, and European Central Bank, Financial Stability Review, May 2017, pp 135-143. The model includes industrial production, the consumer price index, the short-term nominal interest rate, the EPU index and the VIX index as well as the average correlation between the individual returns on US sector portfolios. The average correlation is calculated as an equally-weighted cross-sectional average of monthly pairwise correlations between daily value-weighted returns on equities traded on the NYSE, AMEX and NASDAQ, sorted by 49 sector portfolios taken from the Fama/French Data Library.

⁵ The shocks are calculated from the residuals of the estimation model. Theoretically-derived sign restrictions are used to identify supply, demand and monetary policy shocks. Political uncertainty, correlation and financial uncertainty shocks are identified with the help of recursive time-based restrictions. All shocks can have an immediate impact on the VIX index.

⁶ See J M Pollet and M Wilson (2010), Average correlation and stock market returns, Journal of Financial Economics, Vol 96, No 3, pp 364-380.

an indication that investors are paying greater attention to the fundamentals of the individual companies. One possible cause at the current juncture, moreover, could be that market participants are expecting the reorientation of US economic policy to impact differently on stock returns in different sectors.

Should the dampening effect of the low correlation prove to be temporary, volatility could rise again if economic policy uncertainty persists.

possible winners are already known. Uninsurable events cannot be foreseen. Examples of such events include terrorist attacks or the detailed implementation of a political agenda which is, at present, still abstract.²³

The elections in several European countries during the first half of this year belong to the category of political risks which can explicitly be considered by investors. Financial market indicators suggest that risks resulting from the potential election of Euro-sceptic parties were at least partially reflected in market prices. For instance, prior to the French presidential election, market participants appear to have considered the risks posed by France potentially leaving the European monetary union and the associated redenomination of French sovereign debt in a new national currency.²⁴ Following the victory of pro-European candidate Emmanuel Macron, prices in the financial markets recovered significant-

ly. The redenomination risks and relevant indicators of political uncertainty declined.

Political risks continue to play a significant role as potential triggers for increased risk aversion in the international financial markets. In the markets, politically-induced exit risks in some euro area countries, such as Italy or Portugal, are still deemed to be heightened. In addition, market participants could also reassess the impact of the United Kingdom exiting the EU or a reorientation of US trade and economic policies.

²³ For a conceptual classification of insurable events (risk) and uninsurable events (uncertainty), see F Knight (1921).

²⁴ Such redenomination risks can be derived from the difference between premiums from credit default swaps, which hedge investors against redenomination risks to varying extents on account of their differing contractual arrangements. See Morgan Stanley (2017). For a similar approach, see R A De Santis (2015).

Risks of increasing interest rates to public and private debtors in the euro area

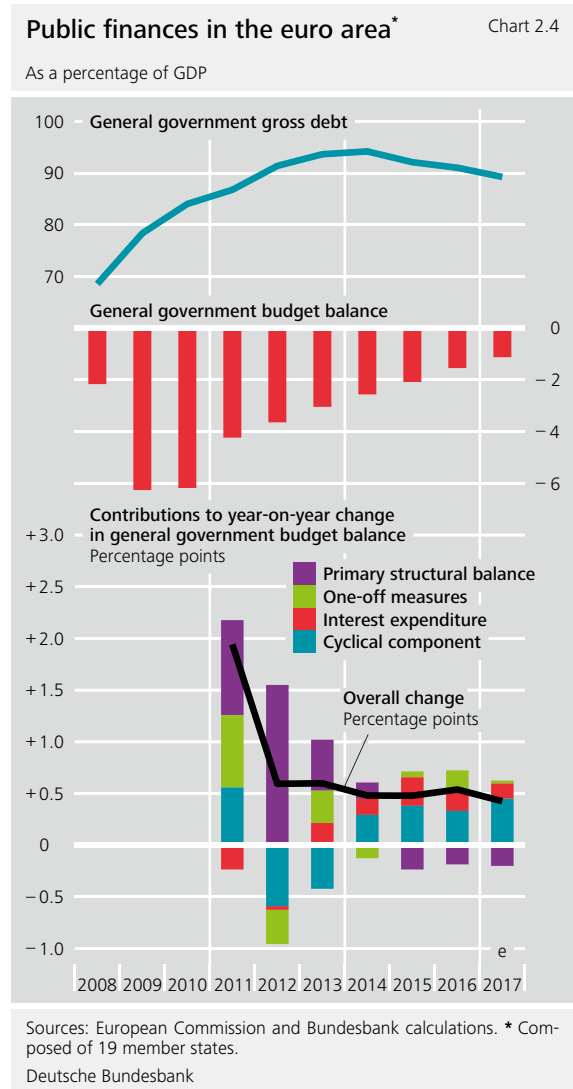
A marked increase in the general interest rate level and the possible repricing of risks in the international financial markets would not only affect the financing conditions of enterprises. Going forward, this development would also result in additional costs for states with, in some cases, persistently high debt levels, as well as for the private non-financial sector as a whole in the euro area.

High public indebtedness increases vulnerability to shocks

Over the course of the global financial crisis and European debt crisis, many euro area member states recorded a considerable increase in their budget deficits and government debt, with expenditure for the stabilisation of their domestic financial sector also being a factor (see Chart 2.4). Since 2010, member states' deficit ratios have predominantly been going back down. In 2016, the general government deficit ratio for the euro area stood at 1.5%. According to the European Commission's forecast, it should continue to decline slightly this year.

Alongside favourable economic activity and falling expenditure for one-off measures such as financial assistance for the banking sector, lower financing costs, which had been declining for years, also contributed substantially to the reduction in government deficits.²⁵ In comparison to 2007, the average rate of interest on sovereign debt in the euro area decreased by around 2 percentage points to 2.4% in 2016.²⁶

However, the positive underlying conditions mask the fact that fiscal consolidation in the euro area as



a whole has ceased in the past few years. The balance adjusted for interest expenditure and cyclical effects and one-off measures – the structural primary surplus – thus deteriorated in 2015 and 2016. A fiscal stance that is more on the expansionary side is projected for 2017 as well (see Chart 2.4). This also contributed to the slow reduction of the public

²⁵ See Deutsche Bundesbank (2017b), p 59, and Deutsche Bundesbank (2017d), p 51.

²⁶ Sources: European Commission data on annual interest expenditure and debt levels in the euro area and Bundesbank calculations.

debt ratio in the euro area compared with its peak in 2014. It amounted to 91.1% at the end of last year and is set to decline only slightly, according to the European Commission's forecast, to 89.3% this year.

The public finances of many euro area member states remain vulnerable to shocks and resulting fiscal burdens due to their high or very high debt ratios. Measures known as automatic fiscal stabilisers, such as unemployment insurance schemes, thus

Public finances of many euro area member states remain vulnerable to shocks.

result in an increase in public expenditure relative to revenue in the event of an economic downturn, even without a political decision

having been directly made. At the same time, however, the fundamentally positive impact of automatic stabilisers on economic activity presupposes sustainable public finances.²⁷ Overall, high public debt levels greatly restrict the government's scope for action in times of crisis.

Provided all other conditions remain the same, the higher the debt level, the greater the burden on public finances when government funding costs rise. Many public issuers are currently aiming for a longer fixed interest rate period, and interest rates continue to be very low. The average rate of interest on public sector debt is therefore likely to decline further initially, even in the case of a continued moderate interest rate rise, and will not immediately show up in increasing budgetary burdens.²⁸ In the event of a prolonged interest rate rise, however, interest expenditure is likely to increase again looking ahead.

Against a backdrop of increasing interest expenditure, more ambitious primary balances are essential, above all for countries with high debt levels. The more challenging the fiscal stance necessary for debt sustainability, the greater the danger of financial markets' confidence being eroded. Without a

credible and solid fiscal policy, there is a danger that risk premiums could go up, which would additionally increase the fiscal burdens resulting from an interest rate rise.

The robust economic activity and low financing costs in the euro area at the current juncture present a favourable opportunity to quickly reduce the mostly still very high public debt ratios. The goal of a close to balanced budget in structural terms should therefore be rapidly achieved and maintained.

Goal of a close to balanced budget in structural terms should therefore be rapidly achieved and maintained.

Contagion channels to the financial system persist in some areas

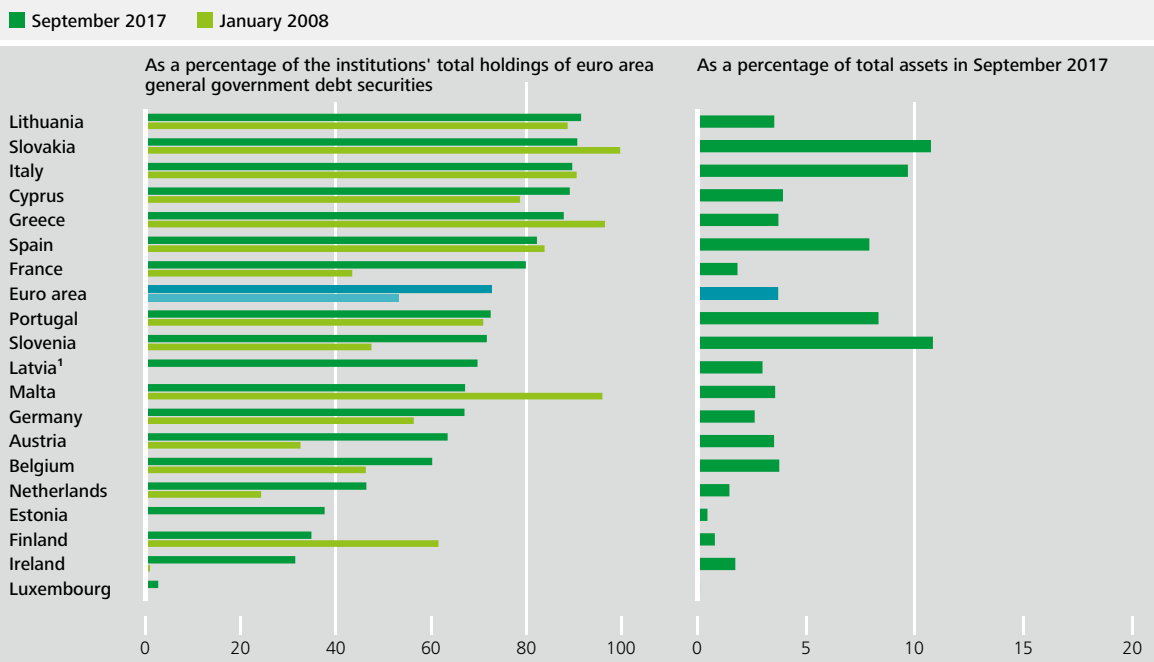
Doubts with regard to the sustainability of public finances in individual euro area countries may threaten financial stability in the euro area. This applies in particular to the persisting sovereign-bank nexus. The preferential regulatory treatment of sovereign debt enables euro area banks to hold high levels of claims on their domestic governments without having to back them with equity capital. Additionally, these claims are exempt from the large exposure limit requirements. Particularly in some of the states hit hardest by the crisis, banks still hold substantial loan portfolios on the domestic public sector (see Chart 2.5). In this way, valuation losses or a partial default on government debt could have

²⁷ See European Central Bank (2002), p 33.

²⁸ See Deutsche Bundesbank (2017d), p 50. It should also be noted that while the low interest level and longer fixed interest rate period may have positive effects for borrowers, they represent a risk to the creditor. For instance, if banks have invested heavily in long-term government securities (or other long-term assets) and have shorter-term funding, an increase in the interest rate will impair their balance sheets.

Monetary financial institutions' holdings of debt securities issued by domestic general government*

Chart 2.5



Sources: ECB and Bundesbank calculations. * Excluding central banks. ¹ No data available for January 2008.
 Deutsche Bundesbank

a direct impact upon the liquidity and solvency of the respective national banking system.²⁹

On account of the closely-interconnected nature of euro area financial and economic systems, direct and indirect contagion effects on the financial systems of other countries would be expected in such a scenario. At the end of the second quarter of 2017, German banks held claims on the general governments of other euro area member states to the tune of over €151 billion (37.6% of the German banking system's capital).

To limit the contagion risks to the banking sector from the government sector, the current preferential treatment of sovereign debt should be abrogated in the medium term.

To limit the contagion risks to the banking sector from the government sector, the current preferential treatment of sovereign debt – insufficient capital backing and

exemption from large exposure limits – should be abrogated in the medium term.³⁰ This would confine the impact of a sovereign debt haircut to individual banks, and any losses would shift more substantially to areas of the financial system in which they would be less likely to lead to a systemic financial crisis.

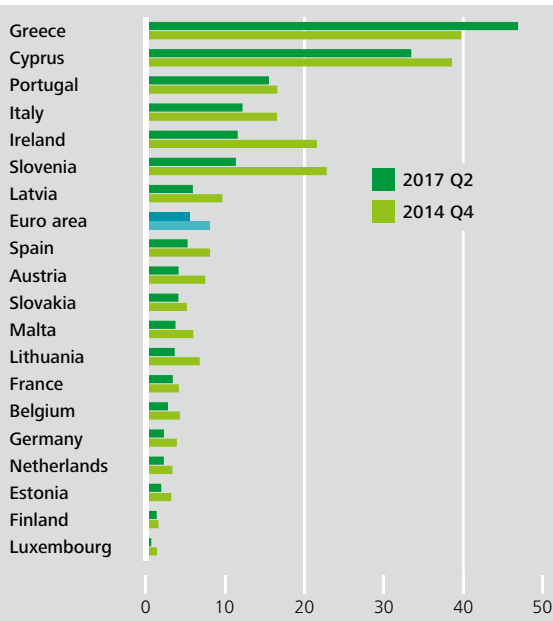
By contrast, a first major reform has already been implemented to limit the countervailing contagion risks for the government sector from banking systems, in the form of the European banking resolu-

²⁹ See Deutsche Bundesbank (2014b), pp 89 ff, and V De Bruyckere, M Gerhardt, G Schepens and R V Vennet (2013).

³⁰ Increasing the binding force of the European fiscal rules would also help to sever the sovereign-bank nexus. In addition, creating a framework for an orderly restoration of sustainable public finances could confine the negative impacts of sovereign defaults on the financial system in the event of overindebtedness. This is discussed in greater detail in Deutsche Bundesbank (2016b), pp 41-62, and Deutsche Bundesbank (2017c), pp 29-44.

Non-performing loans in the national banking systems of the euro area Chart 2.6

As a percentage of gross loans¹



Source: ECB. ¹ Net loans plus risk provisioning.
 Deutsche Bundesbank

Indebtedness of the non-financial private sector in the euro area Chart 2.7

As a percentage of GDP, as at 2017 Q2



Sources: ECB, IMF and Bundesbank calculations. ¹ Including non-profit institutions serving households.
 Deutsche Bundesbank

tion regime.³¹ It aims to manage crisis situations at large banks without recourse to taxpayers' money. Instead, it is intended that shareholders and private creditors should bear the losses. Financial contributions from government institutions are restricted to exceptional cases and are only called upon at the end of a multi-stage liability cascade. To credibly ensure that any risks in the banking system cannot directly affect the creditworthiness of states once again, these rules must be applied consistently (see the box entitled "The institutional framework for bank resolution in the EU" on pages 34 to 36).

Interest rate risks for private debtors as a possible credit risk for banks

Risks in the balance sheets of banks resident in the euro area arise in particular from the persistently high levels of non-performing loans in some member states (see Chart 2.6).³² At the end of the second quarter of 2017, their volume for the euro area as a whole totalled around €869 billion.³³ This represents 3.9% of the euro area banking system's balance sheet assets. These credit claims show the considerable problems both households and enterprises are having in trying to service their contractual liabilities. This particularly applies to countries with a ratio of non-performing loans amounting to more than 10% of total lending.

In the run-up to the global financial crisis and the European debt crisis, the debt levels of the non-

³¹ The banking resolution regime essentially rests on the legal basis of two European frameworks: the Bank Recovery and Resolution Directive (BRRD) and the Regulation establishing a Single Resolution Mechanism (SRM). See Deutsche Bundesbank (2014a), pp 31-55.

³² Non-performing loans are loans with substantial liabilities which are at least 90 days past due, or for which full repayment seems unlikely without recourse to realising collateral. See European Banking Authority (2014).

³³ Sources: ECB Consolidated Banking Data and Bundesbank calculations.

financial private sector in some euro area member states had risen to a level which was no longer sustainable. This resulted in a considerable need for balance sheet adjustments. Since then, noticeable progress has been made in reducing the private debt overhang in countries particularly affected by the crisis (see Chart 2.7). Overall, however, this process has not yet been finalised.³⁴ Given the persistently high stocks of non-performing loans in the banking systems of some states, a comprehensive balance sheet restructuring for both borrowers and lenders still needs to be carried out in some cases.

Risks resulting from an insufficient balance sheet adjustment by the non-financial private sector could become more apparent in the event of an increasing interest rate level. In many euro area countries, the majority of bank loans to households and non-financial corporations are granted with a floating interest rate or a short fixed interest rate period (see Chart 2.8). In these countries, the monetary policy interest rate

Risks resulting from an insufficient balance sheet adjustment by the non-financial private sector could become more apparent in the event of an increasing interest rate level.

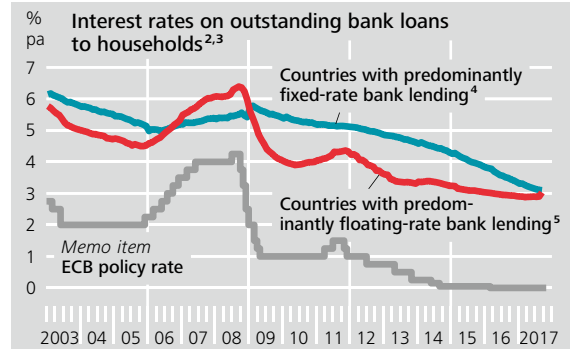
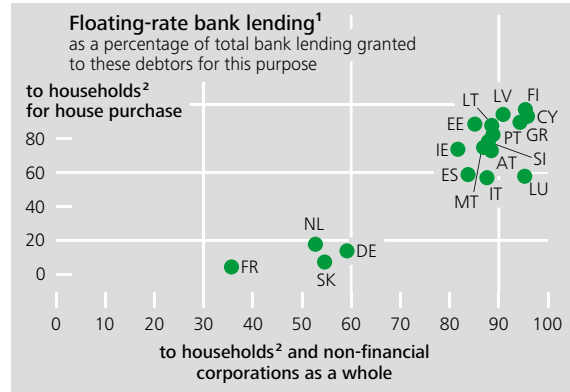
cycle, which was trending upwards before the onset of the crisis, coupled with the previously increased debt levels led to an accelerated rise in the interest burden for private borrowers. The subsequent interest rate reductions also resulted in these debtors obtaining significantly quicker relief (for households, see Chart 2.8). By contrast, banks in Germany predominantly grant loans with a longer fixed interest rate period, particularly to households. This means that the immediate risks resulting from a change in the interest rate have less of an impact on private borrowers, but predominantly affect the banking sector (see the chapter entitled "Risks in the banking sector" on pages 63 to 81).

The borrowing costs (which are lower, for the time being) in the case of a floating interest rate create

Interest rates on bank loans in the euro area

Chart 2.8

As at September 2017



Sources: ECB and Bundesbank calculations. **1** Unweighted mean for the last 60 months of the share of new loans with a floating rate or an initial rate fixation period of up to one year where data are available. Floating-rate bank lending to households for house purchase: Belgium 6.8%. **2** Including non-profit institutions serving households. **3** Calculated as the unweighted mean of the country groups, where data are available. **4** Belgium, France, Germany, the Netherlands and Slovakia. **5** All other euro area countries.

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an incentive for debtors to delay further deleveraging to a sustainable level of debt. In such a case, the interest rate risk for borrowers may ultimately be transferred to the banking sector in the form of increasing credit risk. Thus, a higher interest level directly results in increasing interest expenditure for the borrower. If rising interest expenditure were not accompanied by increased household income

³⁴ This can be seen when comparing the development of the leverage ratio of the non-financial private sector to date in the countries hit hardest by the crisis with other historical debt crises in the private sector. See Deutsche Bundesbank (2017a), pp 41-58.

The institutional framework for bank resolution in the EU

The European Bank Recovery and Resolution Directive (BRRD), which EU member states were required to transpose into national law by 1 January 2015, and the regulation establishing a Single Resolution Mechanism (SRM Regulation), which entered into force at the beginning of 2016, have created a new European framework for the resolution of banks.

The goal of this framework is to enable the orderly resolution even of systemically important institutions without endangering financial stability and burdening the taxpayer. The intention is to reduce the probability of government intervention and thus to counteract the implicit government guarantees which provide systemically important institutions with funding advantages due to the expectation that they will be bailed out. The centrepiece of the new set of rules is the bail-in tool, which allows losses to be borne directly by shareholders and, as a general rule, all creditors. To this end, banks must maintain an institution-specific minimum requirement for own funds and eligible liabilities (MREL) in future to ensure that sufficient loss-absorbing and recapitalisation capacity is available in the event of a resolution.

The new resolution rules were applied for the first time in 2017 (see the table on page 35). In all cases, shareholders and subordinated creditors participated in the losses.¹ Affected retail investors are to be compensated with public funds in some cases. A precautionary recapitalisation, which is based on the SRM Regulation but represents an exception to the standard resolution and additionally is subject to detailed requirements, was triggered for one Italian insti-

tution. Public funds were made available following approval by the European Commission. The European Central Bank (ECB) classified one Spanish and two Italian institutions as failing or likely to fail (FOLTF). After determining the conditions for resolution, the Spanish institution was then sold, in line with the tools set out in the SRM Regulation. In the other two instances, the institutions were liquidated under national insolvency law, outside the scope of the BRRD and the SRM Regulation, after the Single Resolution Board (SRB) had determined that a resolution was not in the public interest. The SRB justified this with the statement that financial stability would not be jeopardised by a national insolvency procedure. For these procedures, however, in line with EU State aid rules, the European Commission approved Italy's request for liquidation aid, which referred to financial stability concerns and severe real economic effects in the region of Veneto.²

These different assessments regarding financial stability undermine the credibility of the resolution mechanism. In addition, in these specific cases they led to taxpayers shouldering more of the burden under national insolvency procedures as opposed to EU resolution law. Both the BRRD and the SRM Regulation stipulate that shareholders and creditors must be bailed in for a minimum amount of 8% of the institution's total liabilities before public funds can be used.

¹ In three out of four cases, the bail-in was implemented according to EU State aid rules pursuant to the European Commission's Banking Communication 2013/C 216/01.

² Pursuant to the European Commission's Banking Communication 2013/C 216/01, State aid must be approved by the EU pursuant to Article 107 et seq of the Treaty on the Functioning of the European Union (TFEU).

Failing banks in 2017

Bank	Banca Monte dei Paschi	Banco Popular Español	Venetian banks (Veneto Banca / Banca Popolare di Vicenza)
Measures	<ul style="list-style-type: none"> – No resolution, precautionary recapitalisation by Italian government¹ – European Commission approves State aid on 4 July 2017 	<ul style="list-style-type: none"> – Resolution in framework of EU law – Single Resolution Board (SRB) identifies “public interest” – Application of the sale of business tool² 	<ul style="list-style-type: none"> – Insolvency under national law – SRB does not identify any “public interest” in resolution under EU law³ – Liquidation following Italian decree of 25 June 2017
Date of ECB decision and justification	28 June 2017: Confirmation of solvency: fulfilment of regulatory minimum capital requirements under Pillar I as at 31 March 2017	6 June 2017: Failing or likely to fail (FOLTF) due to liquidity position ⁴	23 June 2017: FOLTF due to capital position ⁵
Use of government funds	Italy grants State aid amounting to €5.4 bn in order to close capital shortfall resulting from the adverse scenario of the stress test in 2016	None	Following approval by the European Commission, Italy grants State aid up to €17 bn in the interest of financial stability in the region
Bail-in of creditors	<ul style="list-style-type: none"> – Write-down of capital instruments – Conversion of subordinated debt into equity – €4.3 bn in total⁶ 	<ul style="list-style-type: none"> – Write-down of shares – Conversion and write-down of additional tier 1 (AT1) instruments in the amount of €1.3 bn – Conversion of tier 2 (T2) instruments into shares in the amount of €0.68 bn⁷ 	<ul style="list-style-type: none"> – Write-down of capital instruments – Conversion of subordinated debt into equity⁸

¹ Pursuant to Article 18 (4) letter (d) of the SRM Regulation / Article 32 (4) letter (d) of the BRRD. ² Pursuant to Article 22 (2) letter (a) of the SRM Regulation / Article 37 (3) letter (a) of the BRRD. ³ Within the meaning of Article 18 (5) of the SRM Regulation / Article 32 (5) of the BRRD. ⁴ Pursuant to Article 18 (4) letter (c) of the SRM Regulation / Article 32 (4) letter (c) of the BRRD. ⁵ Pursuant to Article 18 (4) letter (c) of the SRM Regulation / Article 32 (4) letter (b) of the BRRD. ⁶ According to EU State aid rules; European Commission’s Banking Communication 2013 section 3.1.2 (burden-sharing). ⁷ Pursuant to Article 21 of the SRM Regulation / Article 59 of the BRRD in conjunction with Article 15 of the SRM Regulation / Article 47 of the BRRD. ⁸ According to EU State aid rules; European Commission’s Banking Communication 2013 section 3.1.2 (burden-sharing).

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By contrast, EU State aid rules, which have to be taken into account where State aid is granted in the context of national insolvency proceedings, essentially only require shareholders and subordinated creditors to be bailed in. One possible solution for this inconsistency regarding creditor bail-in would be to adjust the European Commission’s Banking Communication in order to ensure burden-sharing as defined in the BRRD/SRM Regulation.

The credibility of EU rules would also be at stake if fear of contagion effects within the banking sector were to prevent a bail-in from being carried out. Systemically important contagion risks could arise if banks have substantial holdings of other banks’ bail-inable instruments (cross-holdings). Restrictions on the cross-holding of MREL instruments would therefore be helpful for all those banks for which, according to the resolution plan, a resolution in accordance with EU

rules and not a national insolvency procedure is envisaged.

The above-mentioned cases also show that FOLTF assessments have tended to come very late so far. The public had already considered the institutions in question to be in a critical position for a longer time period. A careful review of the implications of an FOLTF assessment is required, including consideration of the advantages and disadvantages, which takes time. Nevertheless, in the light of experience gained so far, there are many arguments in favour of reviewing the criteria governing the FOLTF decision in the relevant EBA guidelines and the implementation thereof in the Single Supervisory Mechanism (SSM). Avoiding an FOLTF assessment by conducting a precautionary recapitalisation was also in line with EU State aid rules; in future, however, it must be ensured that, as before, governments

can provide taxpayers' money as a preventative measure only in absolutely exceptional cases and in strict compliance with the conditions prescribed by law in order to thus prevent a resolution.

Overall, it is not yet possible to make a reliable statement on whether the first cases in which the new rules were applied have played a role in reducing implicit government guarantees. No analysis can be conducted until there have been further cases and the new rules have become more established. Nevertheless, first experiences show that a bail-in of shareholders and creditors requires the appropriate political backing. The key objective of protecting taxpayers can only be achieved if the new rules are rigorously applied.

and corporate profits resulting from, for example, improved economic developments, the debt service ratio of such borrowers would rise with the interest rate level.³⁵ The share of bank loans at risk of default would therefore also tend to continue to go up.

The increased interest income one would expect from an interest rate rise could have a stabilising effect on banks' solvency in this case. Initially, therefore, banks with a greater share of floating-rate loans in their total lending in particular would profit from higher interest income. On the whole, however, the potential risks connected to an interest rate rise for borrowers and lenders highlight the need for two things: a consistent reduction of private debt overhang and a comprehensive adjustment of bank balance sheets for non-performing loans in a series of euro area member states.

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³⁵ The debt service ratio is expenditure on debt services (principal and interests) over sectoral incomes.

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Risk situation of the German financial system

Financial market stress in Germany is currently low. This is a reflection, not least, of the favourable economic situation. Early warning indicators do not point to a heightened risk situation either. However, it is in precisely such an environment that a build-up of imbalances and, therefore, systemic risks in the financial system can occur. Market participants might be overly optimistic in assuming that currently favourable conditions will continue and turn a blind eye to scenarios that could lead to large losses.

A continuation of positive economic growth in Germany and a gradual rise in interest rates should strengthen the stability of the financial system. By contrast, the scenario of an abrupt increase in interest rates could hurt German banks and life insurers. The stability of the financial system could likewise be impaired in a scenario of persistently low interest rates.

Risks could also accumulate in the residential real estate sector. House prices in Germany went up again in 2017. In the year before, overvaluations in urban areas showed a further increase and become more broad-based regionally. Growth in loans for house purchase is much less dynamic. Moreover, the existing data do not suggest that credit standards have been eased noticeably. Overall, the available information does not at present point to immediate financial stability risks stemming from mortgage lending.

At the same time, the structure of the German financial system is changing as a result, for instance, of technological progress and competition. Banks are withdrawing from international and risky lines of business. Investment funds are becoming more important, as are technological financial innovations (FinTech). Such structural upheaval brings challenges for macroprudential surveillance. Incentive structures can change, risks may shift, and new interconnections and contagion channels may emerge.

Risk situation characterised by robust economic development and low volatility

The German economy is currently experiencing strong and broad-based growth.¹ The rapid pace of expansion continued unabated at the end of the period under review. This is being driven mainly by the buoyant upturn in the industrial and construction sectors. Since the beginning of 2017, the increase in gross domestic product (GDP) has considerably outpaced potential output. Aggregate capacity utilisation, which was already well above average, has shown a further perceptible rise. Germany is thus ahead of the rest of the euro area in terms of the economic cycle.

The rapid pace of expansion in the German economy continues unabated.

The German economy is likely to go on receiving positive growth stimuli from abroad. Buoyant economic momentum is also continuing in the euro area as a whole. And at the global level, too, the impression of a firmer economy has been reinforced. This is supporting a gradual resurgence in interest rates, albeit from a very low level.²

The robust macroeconomic environment is benefiting German households and enterprises as well as financial institutions. Households have reduced their debt and have increased their net financial assets (in each case as a ratio of disposable income; see Chart 3.1). At the same time, interest rates on loans for house purchase are at an all-time low. This has helped bring down households' average interest burden as a percentage of disposable income by more than half since the mid-2000s. In line with the positive macroeconomic developments, the number of consumer insolvencies has also been falling since 2010.

Non-financial corporations are currently able to roll over their debt at very low interest rates. They have been steadily deleveraging over the past two decades. Since the late 1990s, their equity ratio has risen by more than 10 percentage points to an average of around 30% of total assets in 2015 (see Chart 3.2). Interest payments as a percentage of corporate earnings before interest and taxes have roughly halved in the last ten years. At the same time, the number of corporate insolvencies has been declining steadily since 2003 (with the exception of the crisis years 2008-09).

German banks, in turn, are benefiting from households' and enterprises' improved creditworthiness. The expected number and cost of future loan losses are small; risk provisioning is low.³

The robust economic development in Germany is accompanied by declining uncertainty and low volatility on the financial markets. The dispersion of GDP forecasts for Germany has narrowed perceptibly. This is also true of macroeconomic measures of uncertainty and the implied volatility on the German equity market (see Chart 3.3). Broader measures of financial market stress levels do not suggest heightened risks either. The Bundesbank's financial stress indicator, for instance, has been declining for several months and is currently at a low level (see Chart 3.4).⁴

The robust economic development is accompanied by declining uncertainty and low volatility on the financial markets.

¹ See Deutsche Bundesbank (2017b).

² For further details, see the chapter entitled "The international environment" on pp 17-37.

³ See also the section entitled "The risk situation in the German banking sector" on pp 64 ff.

⁴ The stress indicator combines a number of indicators for the situation on the financial markets and macroeconomic developments. See Deutsche Bundesbank (2013), pp 12-13.

Risks could be underestimated

With the economic setting having been favourable for a long time, there is a potential risk that market participants will become overly optimistic about how things are going to develop in the future.

Risk premiums on the financial markets are currently historically low.

Market participants could collectively form excessively positive expectations regarding future macroeconomic developments.

Risk premiums on the financial markets are currently historically low. There is some evidence to suggest that they are systematically too low and that risks are consequently being underestimated.⁵

With low interest rates, the main risk is that market participants' debt sustainability will be overestimated. Lower interest rates make higher debt levels

With low interest rates, there is a growing incentive to run up higher debt.

look sustainable, at least temporarily. As a result, there is a growing incentive to run up more debt or to defer deleveraging. If things

take a turn for the worse – an unexpected economic downturn occurs, for instance, or an abrupt interest rate rise – noticeable corrections could ensue.

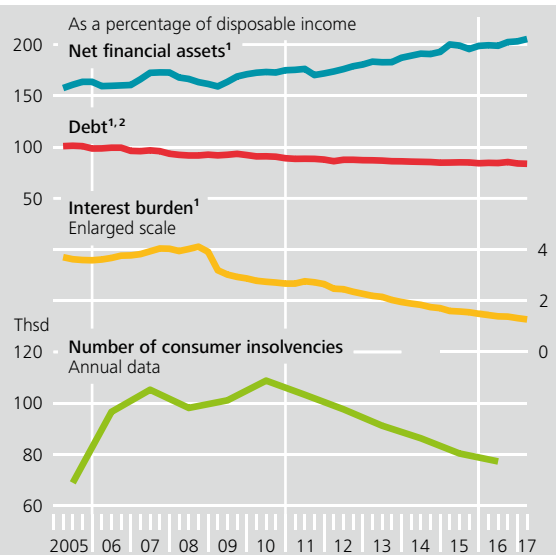
Risk of an unexpected economic downturn

Germany is currently ahead of the rest of the euro area in terms of the economic cycle. The country could therefore experience a cyclical downturn, while the rest of the euro area remains in a cyclical

Financial situation of households in Germany

Chart 3.1

Quarterly data

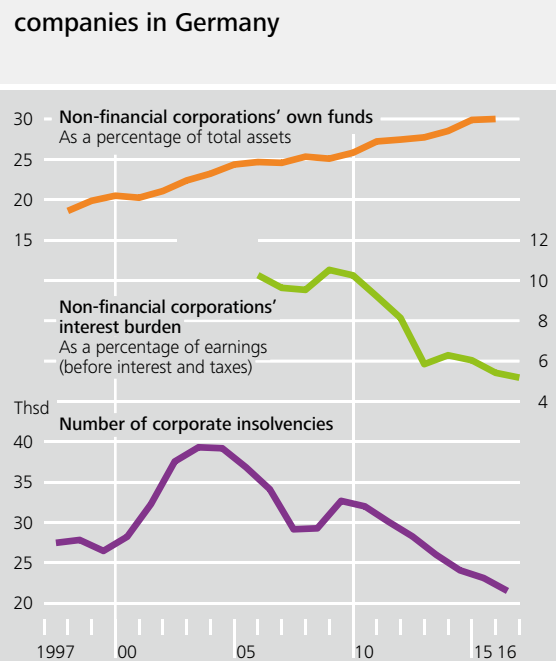


Sources: Financial accounts, Federal Statistical Office, national accounts and Bundesbank calculations. **1** Of households including non-profit institutions serving households. **2** Mainly loans, but also other liabilities.

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Financial situation of companies in Germany

Chart 3.2

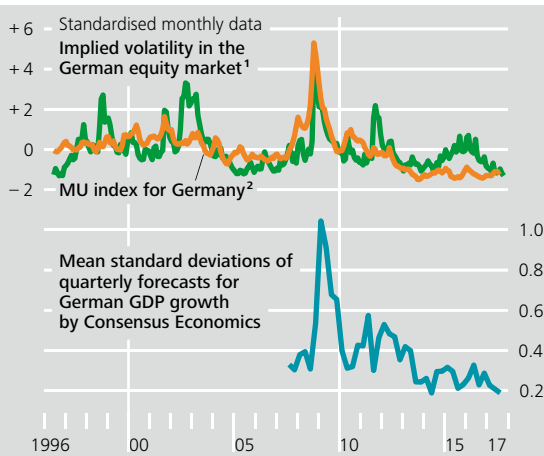


Sources: Extrapolated data from German companies' annual accounts, Federal Statistical Office, national accounts and Bundesbank calculations.

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⁵ For further details, see the chapter entitled "The international environment" on pp 17-37.

Measures of uncertainty and dispersion of GDP forecasts for Germany Chart 3.3



Sources: Bloomberg, Consensus Economics Inc and Bundesbank calculations. **1** Volatility of the DAX in annualised form, derived from market prices for options. **2** The MU index (macroeconomic uncertainty index) is based on the unpredictable components of a large number of macroeconomic and financial indicators. See also P Meinen and O Röhe, On measuring uncertainty and its impact on investment: cross-country evidence from the euro area, European Economic Review, Vol 92, pp 161-179, February 2017, and the "MU1" index they describe.

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upswing and interest rates in the euro area rise.⁶ Interest rate risk and credit risk would therefore materialise at the same time on German banks' balance sheets. Banks' resilience would then also suffer from the fact that these institutions have reduced risk provisioning to low levels on account of the positive economic situation.

The impact of such a scenario depends, not least, on how much the German economy is benefiting from the currently very low interest rates and on what effect a potential interest rate reversal would have. Estimates of the macroeconomic effects of the asset purchase programme are fraught with major uncertainty. The Bundesbank's results based on structural models suggest that real GDP growth in the euro area will range between around ½ and 1½ percentage points in 2016 and 2017, or between around 0 and 1 percentage point, depending on the model used.⁷

It is precisely in an environment of low uncertainty that there is a risk of adverse developments hitting market participants hard. Studies have shown, for example, that monetary policy shocks have a greater impact in times of low uncertainty, with uncertainty generally being proxied by volatility on the equity markets.⁸

In an environment of low uncertainty, there is a risk of adverse developments hitting market participants hard.

Abrupt rate hike could hit the German financial system hard

Most market participants appear to expect that economic developments in Germany and in the euro area as a whole will remain positive. They are consequently anticipating gradually rising interest rates. There is currently little to suggest that such a scenario would imply greater vulnerabilities for the German financial system. The situation would be different in the event of an unexpectedly rapid and sharp hike in interest rates.⁹

The fact that interest rates have been exceptionally low for years means that German banks' interest business has been making an ever smaller contribution to earnings. Many institutions have responded-

The banking sector has become more vulnerable to an abrupt rise in interest rates.

⁶ Back in the early 2000s, the situation was similarly asymmetrical when the euro area was, on average, ahead of Germany in terms of the economic cycle.
⁷ See Deutsche Bundesbank (2016), pp 29-44. V Lewis and M Roth (2017) find positive real economic effects for the euro area and Germany.
⁸ For the United States, see, inter alia, S Eickmeier, N Metiu and E Prieto (2016); K A Aastveit, G J Natvik and S Sola (2017) and G Pellegrino (2017a). For the euro area, see G Pellegrino (2017b).
⁹ For more details, see also the chapters entitled "Risks in the banking sector" on pp 63-81 and "Risks for insurers, pension institutions and investment funds" on pp 83-101.

ed to this by expanding maturity transformation and their business volume. This has heightened the banking sector's vulnerability to an abrupt rise in interest rates.

Depending on the size and type of the rate hike, banks' interest income could shrink noticeably. The extent to which this occurs depends crucially on the size of the asset-liability mismatch. It is also relevant how much new business with higher interest rates the banks could take on to their balance sheets at short notice. The asset-liability mismatch would mean that, in the event of an interest rate hike, growth in interest expenditure would initially outpace the increase in interest income. At the same time, higher interest rates would generate present value losses, causing the bank's economic value of equity and thus its resilience to shrink.

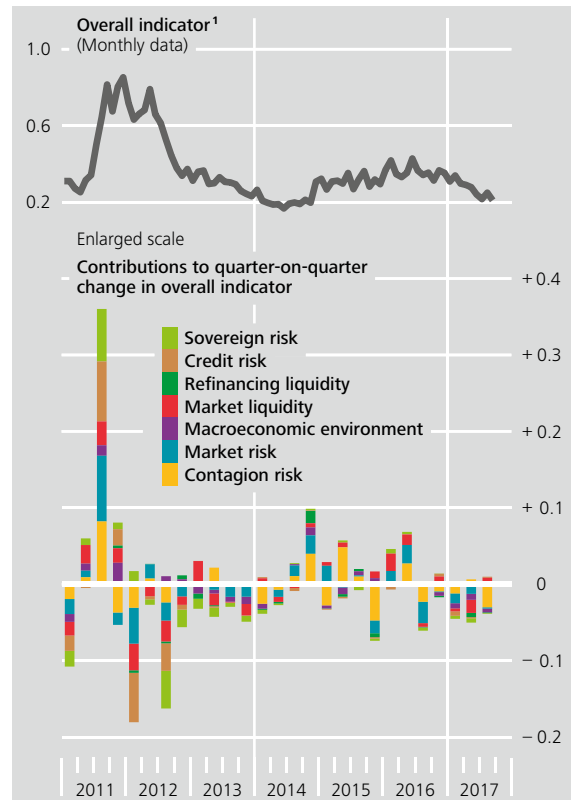
The results of the 2017 low-interest-rate survey, which was conducted by the Federal Financial Supervisory Authority (BaFin) and the Bundesbank, show that, in an extreme scenario of a sudden 200 basis point rise in the yield curve, earnings in the German banking sector would contract in the short term.¹⁰ Looking at a five-year horizon, however, banks expect earnings to go up on aggregate.

An abrupt rise in interest rates could also hurt German life insurance companies. For one thing, fixed surrender values give policyholders an incentive to lapse their policies if interest rates exceed given – enterprise-specific – critical levels. For another, a rate hike could jeopardise life insurers' solvency as defined in the German Commercial Code (*Handelsgesetzbuch*). Insurers might no longer have enough extraordinary income available from the sale of fixed-income paper with hidden reserves to meet the cost, which would initially continue to rise, of the additional interest provision.

As valuations in many segments of the financial market are high, the risks associated with an abrupt

Stress indicator for the German financial system and sub-indicators

Chart 3.4



Sources: Bloomberg, Ifo Institute, Markit, Thomson Reuters Data-stream, Centre for European Economic Research and Bundesbank calculations. ¹ The financial stress indicator is scaled between 0 and 1, with the highest level of 1 equating to the stress in the financial markets in October 2008.

Deutsche Bundesbank

repricing of assets have also grown. A sudden interest rate hike in response to higher risk premiums, say, could be accompanied by significant price corrections and cause losses for market participants.

Assessing interest rate risk throughout the financial system requires information on how risks are transmitted across sectors. Large banks tend to

¹⁰ Further information on the 2017 low-interest-rate survey is available at https://www.bundesbank.de/Redaktion/EN/Pressemitteilungen/BBK/2017/2017_08_30_joint_press_release.html?https=1&https=1&https=1

hedge their interest-bearing positions using swaps. However, this does not eliminate interest rate risk, it merely redistributes it across the financial system. Whether hedging transactions of this type do indeed render the system as a whole less susceptible to interest rate movements depends mainly on where the risks end up.

Permanently low interest rates would put German financial system under pressure

The stability of the German financial system could suffer if interest rates were to remain permanently low or even drop further.

The low-interest-rate environment is having a particularly pronounced impact on the interest margin of small and medium-sized German banks, which are strongly dependent on lending and deposit business. Their interest income is shrinking. At the same time, competition considerations severely limit the extent to which negative interest rates can be passed on to clients, especially for deposits in the private non-financial sector. That makes it difficult to lower interest expenditure and narrows the interest margin. The 2017 low-interest-rate survey among small and medium-sized institutions provides evidence that banks which are chiefly dependent on interest business expect to suffer a clear decline in earnings if interest rates remain low or even drop further.

The low-interest-rate environment is having a particularly pronounced impact on the interest margin of small and medium-sized German banks.

With permanently low interest rates, there is, moreover, a risk that German life insurance companies may no longer be able to generate sufficient earnings with their capital investments to meet their long-term obligations towards clients.

Early warning indicators not flagging up heightened risk situation

In a low-interest-rate environment, imbalances may build up within the financial system. Leading (early warning) indicators can be used to identify such imbalances and potential systemic risks at an early stage.

Developments ahead of systemic financial crises frequently display similar patterns. For instance, credit volumes and asset prices often rise sharply.¹¹ Building on the analysis of characteristic patterns of earlier crises, various macroeconomic indicators can be systematically merged into a single early warning model. The added value of such a model consists in the fact that it classifies developments in various indicators in terms of the potential danger they pose and distils them into a “big picture”.

A model based on the international experience of recent decades currently does not, on the whole, supply any evidence to suggest a build-up of excessive risks for the German financial system (see the box entitled “Early warning models for systemic banking crises” on pages 45 to 48). However, this does not rule out the emergence of contagion effects if risks materialise in other countries.

An early warning model, does not, on the whole, currently supply any evidence to suggest a build-up of excessive risks for the German financial system.

Early warning models are based on historical empirical values. If the patterns of the past repeat themselves, they may provide valuable information on the

¹¹ For more on this subject, see, for instance, C M Reinhart and K S Rogoff (2009); O Jordà, M Schularick and A M Taylor (2015); C Detken, O Weeken, L Alessi, D Bonfim, M M Boucinha, S Frontczak, G Giordana, J Giese, N Jahn, J Kakes, B Klaus, J H Lang, N Puzanova and P Welz (2014) as well as M Drehmann and M Juselius (2014).

Early warning models for systemic banking crises

Early warning models help draw conclusions about the current risk situation in the financial system based on typical developments in the run-up to past crises. Econometric estimates are used to calculate an overall indicator and a threshold value from various individual indicators.¹ An early warning signal is emitted when the overall indicator exceeds the threshold. Early warning indicators and models are widespread instruments in the context of financial stability analysis. They are used, amongst others, by the Bank for International Settlements (BIS), the European Central Bank (ECB), and the International Monetary Fund (IMF).²

The early warning model for systemic banking crises outlined here uses a large number of individual indicators to estimate the overall indicator.³ These individual indicators represent various categories: credit developments, asset prices, macroeconomic developments, and external or global imbalances.⁴ The indicators are selected, first, on the basis of theoretical considerations relating to potential imbalances that may arise in the financial system in the run-up to a crisis. Second, they incorporate empirical studies documenting these relationships.⁵

In the past, asset prices – for instance real estate or equity prices – have often exhibited pronounced growth in the run-up to banking crises.⁶ This is particularly likely to result in risks to the financial system if such asset price increases are financed on credit; in other words, if they are associated with rising household or corporate debt.⁷ A sharp decline in asset prices and a fall in corpo-

rate earnings or household income could result in loan losses or revaluations. Developments of this nature were observed in some countries prior to the global financial crisis in 2008. Earlier crises between the late 1970s and early 1990s in Fin-

¹ The threshold maximises the model's predictive power based on past observations. The threshold strikes a balance between two prediction errors. First, the error of falsely predicting a crisis (false alarm) and, second, the error of failing to predict a crisis (missed crises).

² See also Bank for International Settlements, Annual Report, June 2017; European Central Bank, Financial Stability Review, November 2016; and International Monetary Fund, Global Financial Stability Report, March 2002.

³ See J Beutel, S List and G von Schweinitz, An evaluation of early warning models for systemic banking crises: does machine learning improve predictions?, Deutsche Bundesbank, mimeo, 2017.

⁴ Besides credit to the private non-financial sector and residential real estate and equity prices, explanatory variables comprise, in particular, macroeconomic indicators (ie gross domestic product, or GDP, gross fixed capital formation relative to GDP, short-term interest rates, and inflation). The external sector is captured by the current account balance relative to GDP and the real effective exchange rate. The oil price is included in the model as a global variable. Other variables such as banks' balance sheet metrics or certain financial market indicators would be desirable early warning indicators. However, to obtain the most reliable forecast possible from the early warning model, a long period of time has to be captured across several countries and include various crisis periods. As these data are not available for a sufficiently long period of time for the countries under review, they are not considered in the model.

⁵ Earlier empirical studies on early warning indicators include C Detken, O Weeken, L Alessi, D Bonfim, M M Boucinha, S Frontczak, G Giordana, J Giese, N Jahn, J Kakes, B Klaus, J H Lang, N Puzanova and P Welz, Operationalising the countercyclical capital buffer: indicator selection, threshold identification and calibration options, ESRB Occasional Paper No 5, 2014; and M Drehmann and M Juselius, Evaluating early warning indicators of banking crises: satisfying policy requirements, International Journal of Forecasting, Vol 30, No 3, pp 759-780, 2014.

⁶ See also C M Reinhart and K S Rogoff, Is the 2007 US subprime financial crisis so different? An international historical comparison, The American Economic Review, Vol 98, No 2, pp 339-344, 2008.

⁷ See also O Jordà, M Schularick and A M Taylor, Leveraged bubbles, Journal of Monetary Economics 76, Supplement, pp 1-20, 2015.

land, Norway, Sweden and Spain were also characterised by similar developments.⁸ Price spirals can intensify the effects on the banking system. Such spirals may emerge, for instance, if banks respond to losses by selling more assets to meet regulatory or internal requirements or to prevent impending insolvency.⁹

Risks to the stability of the financial system can also stem from the macroeconomic environment. A sustained economic upturn may result in excessive risk-taking, while negative real economic developments could cause borrowers to experience repayment difficulties.¹⁰ In addition, capital inflows from abroad can encourage a surge in asset prices. A sudden reversal in these capital flows could potentially cause significant price corrections and compromise financial stability.¹¹

A majority of the indicators outlined above are not fed into the model as absolute values, but as deviations from their long-term trend.¹² This detrending helps identify medium-term cyclical fluctuations, flagging a potential build-up of risks.¹³

The dependent variable of the econometric model represents the pre-crisis period. It is based on a new database set up by the ECB and the European Systemic Risk Board (ESRB) covering financial crises in European countries between 1970 and 2016.¹⁴ This database classifies country-specific crisis periods based on various criteria such as type (eg banking crisis) and geographical origin (domestic or external).

The main focus of the early warning model is to identify domestic imbalances. Consequent-

ly, the estimation is based only on crisis periods which originated either purely domestically or both domestically and abroad. Moreover, the crisis must at least affect the banking sector.¹⁵ The ECB and ESRB crisis database was extended to include Japan and the United States.¹⁶ Against this backdrop, it is possible to identify within the dataset 22 crisis episodes for which data on potential early warning indicators are also available.¹⁷

8 See C M Reinhart and K S Rogoff, loc cit; and C M Reinhart and K S Rogoff, *This time is different: eight centuries of financial folly*, Princeton University Press, Princeton and Woodstock, 2009.

9 See M K Brunnermeier, *Deciphering the liquidity and credit crunch 2007-2008*, *Journal of Economic Perspectives*, Vol 23, No 1, pp 77-100, 2009.

10 See H P Minsky, *Can "It" happen again – essays on instability and finance*, M. E. Sharpe Inc, Armonk, New York, 1982; and F Allen and D Gale, *Understanding financial crises*, Oxford University Press, Oxford, 2007.

11 See G L Kaminsky and C M Reinhart, *On crises, contagion and confusion*, *Journal of International Economics*, Vol 51, No 1, pp 145-168, 1999.

12 This does not apply to the variables current account balance/GDP, inflation and short-term interest rates.

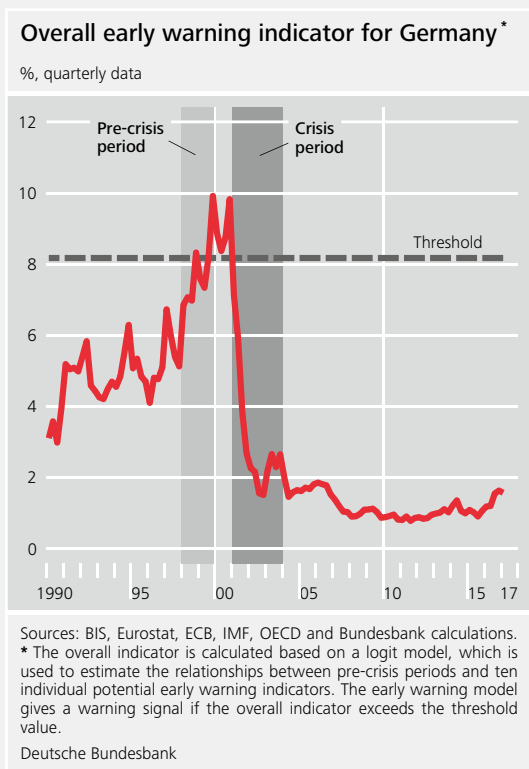
13 Although this method, too, can be criticised from an econometric point of view (see, for example, European Central Bank, *Financial Stability Review, Special Feature B*, May 2017), detrending using the Hodrick-Prescott filter is common in the empirical literature. When looking at early warning models for systemic banking crises, this method is attractive not least because of the predictive performance it achieves.

14 The model looks at a period of between 5 and 12 quarters before the onset of the crisis.

15 Most of the crises were classified as complex crises. These are crises which go beyond the banking sector. The categories banking crisis and significant asset price corrections overlap in many cases. See M Lo Duca, A Koban, M Basten, E Bengtsson, B Klaus, P Kusmierczyk, J H Lang, C Detken and T Peltonen, *A new database for financial crises in European countries – ECB/ESRB EU crises database*, ECB Occasional Paper Series 194, July 2017.

16 Crisis periods for the United States and Japan are based on the database of Laeven and Valencia. See L Laeven and F Valencia, *Systemic banking crises database: an update*, IMF Working Paper 12/163, June 2012.

17 The countries included in the dataset are Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States.



The relationship between pre-crisis periods of between 5 and 12 quarters before the onset of a crisis and potential early warning indicators was estimated using the logit approach, which is widespread in the literature, and various methods used in the more recent literature on early warning models. These latter methods consist of machine learning approaches: decision trees, random forest, k-nearest neighbours and support vector machines.¹⁸ A comparison of methods revealed that applying the logit approach to the available dataset yields a higher out-of-sample predictive performance than the machine learning approaches. The following analysis is therefore based on the logit approach.¹⁹

The logit approach describes a regression analysis where the relationship between the dependent variable, which takes a value of zero or one

(pre-crisis period: yes or no), and the explanatory variables (potential early warning indicators) is described by means of a logistic function. The relationships estimated using the logit model are based on a pooled logit, which means that they should be interpreted as an average across all countries. The predicted values can be interpreted as the probability of the financial system being in a pre-crisis period and therefore represent an overall early warning indicator.

In the countries considered in this model, certain variables have, in the past, often exhibited abnormal behaviour ahead of banking crises. These variables can thus be identified as key early warning indicators; they are credit relative to GDP, residential real estate prices, equity prices, gross fixed capital formation relative to GDP, and the current account deficit relative to GDP.

Based on the corresponding indicators for Germany, an overall early warning indicator is derived from model estimations. It is currently at a low level and markedly below the threshold value (see the adjacent chart). As a result, the model is currently not emitting a warning signal. Although the price growth in the German residential real estate market is driving the overall indicator slightly upwards, the low ratio of credit to GDP compared with its long-term trend, for example, is having a moderating effect. The interaction between these two indicators, in particular, should continue to be monitored. If the increase in residential real estate prices continues

¹⁸ For further information on the data and methods used, see J Beutel, S List and G von Schweinitz, op cit.

¹⁹ An out-of-sample forecast is one that takes into account information up to a specific point in time to make forecasts for subsequent points in time.

and is associated with growing household debt, this could create heightened risks for financial stability.

When interpreting early warning models, it should be kept in mind that they capture only certain aspects of the financial system's risk situation. For example, the models are based exclusively on information from past crises and can, therefore, only give warnings about similar crises in the future. In addition, the objective of the model discussed here is to identify domestic imbalances. Potential risks from abroad are not directly modelled. Risks arising in other countries – as was the case during the global financial crisis – could produce contagion effects. To obtain a comprehensive assessment of the risk situation, early warning models should therefore be

supplemented by further analyses, eg on developments in the international financial system.

risk of future financial crises. It is, however, far from certain that future crises will unfold in the same way as earlier ones. Moreover, the early warning model presented here focuses exclusively on critical developments resulting from domestic imbalances. This means that it captures only some aspects of the risk situation. Forecasts produced by early warning models should therefore not be viewed in isolation. Instead, they should be embedded in the ongoing stability analysis and augmented by further analyses, say, on developments in the housing market.

Overvaluations in the German residential real estate market have risen

Low interest rates encourage overvaluations on the asset markets, including the housing sector. House prices in Germany continued to rise in 2017. Having gone up by 6% in 2016 according to data provided

by the Association of German Pfandbrief Banks (*Verband deutscher Pfandbriefbanken*, or vdp), prices for residential property appreciated by an average of 5.6% on the year in the first three quarters of 2017. According to Bundesbank calculations based on data provided by bulwiengesa AG for 2016, inflation rates for residential real estate remained highest for the seven largest German cities.¹² But prices also shot up in smaller towns and rural areas.¹³

This continued price momentum is a consequence, amongst other things, of high demand for housing relative to supply. This reflects, not least, house-

¹² These cities are Berlin, Cologne, Düsseldorf, Frankfurt am Main, Hamburg, Munich and Stuttgart.

¹³ Bundesbank calculations based on price data provided by bulwiengesa AG. Further information on the German residential real estate market can be found in the Bundesbank's System of indicators, which is available at www.bundesbank.de/residential_property

holds' positive income prospects and the favourable funding conditions. To date, this demand has been only partially covered by an expansion in the supply of housing. It is true that building permits and completions continued to rise last year, and the housing investment ratio climbed to just under 6.2% of GDP in the second quarter of 2017. Nonetheless, overall, the indicators do not yet suggest an excessive expansion of housing capacity. In fact, the number of new builds fell short of the estimated demand.¹⁴

Overvaluations of residential real estate increased further in 2016 in towns and cities and also become more broadly based regionally. Bundesbank estimates suggest residential property is overvalued by around 15% to 30% in urban areas. In Germany as a whole, too, upward price deviations increased in the past year.¹⁵

Overvaluations of residential real estate increased further in 2016 in towns and cities and also become more broadly based regionally.

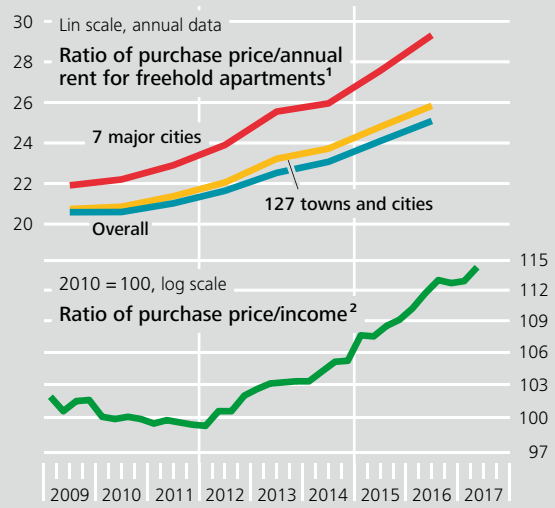
The estimated overvaluations can also be attributed to the contribution made by exceptionally low interest rates. Low interest rates mean that borrowers can take out higher loan amounts, thus allowing higher purchase prices.¹⁶ Excluding the large special contribution made

The exceptionally low interest rates mean that borrowers can take out higher loan amounts, thus allowing higher purchase prices.

by the further drop in mortgage lending rates in 2016, there were no substantial overvaluations for Germany as a whole, though the picture is different for its towns and cities. Other standard indicators for assessing house prices, such as the ratio of purchase prices to annual rents or the ratio of purchase prices to incomes, also point to prices having increased further relative to their fundamentals, particularly in towns and cities (see Chart 3.5).

Indicators for assessing housing prices in Germany

Chart 3.5



Sources: Bundesbank calculations based on data provided by bulwiengesa AG, the Association of German Pfandbrief Banks (vdp) and the Federal Statistical Office. **1** Transaction weighted. Purchase prices and rents for new lettings provided by bulwiengesa AG. **2** Purchase prices provided by vdp. Disposable income per household in Germany, nominal.
 Deutsche Bundesbank

Financial stability risks emanating from lending for house purchase remain limited

Price exaggerations in the housing markets can pose a threat to financial stability, especially if they are accompanied by strong loan financing. In particular, there exists a danger of market participants systematically underestimating the risks of loans for house purchase. This could happen if they simply extrapolate price developments in the housing market into the future. They could also form over-

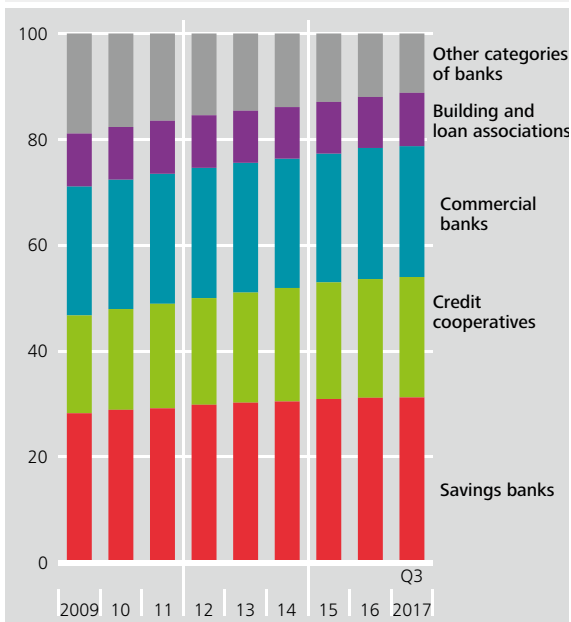
¹⁴ See Federal Institute for Research on Building, Urban Affairs and Spatial Development (2016).

¹⁵ See F Kajuth, N Pinkwart and T Knetsch (2016) as well as Deutsche Bundesbank (2017a), pp 51-53. The data on overvaluations are based on a regionally differentiated estimation model. They refer to an estimated fundamental real estate price, which is conceptually based on the sustainable components of economic and sociodemographic factors.

¹⁶ See K McQuinn and G O'Reilly (2008).

Stocks of housing loans* issued by domestic categories of banks Chart 3.6

Percentage shares, year-end data



* To domestic enterprises and households.
 Deutsche Bundesbank

ly positive expectations about the development of key factors in borrowers' debt sustainability, such as income and interest rates. Such a build-up of risk as a result of issuing loans for house purchase would be reflected, *inter alia*, in heavily expanded lending volumes and considerably eased credit standards.

Growth in lending to households for house purchase has been accelerating steadily since the start of the upturn on the housing market in 2010. However, the increase in the growth rate has been tailing off since the middle of last year. In the third quarter of 2017, the growth in loans for house purchase was 3.9% (2016: 3.7%). This is only somewhat more than the 3.3% growth rate of nominal GDP in 2016. Furthermore, the growth rate of loans for house purchase is still

Indicators do not point to a deterioration in households' debt sustainability.

ing off since the middle of last year. In the third quarter of 2017, the growth in loans for house purchase was 3.9% (2016: 3.7%). This is only somewhat more than the 3.3% growth rate of nominal GDP in 2016. Furthermore, the growth rate of loans for house purchase is still

below the long-term average since the early 1980s of 4.8%. By the end of the second quarter of 2017, aggregate household debt had fallen slightly to just under 53% of GDP. By comparison, household debt in the advanced economies averaged 63% in 2016.¹⁷ At the same time, Germany's household debt-to-disposable-income ratio was edging downwards. These aggregated indicators do not point to a deterioration in households' debt sustainability.

Since 2010, the share of lending for house purchase in total lending to domestic enterprises and households has been rising, from roughly 46% in the first quarter of 2010 to around 51% in the third quarter of 2017. The expansion in loans for house purchase was marked to differing degrees across the individual categories of banks (see Chart 3.6). Credit cooperatives posted above-average and steady growth in their stocks of loans for house purchase. In the case of savings banks, too, the stock grew more quickly over a longer period than in the banking sector as a whole. As a result, the market shares of credit cooperatives and savings banks in bank-based lending to households and enterprises for house purchase rose to just under 23% and just over 31%, respectively, in the third quarter of 2017. Their market shares thus increased by 4 and 3 percentage points, respectively, compared with early 2010. With a share of 6.5% in lending to households for house purchase, actors outside the banking system – such as insurers – play a comparatively minor role.

The trend towards longer interest rate lock-in periods when taking out loans for house purchase has continued. Since the start of the upturn on the German housing market in 2010, the share of loans for house purchase with an interest rate lock-in

The trend towards longer interest rate lock-in periods when taking out loans for house purchase has continued.

¹⁷ See International Monetary Fund (2017), p 58.

period of over ten years has risen from roughly 26% of all loans for house purchase to around 44% in the third quarter of 2017 (measured by the volume of new business; see Chart 3.7). This has lowered households' interest rate risk. By contrast, credit institutions have expanded the interest rate risk on their balance sheets.

On the basis of the available data, it cannot be concluded that credit standards have been eased considerably. The results of the 2017 low-interest-rate survey do not point to substantially higher loan-to-value ratios in the funding of house purchases. Analyses by market participants likewise reveal comparatively steady average loan-to-value ratios.¹⁸

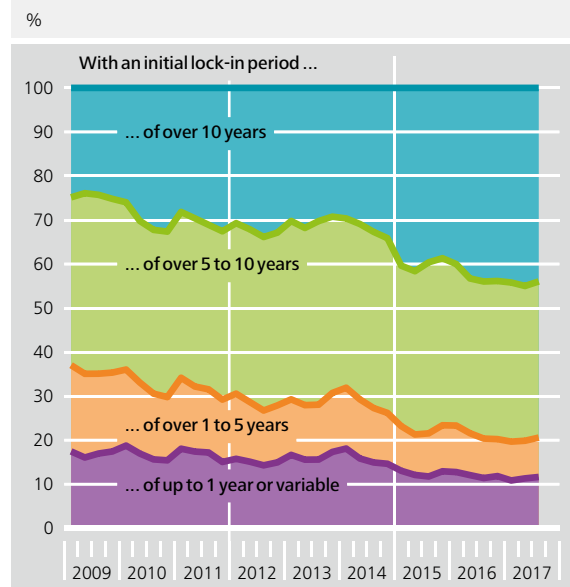
It cannot be concluded that credit standards have been eased considerably.

Furthermore, the data from the low-interest-rate survey show that the initial amortisation rates for new lending between 2014 and 2016 rose slightly on average from 3.6% to 3.8%. In the same period, however, average interest rates fell from 2.4% to 1.7%, while loan amounts rose from an average of €92,000 to €110,000. This would suggest that borrowers have used the available financial leeway to pay higher house prices with larger loan amounts. The granting of higher loans implies an easing of credit standards if it has an adverse effect on borrowers' debt sustainability and, at the same time, the higher credit risk is not offset by higher lending rates.

In the Eurosystem's quarterly Bank Lending Survey (BLS), the 34 institutions surveyed in Germany stated that they had narrowed their interest margins on loans for house purchase on balance in the first three quarters of 2017. The results of the low-interest-rate survey reveal that interest margins were already in decline in the period from 2014 to 2016. Narrowing margins contribute to a build-up of risk

Interest rate lock-in periods for loans for house purchase issued to households in Germany*

Chart 3.7



* Calculated as domestic banks' volume of new business with respective rate fixation periods as a share of total new business (also including extensions).
 Deutsche Bundesbank

if insufficient attention is paid to credit risk. However, due to a lack of collected data, it is not possible to provide a detailed analysis of changes in credit standards using loan microdata (see also the box entitled "Assessment of the implementation of the German Financial Stability Committee's recommendation on new instruments in the area of housing loans" on pages 54 to 56).

Stress tests show sufficient bank capitalisation for shock on the residential real estate market

Stress tests can provide further clues as to how far vulnerabilities and risks have built up in the wake of the latest developments on the housing market.

¹⁸ For further details, see, inter alia, the information from the EUROPACE trend indicator for loans for house purchase. Analyses conducted by EUROPACE are based on data on loan applications received by enterprises.

Using statistical models and looking at loans for house purchase in isolation, it is possible to estimate the economic losses to be expected in the housing loan portfolio in an adverse macroeconomic scenario.

On the basis of granular data taken from the low-interest-rate survey, a microprudential stress test focused on housing was carried out for all non-significant German institutions.¹⁹ These include, *inter alia*, all banks whose total assets do not exceed €30 billion. They represent around 88% of all banks in Germany and are largely composed of savings banks and credit cooperatives. The underlying data reflect these institutions' risk positions in the housing loan segment as at the end of 2016. They provide, *inter alia*, information on probabilities of default and collateralisation ratios.

Two different scenarios are taken into account, each with a projection horizon of three years. In the first scenario, it is assumed that house prices slump by up to 20%. In the second adverse scenario, they drop by as much as 30%. The decline in prices is also accompanied by consistent dynamics of other important macroeconomic variables. A broad-based economic slump is modelled in this connection. While the adverse development of the macroeconomic variables increases the probability of mortgage defaults, the steep decline in prices causes losses given default to rise and loan collateral to lose value due to falling prices. The banks are subsequently faced with losses arising, in particular, from higher write-downs.

In the stress test, banks' own funds ratios are also adversely affected by the rise in risk-weighted assets and the fall in mortgage interest income.

A considerable heterogeneity of the stress impact is apparent at the individual bank level.

All in all, the estimated losses, the increase in risk-weighted assets and the decline in

interest income in the first and second adverse scenarios reduce the aggregate common equity tier 1 (CET1) capital ratio by 0.5 percentage point and 0.9 percentage point, respectively. In this context, a considerable heterogeneity of the stress impact is apparent at the individual bank level. Around one-third of capital losses is due to the increase in risk-weighted assets and the lower interest income. The rest is the result of higher write-downs. The results show that non-significant institutions have sufficient capital to absorb a shock emanating from the housing market.

An additional housing stress test for the German banking system as a whole produces similar results.²⁰ The model is based, *inter alia*, on regularly collected bank-level data for both non-significant and significant institutions as well as regionally differentiated housing price data for the 401 administrative districts in Germany. This ensures that regional differences in price developments are explicitly taken into consideration. Once again, the estimates are based on the macroeconomic scenarios presented above. It is assumed that house prices across Germany decline by up to 20% and 30%, respectively. In this model, too, probabilities of default and losses given default on loans for house purchase rise as a result of the adverse shocks.

The model estimates the losses that would be incurred by a bank in the wake of an adverse shock owing to write-downs on its loans for house purchase. On aggregate, the decline in the CET1 capital ratio for the entire banking system amounts to just under 0.4 percentage point in the first scenario. In the second adverse scenario, the CET1 capital ratio falls by around 0.6 percentage point. Overall, the estimation results suggest that the German banking

¹⁹ See T Siemsen and J Vilsmeier (2017).

²⁰ For the methodology, see N Barasinska, P Haenle, A Koban and A Schmidt (2017).

sector as a whole has sufficient own funds to withstand an isolated shock on the housing market.

However, stress tests focusing exclusively on loans for house purchase provide no more than a limited estimate of how a housing market crisis would ultimately affect the stability of the financial system. For instance, they do not capture any contagion effects on other exposure classes or institutions. For the assumed scenarios, the results of the stress tests thus tend to represent a lower bound in terms of the possible implications.

Even though overvaluations of residential real estate have become more widespread, the available information does not, overall, currently point to any immediate risks to financial stability stemming from residential real estate financing. If there were to be a significant build-up of risk on the German housing market in future, there would also be macroprudential instruments available from this year to counter it (see also the box entitled “Assessment of the implementation of the German Financial Stability Committee’s recommendation on new instruments in the area of housing loans” on pages 54 to 56).

No indications of a build-up of systemic risk stemming from commercial real estate

Commercial real estate can also be a source of systemic risk.²¹ Office and retail property prices, in particular, have risen sharply in recent years.²² The nominal prices of commercial real estate in Germany’s seven largest cities rose by 12% in 2016, following an 11.5% increase in the previous year.²³ Over the longer term, however, the increase in commercial real estate prices in Germany was below the

European average. As rents have not been going up at the same pace as prices since 2009, returns on commercial real estate have been falling. Although low returns point to a high valuation level, this development is still moderate compared with other asset classes, meaning that investment in commercial real estate is still generating comparatively high returns. The low-interest-rate environment is thus continuing to provide investors with incentives to invest in commercial real estate.²⁴

Measured by the volume of funding, banks are the biggest lenders when it comes to financing commercial real estate. In mid-2017, outstanding commercial real estate loans accounted for around 8% of German banks’ total assets. By way of comparison, outstanding loans for house purchase accounted for 16% of their total assets. The stock of domestic commercial real estate loans rose moderately overall. The stock of commercial real estate loans to non-residents in the first half of 2017 was slightly down on the same period of 2016. This was due, *inter alia*, to the reduction in loans to borrowers in the United Kingdom.

There is currently no evidence of a general lowering of credit standards. A survey of 19 banks conducted by the Bundesbank in December 2016 showed that, between 2013 and 2015, the loan-to-value ratio for commercial real estate loans

The available information does not, overall, currently point to any immediate risks stemming from residential real estate financing.

Survey results indicate that commercial real estate is generally conservatively financed.

²¹ See A J Levitin and S M Wachter (2013); K Olszewski (2013); and R A Cole and G W Fenn (2008).

²² See also Financial Stability Committee (2017).

²³ The commercial real estate price index published by bulwiengesa AG is a weighted aggregate of prices for offices and retail properties.

²⁴ Further information on the German commercial real estate market can be found in the Bundesbank’s System of indicators, which is available at www.bundesbank.de/commercial_property

Assessment of the implementation of the German Financial Stability Committee's recommendation on new instruments in the area of housing loans

The housing market is of major importance for the stability of the German financial system.¹ Housing loans account for around 72% of household debt. Their share in the sum total of outstanding loans issued by German banks to domestic enterprises and households is roughly 51%.² Should a threat to financial stability arise in the course of a lowering of credit standards for housing loans, the capital-based macroprudential instruments available under the EU Capital Requirements Regulation and Capital Requirements Directive³ can only increase the resilience of the banking sector through additional capital requirements. The German Financial Stability Committee and international organisations have therefore recommended that a legal basis for macroprudential tools be created preventively in Germany to enable, if necessary, minimum standards to be set with regard to the granting of new housing loans in order to safeguard financial stability.⁴

On 21 December 2016, the Federal Government adopted the draft Act on the Amendment of Financial Supervisory Law (*Finanzaufsichtsrechtsergänzungsgesetz*). In line with the Financial Stability Committee's recommendation of June 2015, four instruments were envisaged:⁵

- a cap on the ratio of the sum of all debt resulting from a residential property financing transaction to the market value of the residential property concerned (loan-to-value ratio, or LTV);

- a maximum time limit for the repayment of a certain fraction of a loan and a maximum maturity for bullet loans repaid in full at the end of their term (amortisation requirement);
- a cap on the ratio of the total servicing of all a borrower's debts (interest payments and principal repayments) to the borrower's income (debt-service-to-income ratio, or DSTI);
- a cap on the total debt of a borrower in relation to the borrower's income (debt-to-income ratio, or DTI).

The German Bundestag adopted the draft Act on the Amendment of Financial Supervisory Law on 30 March 2017 on the basis of the recommendation made by the Finance Committee of the Bundestag. The Act that entered into force on 10 June 2017 created a legal foundation for

¹ For more information, see also Deutsche Bundesbank, Financial Stability Review, November 2016, pp 22-24.

² These figures are based on data for the first quarter of 2017 and comprise loans to domestic enterprises and households excluding holdings of negotiable money market paper and securities.

³ See Capital Requirements Regulation (CRR) and Capital Requirements Directive IV (CRD IV).

⁴ See Financial Stability Committee, Recommendation on new instruments for regulating loans for the construction or purchase of residential real estate, 30 June 2015, as well as the recommendations of the International Monetary Fund, the Financial Stability Board and the European Systemic Risk Board.

⁵ See Federal Government, Draft Act on the Amendment of Financial Supervisory Law in the Area of Measures in the Event of a Threat to the Stability of the Financial System and on the Amendment of the Implementation of the Mortgage Credit Directive (*Finanzaufsichtsrechtsergänzungsgesetz*) of 21 December 2016, available as Bundestagsdrucksache 18/10935.

two of the four instruments recommended by the Financial Stability Committee: the LTV and the amortisation requirement.⁶

In the case of a threat to financial stability, the Act makes it possible to prescribe that borrowers provide a certain minimum share of own funds in new residential property financing transactions. This can help to limit the potential losses for lenders if a loan default results in residential property being subject to foreclosure. With a (minimum) amortisation requirement, the borrower can be required to pay back at least a certain part of a new loan within a specified period of time. This reduces the lender's potential loss should the borrower default on the loan. Both instruments therefore primarily aim to limit the losses that could arise in the event of a default. However, they only indirectly – and to a much lesser extent than the income-related instruments – influence the likelihood of a default occurring further down the line.

This is why the Financial Stability Committee recommended that all four instruments be implemented, as the income-related instruments also take the borrower's debt sustainability into account, which in turn determines whether a household will be able to service a loan over its entire term.⁷ In the event of a credit-driven housing price boom building up, the strong price dynamics allow higher absolute loan amounts to be achieved while keeping the LTV constant. This is because when, in the case of a residential property financing transaction, the loan volume and the market value of the property to be financed increase proportionately, the LTV does not change. Given that, in this situation, borrowers' income is, on average, unlikely to keep up

with property price developments, the higher loan amounts reduce households' debt sustainability, whereas the loan collateral might possibly be overvalued. Much the same applies in the case of the amortisation requirement, with the Financial Stability Committee arguing that the macroprudential effect of the amortisation requirement can only be fully realised if it is used in combination with the income-related instruments.

By opting not to implement the income-related instruments, the effectiveness and efficiency of macroprudential policy measures are likely to be reduced. This is because income is a significant factor in determining debt sustainability. Income-related instruments such as those already used in other euro area countries can therefore help to combat the emergence of potential systemic housing crises in a target-oriented manner. Thus, there is still a need for income-related instruments as suggested in the Financial Stability Committee's recommendation. Experiences of other countries also show that, during the course of a boom in the housing market, it may become necessary to deploy additional instruments (eg income-related measures) to supplement measures that have already been in place for longer periods of time (eg LTV requirements).⁸

⁶ See Federal Law Gazette I (Bundesgesetzblatt) 2017, No 34, Bonn, 9 June 2017, pp 1495 ff.

⁷ See Financial Stability Committee, op cit.

⁸ For the example of Sweden, see Swedish Ministry of Finance, Response to the warning of the European Systemic Risk Board on medium-term vulnerabilities in the residential real estate sector of Sweden (ESRB/2016/11), November 2016, as well as International Monetary Fund, 2017 Article IV Consultation with Sweden – IMF Mission Concluding Statement, September 2017.

Macroeconomic information alone is not sufficient for analyses that aim to assess the risk situation and thus the need for intervention, nor is it sufficient for impact analyses prior to deployment as a means of selecting and calibrating the instruments or to assess the consequences of using an instrument. Relevant disaggregated data are required for this purpose in order, for example, to more closely examine the impact of using an instrument.

In a second recommendation, the Financial Stability Committee therefore called on the Federal Government to create a legal basis for the regular collection of data on housing loans.⁹ Considering the possibility of a regulation at the European level, the Federal Government has refrained from implementing this recommendation at the national level for the time being.¹⁰ Reference should be made here, in particular, to the relevant initiatives of the European Central Bank and the Eurosystem resulting from the recommendation of the European Systemic Risk Board on closing the data gaps in the oversight of residential and commercial real estate markets.¹¹

The non-implementation of the Financial Stability Board's data recommendation has repercussions for macroprudential surveillance and the analyses required in the event of a potential deployment of the instruments. For example, the Eurosystem's quarterly survey on commercial banks' lending policies (Bank Lending Survey, or BLS), which is designed exclusively for the purpose of monetary policy analyses, does not provide sufficient information for macroprudential purposes. By contrast, the systematic analysis of data provided by private market participants¹²

does, in principle, allow developments in credit standards for housing loans to be assessed in the regular macroprudential monitoring process. However, the information provided by private market participants is not necessarily meaningful for the economy as a whole, nor is it available in the required frequency or granularity. In other countries where such instruments are used, as recommended by the Financial Stability Committee, the data situation is significantly better.¹³

In the case of a potential deployment of these instruments and an analysis of their impact, it will therefore have to be taken into account that the relevant data will not yet be available in the quantity and quality recommended by the Financial Stability Committee. Also, the use of special surveys as a measure of last resort, especially in the run-up to a potential deployment of the instruments, cannot fully make up for this lack of information.

⁹ See Financial Stability Committee, *op cit.*

¹⁰ See Federal Government, *op cit.*

¹¹ See European Systemic Risk Board, Recommendation of the European Systemic Risk Board on closing real estate data gaps (ESRB/2016/14), October 2016.

¹² For further details, see, *inter alia*, the information from the EUROPACE trend indicator for housing loans.

¹³ See, *inter alia*, Central Bank of Ireland, Review of residential mortgage lending requirements, November 2016.

remained essentially constant, moving, on average, at a moderate level. The survey results on the debt service coverage ratio also indicate that commercial real estate is generally conservatively financed. Nevertheless, banks are willing, in principle, to accept lower margins because the risk-return profile of commercial real estate is still considered attractive compared with that of alternative investments.

Analyses based on the available data therefore do not point to emerging systemic risks to financial stability on the commercial real estate markets at present. Future cyclical developments are likely to depend even more strongly on further interest rate movements than is the case for the housing market, as investors in the commercial real estate market are guided, in particular, by the return-interest rate differential.

Structural change in the financial system

The structure of the financial system is constantly changing owing, for instance, to technological progress and competition. This can alter transmission channels, which are important, not least, in the context of financial stability analysis.

The financial accounts provide a data basis for the sectoral analysis of the financial system. Measured

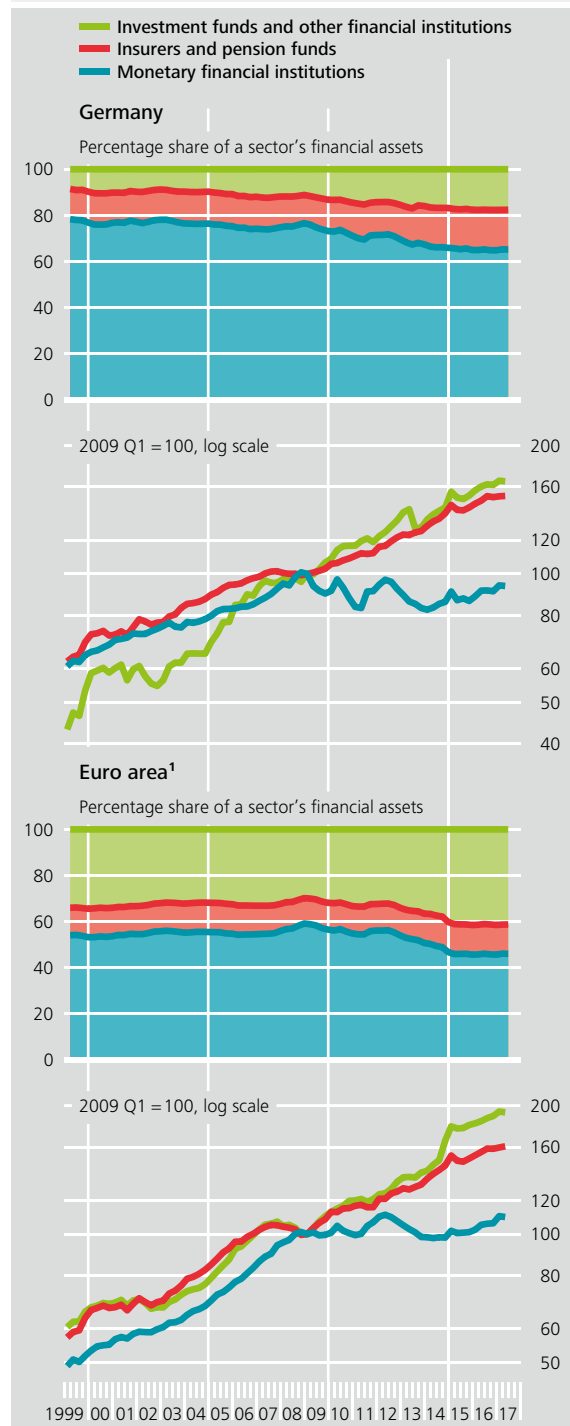
The monetary financial institutions sector in Germany became relatively less important after the crisis.

by financial assets, it is apparent that the monetary financial institutions (MFI) sector in Germany became relatively less important after the crisis

(see Chart 3.8). There is a similar finding for the euro area as a whole.

Financial assets of the financial system, by sector

Chart 3.8



Sources: Eurostat, financial accounts and Bundesbank calculations.
 1 Composed of 19 member states.
 Deutsche Bundesbank

This can be put down to the fact that the value of financial assets held by the MFI sector has been stagnating since 2009, while the value of the other sectors' financial assets has continued to grow since the crisis. Notwithstanding this, the MFI sector's share of total financial assets remains high, especially in Germany.

The aftermath of the global financial crisis saw a trend break in the development of the MFI sector's holdings of financial assets, both in Germany and the euro area as a whole. The banking sector has scaled back its liabilities as part of a general process of deleveraging. The banks have become less interconnected.²⁵

The growing significance of the non-MFI sectors in Germany is attributable, first, to increases in the value of assets managed by investment funds, insurers and pension funds, which have been driven by general market developments.²⁶ Second, sector-specific factors have contributed to growth. Large single premium policies represent a major driver in the insurance and pension sectors. If these were to dry up, growth in this sector would probably become weaker. A lengthening of the intermediation chain can be observed in the investment fund sector. Funds are investing more heavily in other funds, thereby increasing the sector's financial assets. Greater direct interconnectedness has led to growing mutual dependencies between investment funds, increasing the risk of a systemic liquidity crisis.²⁷

Furthermore, an increasingly significant driver of structural change is digitalisation. Technological financial innovations (FinTech) are gaining in importance. The implications of this for financial stability are difficult to assess,

An increasingly significant driver of structural change is digitalisation.

however, given the early stage of innovation, the endogenous adjustments of established financial

intermediaries and the inadequate data situation (see the box entitled "Supervisory and regulatory issues relating to FinTech in a financial stability context" on pages 59 and 60).

Given the United Kingdom's decision to leave the European Union, further structural changes in the European financial system may be expected over the next few years. In the euro area, central counterparties could gain in significance. There could also be growth in the number of foreign subsidiaries of banks with an international focus. The resulting medium to long-term implications of how risks shift between individual national financial systems are all but impossible to predict. These will hinge, in particular, on the exit arrangements and future legal relationships between the United Kingdom and the European Union.

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²⁵ For further details, see also pp 75 ff of the chapter entitled "Risks in the banking sector".

²⁶ In the financial accounts, the lion's share of financial assets are marked to market. This makes it possible to capture valuation effects that, for instance, are not recognised under insurers' accounting rules pursuant to the Commercial Code.

²⁷ For further details, see also pp 88 ff of the chapter entitled "Risks for insurers, pension institutions and investment funds".

Supervisory and regulatory issues relating to FinTech in a financial stability context

Technology-enabled financial innovation (FinTech) is seeing dynamic growth. To date, FinTech has played a fairly minor role in most market segments of the financial system; however, its significance is likely to increase markedly in the next few years. From a macroprudential perspective, it therefore seems appropriate to monitor FinTech from an early stage.

Classifying FinTech innovations by their respective economic function is helpful for the identification of potential risks.¹ In addition, they should be analysed in terms of their potential to become disruptive or to contribute to decentralisation or disintermediation. As part of this analysis, regulators should also consider the benefits and drawbacks of different regulatory strategies, including, *inter alia*, when and how possible regulatory changes might be made – ie following a principles-based or a rules-based approach, for example. Another question to be answered is whether it would make sense to implement a harmonised solution at the international level.²

In its 2016 *Financial Stability Review*, the Bundesbank suggested developing criteria which could enhance the regulatory framework.³ In June 2017, the Financial Stability Board (FSB) published a report commissioned by the G20 which explores the foremost supervisory and regulatory issues raised by FinTech that merit authorities' attention.⁴ That report's findings were endorsed by the G20 leaders at their Hamburg summit in July 2017 and thus represent a mandate for action for G20 members.

In its report, the FSB – in connection with undertaking regular risk assessment and developing microprudential and macroprudential regulatory frameworks – identifies three priority areas for international supervisory cooperation. One is to investigate whether the regulatory framework is appropriate to manage operational risks from third-party providers to financial institutions, including cross-border services, such as in cloud computing. Second, and no less important, is to forge an internationally coordinated approach to mitigating cyber risks.⁵ This involves preparing *ex ante* contingency plans, sharing information and monitoring risks on an ongoing basis. Third, the FSB recommends monitoring the macrofinancial risks that can emerge from FinTech activities. National authorities should enhance their analytical capacity in both staffing and technical terms, and improve the data basis to facilitate an adequate level of monitoring.

The FSB report continues by identifying other issues that merit authorities' attention in future. One addresses cross-border legal issues and regulatory arrangements, particularly with respect to cross-border lending, trading and payment

¹ See, for example, Deutsche Bundesbank, *Financial Stability Review*, November 2016, pp 68-69.

² See A Minto, M Voelkerling and M Wulff, *Separating apples from oranges: identifying threats to financial stability originating from FinTech*, *Capital Markets Law Journal*, Vol 12, No 4, pp 428-465, October 2017.

³ See Deutsche Bundesbank, *op cit*, p 76.

⁴ See Financial Stability Board, *Financial stability implications from FinTech – supervisory and regulatory issues that merit authorities' attention*, June 2017.

⁵ For more information on cyber risks and financial stability, see Deutsche Bundesbank, *op cit*, pp 27-28.

transactions. The recommendations mainly relate to smart contracts and other applications of distributed ledger technology, the legal validity and enforceability of which have so far been highly uncertain.⁶ Another is that outstanding governance and disclosure issues in connection with big data analytics need to be resolved. In addition, authorities should not only review the regulatory perimeter regularly but should also update it on a timely basis. Another issue which

merits authorities' attention in the FSB's view is shared learning with other authorities and the private sector. The last issue identified concerns digital currencies, where the FSB recommends monitoring developments and conducting further analyses. This might involve assessing digital currencies' implications for monetary policy, financial stability or the global monetary system, for example.

⁶ A distributed ledger is a decentralised ledger system that records transactions between users without the need for a central party to authorise each individual transaction. One example of this is the blockchain technology used for digital currencies.

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■ Risks in the banking sector

Ten years after the global financial crisis began, the long period of low interest rates and a favourable macroeconomic environment now characterise the situation in the German banking sector. In recent years, these underlying conditions have been one of the main reasons why banks' risk provisioning has reached a historic low, boosting profitability.

The capitalisation of banks in Germany is now significantly better than before the crisis. This is especially true for the tier 1 capital ratio used for supervisory purposes, which is calculated in terms of risk-weighted assets. That said, the risk weights used to calculate risk-weighted assets may underestimate systemic risks, especially in the case of systemically important financial institutions.

The current period of economic growth and low interest rates harbours the danger that banks tend to underestimate credit risk. Moreover, banks have expanded their maturity transformation in recent years, causing interest rate risk to increase. If net interest income remains muted due to persistently low interest rates, there is the incentive to take on more risk and to increase maturity transformation even further. If interest rates were to rise abruptly, ie unexpectedly fast and sharply, this could result in considerable losses on market-valued assets and an increase in funding costs.

Interconnectedness between German banks decreased in the years following the global financial crisis. The unconventional monetary policy measures taken by the Eurosystem are likely to have been a reason for this decrease in addition to regulatory changes and improved access to alternative funding. The immediate contagion effects in the banking system caused by a negative shock are expected to be lower as a result. At present, it is not possible to assess how long this development will last.

The risk situation in the German banking sector

German banks have once again benefited this year from a series of positive developments in their business environment, with the general economic situation developing favourably of late. The positive economic momentum, the favourable labour market situation and the solid financial situation of households have been instrumental in keeping default rates for loans and risk provisioning low.

Default rates for loans and risk provisioning remain low.

However, two contrasting developments characterise banks' profitability. On the one hand, the positive trend from previous years has continued; for many institutions, a historically favourable net valuation result has been a mainstay of profitability.^{1,2} On the other, the ongoing low-interest-rate environment is depressing profits in traditional deposit and lending business, especially since banks are limited in the extent to which they can pass interest rate reductions on to depositors at the zero lower bound. On the whole, this is putting increasing pressure on margins at many banks.

There is increasing pressure on margins at many banks.

Meanwhile, the ongoing economic recovery in the euro area is supporting an increase in long-term interest rates. Should interest rates rise gradually, it is likely that banks' interest margins would recover over time, all other things being equal. Nevertheless, the current favourable setting conceals the potential for setbacks. For instance, risk premiums and thus interest rates could rise abruptly, ie unexpectedly fast and sharply, even independently of policy rates. This scenario could occur, for example, if political risks were to crop up in the interna-

tional environment.³ If this type of scenario were to coincide with an economic downturn, steep rises in funding costs could be accompanied by an increase in credit defaults.

In a protracted period of low interest rates with a relatively flat yield curve, banks' net interest income would come under even greater pressure, however. This would give credit institutions a stronger incentive to take greater risks in order to stabilise their profits.

Capitalisation significantly better than before the crisis

German banks strengthened their capital base in the years that followed the crisis (see Chart 4.1). Tier 1 capital ratios (the ratio of tier 1 capital to risk-weighted assets) therefore rose within nine years from 9% on average in the first quarter of 2008 to 16.6% in the second quarter of 2017. The increase tended to be stronger among those banks that were less well capitalised prior to the crisis.

While tier 1 capital increased for all categories of banks, growth among smaller and medium-sized banks, especially among savings banks (+104%) and credit cooperatives (+125%), was signif-

Tier 1 capital growth among smaller and medium-sized banks is significantly stronger than for large banks.

¹ For further details, see the chapter entitled "Risk situation of the German financial system" on pp 39-61.

² Individual big banks and Landesbanken are exceptions to this. Their risk provisioning rose sharply in 2016, which was largely attributable to very high impairments in the shipping loan portfolios.

³ For further details, see the chapter entitled "The international environment" on pp 17-37.

icantly stronger than for large banks (+14%) (see Chart 4.2).⁴

By contrast, large banks reacted to the stricter capital requirements by reducing their risk-weighted assets more substantially (by 39%) (see Chart 4.3).⁵ Part of this decrease can be explained by lower credit risk or shifts to lower-risk assets, though most of it was due to balance sheet reduction. Meanwhile, savings banks, credit cooperatives, regional and other commercial banks continued

Large banks have scaled back their risk-weighted assets more substantially.

to expand both their loans to the real economy and their risk-weighted assets overall. Banks that increased their tier 1 capital more strongly compared to the median bank tend to record greater growth in their loans to the real economy.⁶

Improved capitalisation also due to low risk provisioning

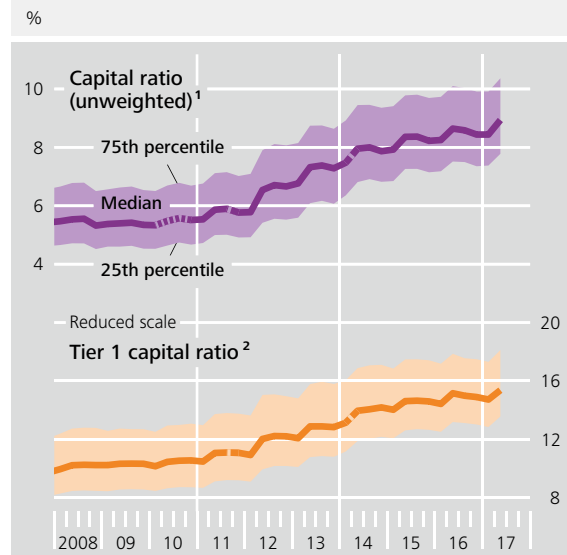
The upbeat economic environment helped credit institutions to increase their capital ratios. Banks benefited particularly from favourable valuation

⁴ Note that for many institutions in the savings bank sector and the regional institutions of credit cooperatives, especially in 2011 in preparation for Basel III, (hidden) reserves held pursuant to section 340f of the German Commercial Code (Handelsgesetzbuch) were reallocated to (disclosed) reserves held pursuant to section 340g of the German Commercial Code. The reserves held pursuant to section 340f are only recognised as regulatory tier 2 capital, while the reserves held pursuant to section 340g are classed as tier 1 capital. Although this reallocation alters the liability structure within the institutions, it only amounts to a redistribution of the reserves in terms of the institutions' loss absorbency capacity. As a result, the increase in tier 1 capital in recent years cannot be interpreted entirely as an increase in financial resources. See Deutsche Bundesbank (2012b), pp 27-28.

⁵ Large banks are the 12 major German banks with an international focus which did not outsource positions to resolution agencies. Since the third quarter of 2016, the category only includes 11 banks owing to a merger. As of mid-2017, this category of institutions accounted for around 44% of the total assets of all German banks.

⁶ This observation is in line with the findings of empirical studies. See L Gambacorta and H S Shin (2016).

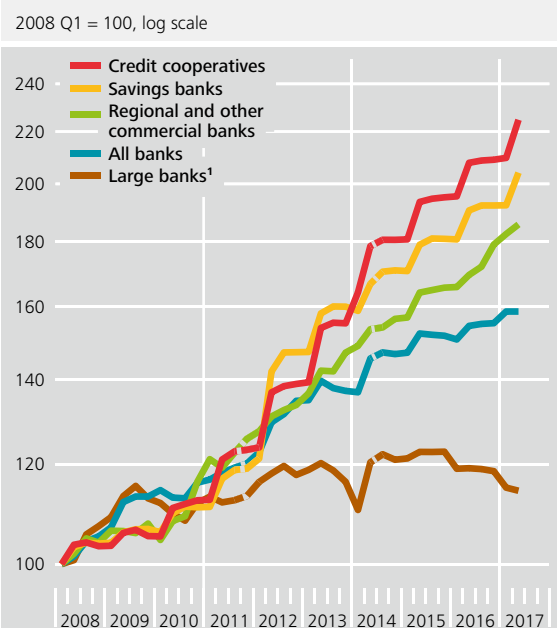
Capitalisation of German banks* Chart 4.1



* In 2011 and 2014, the valuations of tier 1 capital and risk-weighted assets changed as a result of Capital Requirements Directives CRD III and CRD IV. ¹ Tier 1 capital in relation to total assets; transitional period in 2010 pursuant to the Accounting Law Modernisation Act (Bilanzrechtsmodernisierungsgesetz). ² Tier 1 capital in relation to risk-weighted assets.

Deutsche Bundesbank

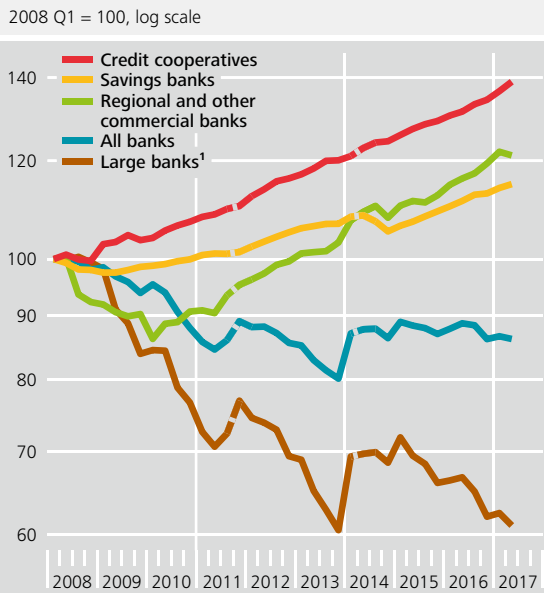
Tier 1 capital by categories of banks* Chart 4.2



* Change in valuation in 2011 and 2014 as a result of Capital Requirements Directives CRD III and CRD IV. ¹ 12 major German banks with an international focus which did not outsource positions to resolution agencies in the observation period.

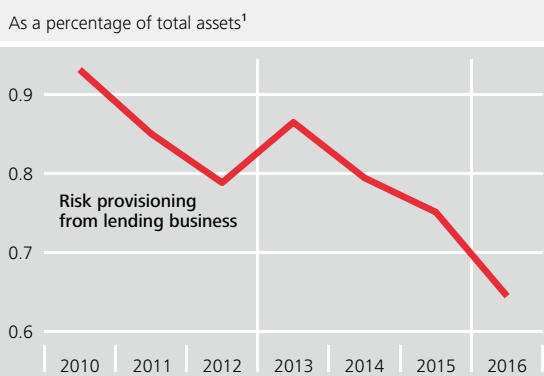
Deutsche Bundesbank

Risk-weighted assets by categories of banks* Chart 4.3



* Change in valuation in 2011 and 2014 as a result of Capital Requirements Directives CRD III and CRD IV. ¹ 12 major German banks with an international focus which did not outsource positions to resolution agencies in the observation period.
 Deutsche Bundesbank

Risk provisioning of German banks Chart 4.4



¹ Accounting-related increase in aggregate total assets in 2011 owing to the Accounting Law Modernisation Act (Bilanzrechtsmodernisierungsgesetz).
 Deutsche Bundesbank

results and low risk provisioning in recent years (see Chart 4.4).⁷ This development particularly reflects the current low corporate insolvency rate (see Chart 3.2 on page 41) and thus ultimately the favourable economic conditions in Germany. A large proportion of the profits that were boosted by this devel-

opment was used to further strengthen tier 1 capital through profit retention, which is a key source for German banks when building up capital.

Because banks generally take their bearings from the developments of previous years when determining their credit risk provisioning, however, there is the danger that they are systematically underestimating risks in this current economic upturn and prolonged period of low interest rates. Banks' seemingly rather strong resilience at present may therefore prove to be overly optimistic. Unexpected, abrupt corrections to asset prices as well as inter-

Banks' seemingly rather strong resilience at present may prove to be overly optimistic.

est rate changes could put significant strain on capital. Should the economy cloud over unexpectedly, banks' resilience could be further weakened. This would be the case if the current low impairments were to rise excessively sharply and quickly. Low default rates in lending business therefore should not tempt banks into dismantling the resulting capital buffers through profit distributions, for example.

Risk weights of systemically important institutions may underestimate systemic risks

From a microprudential perspective, an adequate capital level is determined not least by the tier 1 capital ratio, which is measured as the ratio of regulatory capital to the total risk exposure amount. This in turn is calculated from the total own funds requirements for individual exposure amounts, which are assigned various risk weights depending on how risky they are. When calculating the risk-weighted exposure amounts for credit risk, institutions may choose

⁷ For more details on the significance of the valuation result for German banks' operating result, see Deutsche Bundesbank (2016), pp 37-40.

between two methods. First, there is the standardised approach, in which the risk weights are largely determined by regulatory parameters (credit risk standardised approach, or CRSA). Second, there is an approach that allows banks to use their own risk models (internal ratings-based approach, or IRBA).⁸

Larger, systemically important institutions, in particular, generally choose the IRBA to determine their risk-weighted exposure amounts, while the bulk of smaller, less systemically important institutions use the CRSA.⁹ Currently, around 68% of the aggregate risk positions of other systemically important institutions (O-SIIs) are evaluated based on internal

Around two-thirds of the aggregate risk positions of O-SIIs are evaluated based on internal models.

models. By contrast, in the case of less systemically important institutions, this number is only 18%.

The use of banks' internal risk models for regulatory purposes gives institutions the advantage of being able to better depict their individual risk structure. To incentivise the use of a more risk-sensitive model, the average risk weights of the exposure amounts calculated in this way are usually lower than in the CRSA, however. They also react more strongly to macroeconomic developments.¹⁰

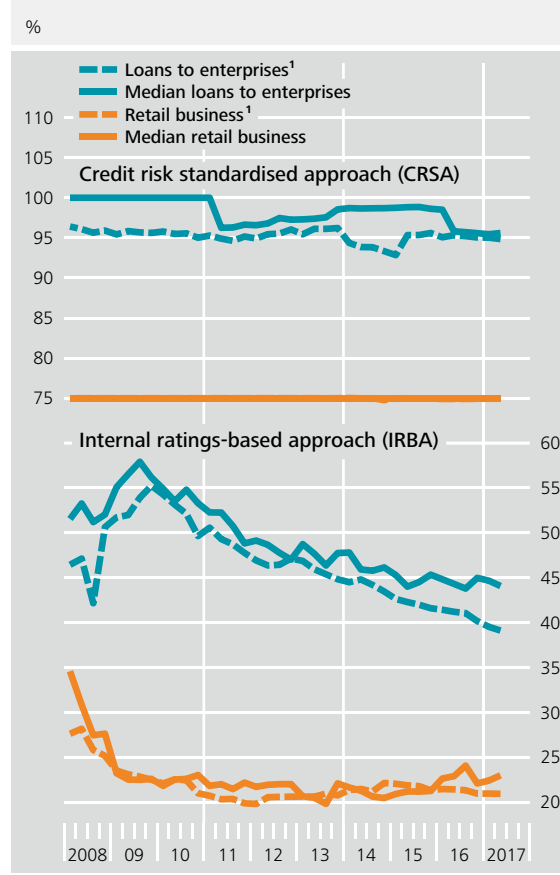
The favourable economic situation is reflected not least in the falling corporate insolvency rates and ultimately in a lower level of credit risk. This is why the IRBA risk weights for loans to enterprises and in retail business fell sharply in recent years.

The IRBA risk weights for loans to enterprises and in retail business fell sharply.

By contrast, the average risk weights of the corresponding CRSA exposure classes have

changed little over time (see Chart 4.5).¹¹ The danger of potentially underestimating the risks that may arise from unexpected macroeconomic developments therefore mainly concerns the risk-weighted exposure

Average risk weights of German banks for loans to enterprises and in retail business* Chart 4.5



* The risk weights can be calculated using two approaches: the CRSA, or the IRBA, which allows banks to use their own risk models. ¹ Aggregated across all bank microdata.
 Deutsche Bundesbank

amounts of IRBA exposure classes and thus, owing to the greater use of the IRBA, to a larger extent the capital ratios of systemically important institutions.

⁸ Banks can only apply the IRBA following examination and approval by supervisory authorities.

⁹ Systemically important institutions include global systemically important institutions (G-SIIs) and other systemically important institutions (O-SIIs). Currently, 13 institutions are designated as O-SIIs in Germany. Deutsche Bank is also designated as a G-SII.

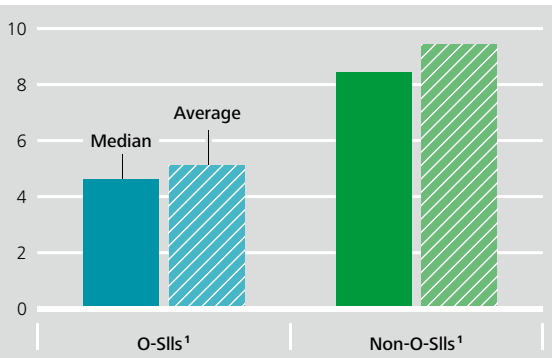
¹⁰ An exception to this is exposure to the public sector, which is generally given a risk weight of 0% in the CRSA.

¹¹ It should be noted that the levels of the risk weights in the two approaches considered cannot be compared directly because they refer to exposure amounts that have been calculated differently.

Common equity tier 1 capital

Chart 4.6

As a percentage of total assets, as at 2016 Q4



¹ Number of observations: 13 O-SIs (other systemically important institutions) and 1,580 non-O-SIs.
 Deutsche Bundesbank

Risk weights also fail to take into account systemic risks in particular, which may result, for example, from an institution's integration within the bank-

A potential under-estimation of the risks would be mirrored in the systemic capital buffers.

ing system and its risk concentrations. These systemic risks that may emanate from a bank should be covered by additional institution-specific macroprudential capital buffers.¹² However, since the buffer requirements also refer to the total risk exposure amount, the capital that has to be held on account of the buffer depends on the underlying risk weights. A potential underestimation of the risks because of the current low default rates would therefore also be mirrored in the banks' systemic capital buffers.¹³ The lower the average risk weight that provides the basis for determining the risk-weighted exposure amount

On balance, the unweighted capital ratios of the O-SIs are lower than for non-systemically important institutions.

across all assets in the balance sheet, the lower the buffer's capital impact.¹⁴ At present, the average risk weight for systemically important institutions

is smaller than for non-systemically important institutions. This difference is partly caused by different portfolio structures. For example, O-SIs on average have a larger exposure to the public sector, which is valued with a lower risk weight. However, the greater use of internal models and the risk weights in the corporates and retail exposure classes, which are lower compared to the CRSA and have fallen more sharply in recent years on account of cyclical effects, also contribute to this difference. On balance, the unweighted capital ratios (the ratio of common equity tier 1 capital to total assets) of the O-SIs are significantly lower than those of non-systemically important institutions, despite the former having stricter capital requirements (see Chart 4.6).¹⁵ Risks resulting, for example, from an unexpected deterioration in economic activity could be insufficiently covered by the capital ratios.

To prevent a potential underestimation of risks in the risk-weighted minimum capital requirements, a minimum leverage ratio is also envisaged in banking regulation. The Basel Committee on Banking Supervision (BCBS) is currently examining whether this minimum value should be increased for global systemically important institutions (G-SIs).¹⁶ Similar considerations could also be pushed for in the European context for O-SIs. Limits to the internal models, as are currently being considered in the Basel

¹² See Deutsche Bundesbank (2013), p 99.

¹³ Empirical studies have found evidence that institutions permitted to apply internal models systematically underestimate default risk. See T Berg and P Koziol (2017), and M Behn, R Haselmann and V Vig (2016). The Director of the Monetary and Capital Markets Department at the International Monetary Fund likewise makes reference to the potential of risk weights being too low as a result of internal models. See also T Adrian and A Narain (2017).

¹⁴ The average risk weight is calculated as the ratio of risk-weighted assets to total assets.

¹⁵ The group of non-systemically important institutions includes all German non-systemically important institutions for which it was possible to calculate risk weights at the level of individual exposure classes.

¹⁶ See Basel Committee on Banking Supervision (2016a).

III negotiations, would also strengthen the capital impact of macroprudential buffers.¹⁷

Harmonisation of capital buffers for systemically important institutions in Europe desirable

Since 2016, it has been possible for systemically important institutions to be assigned additional capital buffers to cover the risks they pose to the financial system as a whole. In Germany, these capital buffers have been phased in incrementally for G-SIIs since the beginning of 2016 and for O-SIIs since the beginning of 2017.

A uniform and binding international methodology is in place to identify institutions as G-SIIs and to set the corresponding capital buffers. By contrast, O-SIIs, ie those institutions that are systemically important to the national or European financial system, fall under the responsibility of the relevant supervisory authority. This authority can take into account particular features of the national financial system when they identify institutions as O-SIIs and set capital buffers.

To encourage a harmonised single market and to guarantee the same competitive conditions, the European Banking Authority (EBA) issued guidelines on how to identify O-SIIs. So far there has been no equivalent harmonising framework for determining the capital buffers. As a result, in practice there is

Systemic risks in individual countries are not sufficiently covered by the O-SII buffer.

wide variation in how national supervisory authorities apply this instrument and how high they calibrate it. Currently, the O-SII buffer can also only be imposed at up to 2% of an institution's risk-weighted assets. The O-SII buffer cap set out in European law means that systemic risks in individual countries cannot be sufficiently covered by the O-SII buffer and that other macroprudential instruments are

used in place of or in addition to the O-SII buffer, such as the systemic risk buffer.

For reasons of consistency and to evaluate a measure's efficiency appropriately, it is generally desirable for systemic risks emanating from O-SIIs to be sufficiently covered by the envisaged instrument. It would therefore make sense to scrap the cap on the O-SII buffer at the European level or at least to raise it significantly. Moreover, it would be desirable to develop and implement guiding principles for applying the O-SII buffer to encourage risk-appropriate calibration as well as competitive equality. Once these uniform principles have been introduced, it would have to be examined in all EU member states, including Germany, whether adjustments to the present methods for determining the buffers are necessary.

The cap on the O-SII buffer should be scrapped or at least raised significantly.

Significant interest rate risk

In the prevailing macroeconomic environment, the risks that arise from changes to the interest rate structure could also increase. Particularly in this period of falling interest rates, which has lasted for years now, many market participants may perceive the risk of abrupt interest rate changes to be relatively low.

In past years, banks attempted to stabilise their interest income by adjusting the maturities of their assets and liabilities.

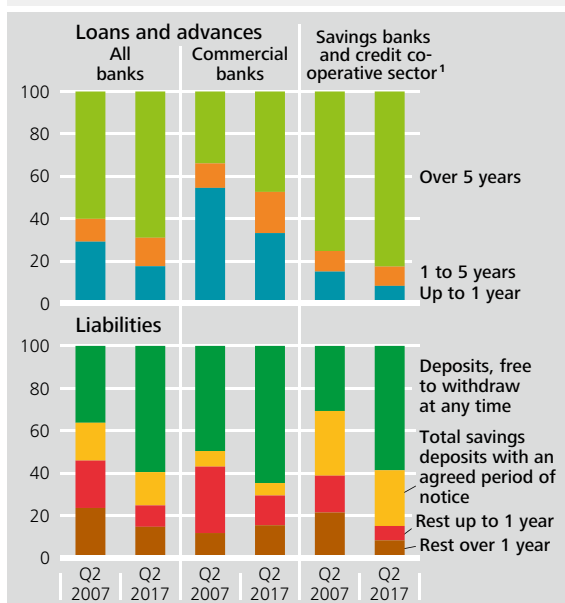
Amongst other things, they extended the maturities and the interest rate lock-in

Banks have extended the maturities and the interest rate lock-in periods of their loans.

¹⁷ In the process of finalising the Basel III reforms, there have been discussions regarding an "output floor". This rule would stipulate that the risk weights calculated on the basis of internal risk models must not fall below a given percentage of the risk weights in the standardised approach.

Maturity of loans and advances and liabilities to non-banks* Chart 4.7

Percentage shares



* According to original maturity. ¹ Primary and central institutions in the savings bank and credit cooperative sector.
 Deutsche Bundesbank

periods of their loans, whilst at the same time shortening the maturities of their liabilities.¹⁸

The share of long-dated loans and advances to non-banks has increased in particular,¹⁹ and is especially high among institutions in the savings bank and cooperative bank sector; their share of loans and advances with original maturities of over five years is significantly higher at 83% than the commercial banks' share (47%). Meanwhile, the average share of short-term, overnight deposits has also grown significantly. Their share in total liabilities to non-banks rose within ten years from 36% in the second quarter of 2007 to 60% at the current end (see Chart 4.7). Note, however, that the actual length of time short-term deposits are held is generally much longer than the contractual maturity.

At banks, both the maturity and the interest rate lock-in period are usually longer for assets than for liabilities. If the interest rate lock-in periods of assets

and liabilities diverge, the risks to financial stability that would arise from an abrupt interest rate hike could increase. The systemic importance of interest rate risk mainly stems from its tendency to impact on many banks at the same time. Credit institutions therefore have correlated risks in interest business.

Because most banks in Germany have an asset overhang for longer maturity bands, a parallel rise in the yield curve generally means that the value of assets falls more sharply than the value of liabilities. This is true of the bulk of German banks which primarily conduct lending and deposit business. Thus, the economic value of the individual institution's capital falls, as does its resilience.²⁰ If one assumes a hypothetical, positive parallel shift by 200 basis points in the yield curve, the potential net present value losses in the banking book would have risen from 7% of own funds at the end of 2011 to 10.4% by the second quarter of 2017 (see Chart 4.8).²¹ Only a small portion of banks would record value gains in this type of scenario. Even though this scenario represents an extreme event, it provides an indication of the extent and direction of interest rate risk.

Savings banks and credit cooperatives in particular have relatively high interest rate exposure. The fact that this is decreasing slightly at present is likely to be down to greater pressure from supervisory authorities, amongst other things. For instance, the Supervisory Review and Evaluation Process (SREP) recently gave a precise description of the capital requirements for interest rate risk. As a result, banks

¹⁸ Data from MFI interest rate statistics on new business indicate a rise in loan interest rate lock-in periods. For more details on interest rate lock-in periods for loans to households for house purchase, see Chart 3.7 in the chapter entitled "Risk situation of the German financial system" on p 51.

¹⁹ Non-banks include enterprises, general government, individuals and non-profit institutions.

²⁰ Not all changes in economic value have an effect on the balance sheet, however, provided that balance sheet items are not marked to market.

²¹ The analyses are based on institutions' reports for the Basel interest rate coefficient, a measure for valuing banks' interest rate risk in the banking book. See Deutsche Bundesbank (2012a), pp 51-60.

are likely to have directed more attention to this risk. That said, in the interest rate hike scenario, around 39% of savings banks and 55% of credit cooperatives would still face heightened interest rate risk

Savings banks and credit cooperatives in particular face relatively high interest rate risk.

in the second quarter of 2017. According to current regulatory standards, interest rate risk is deemed to be elevated if the present value losses exceed 20% of own funds following a 200 basis point interest rate shock. New regulatory standards will lower this threshold in future to 15% of tier 1 capital.²²

Momentum of interest rate hike crucial

An increase in interest rates affects the balance sheet's underlying value as well as interest income. In the short term, rising interest rates usually cause interest paid to increase more sharply than interest received. One-off effects also occur owing to valuation adjustments. An abrupt interest rate hike could therefore hit parts of the banking system

Rising interest rates usually cause interest paid to increase more sharply than interest received in the short term.

hard. According to the low-interest-rate survey conducted by the Bundesbank and the Federal Financial Supervisory Authority (BaFin),²³ banks expect a sustained,

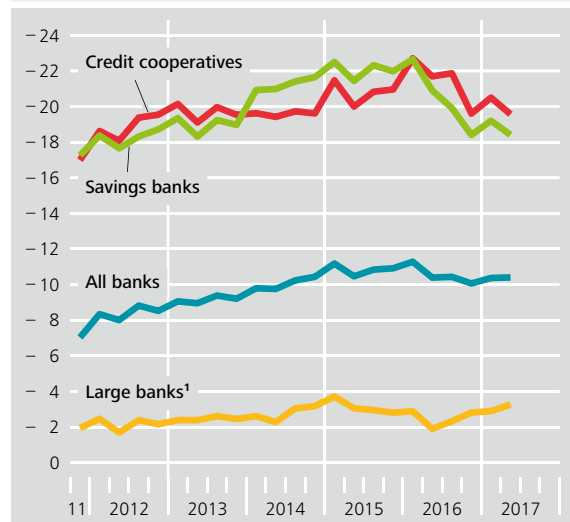
sharp drop in profits over several years in the event of a steep hike in short-term interest rates paired with a decline in long-term interest rates. By contrast, if long-term interest rates also increase, banks only forecast a drop in profits in the first year, but profits would recover in the medium to long term due to rising margins, amongst other factors.²⁴

If interest rates were to fall further or to persist at their current low level, this would also cause con-

Changes in present value given interest rate rise*

Chart 4.8

As a percentage of regulatory own funds



* Changes in present value of positions in the banking book subject to interest rate risk caused by an abrupt interest rate rise of 200 basis points across all maturities. The analyses are based on reports from institutions for the Basel interest rate coefficient. ¹ 12 major German banks with an international focus which did not outsource positions to resolution agencies in the observation period.

Deutsche Bundesbank

siderable persistent decreases in profits (see Chart 4.9).²⁵ Risks arising from maturity transformation could accumulate further in this case. Banks could also attempt to increase their interest income by lending to riskier companies. This could apply especially to weaker banks.²⁶

²² See Basel Committee on Banking Supervision (2016b). The Basel interest rate coefficient on which these standards are based determines the present value loss from the poorer result in each case due to an interest rate hike or reduction. The figures shown here only refer to a hike in interest rates, however.

²³ The survey was carried out as at 31 December 2016 and concerns the effects of the low-interest-rate setting on the profitability and resilience of German credit institutions. Around 1,500 smaller and medium-sized institutions were surveyed, including commercial banks, savings banks and credit cooperatives.

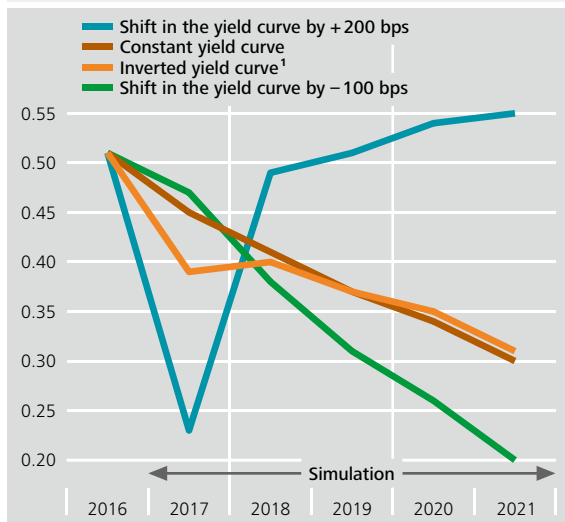
²⁴ Econometric analyses confirm that positive effects prevail in the longer term. See R Busch and C Memmel (2017). The results of the study suggest that the initial narrowing of the interest margin is offset around one-and-a-half years after an increase in interest rates.

²⁵ See A Dombret, Y Gündüz and J Rocholl (2017).

²⁶ Empirical results imply that riskier companies tend to receive loans from weak banks. See M Storz, M Koetter, R Setzer and A Westphal (2017).

Return on assets of less significant banks in various interest rate scenarios* Chart 4.9

Profit for the financial year before tax as a percentage of total assets



Source: 2017 survey on the profitability and resilience of German credit institutions in the low-interest-rate setting. * Simulation for 1,510 less significant banks. The scenarios depicted are based on a static balance sheet. ¹ The inverted yield curve includes a rise in the short-term interest rate level by up to 200 basis points (bps) and a fall in the long-term interest rate level by up to 60 bps.

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subject to an SREP assessment in 2016. Institutions that have not yet undergone an SREP assessment are subject to BaFin’s general administrative act on interest rate risk in the banking book. In the second quarter of 2017, the add-on under this general provision amounted to 1.5 percentage points on average, before being offset against free contingency reserves.

Taken in isolation, the institutions therefore appear to hold sufficient capital against interest rate risk. The difference between actual own funds and total capital requirements (including the buffer requirement)³⁰ amounts, on average, to 7.3% of the total risk exposure amount for German significant and less significant institutions (see Chart 4.10). It would appear that even higher losses stemming from interest rate risk could be shouldered. However, interest rate risk could take on a systemic dimension in that many banks are exposed to it in a similar way. Furthermore, a sudden rise in interest rates is likely to be accompanied by other risks, such as credit risk.

Sustainability of interest rate risk

While many banks manage their interest rate risk via hedging transactions such as interest rate swaps or via the interbank market, this simply redistributes the risk, rather than eliminating it. That said, a redistribution of risks can make sense if the interest rate risk is taken on by counterparties that have a better risk-bearing capacity.

Hedging transactions do not eliminate interest rate risk, but merely redistribute it.

Banking supervisors can impose capital add-ons for interest rate risk. The significance of these add-ons has risen, in particular, since the 2014 revision of the EBA guidelines²⁷ on the Supervisory Review and Evaluation Process (SREP). The resulting capital add-on for interest rate risk was 0.89 percentage point,²⁸ on average, for less significant²⁹ institutions that were

Interest rate risk correlates with other risks

Viewed in isolation, the usual measures of risk, such as the Basel interest rate coefficient, underestimate the systemic risks stemming from rising interest rates. Rising interest rates have an indirect impact on credit and liquidity risk, too, and can therefore lead to higher losses for institutions. At the same time, the hedging strategies banks customarily use for

²⁷ See EBA/GL/2014/13.

²⁸ In addition, 0.59 percentage point on average must be held for other material risks. See BaFin (2017), pp 92-95.

²⁹ Less significant institutions are those which are not supervised directly by the European Central Bank (ECB) under the Single Supervisory Mechanism (SSM).

³⁰ The combined buffer requirement comprises a capital conservation buffer of 1.25% of risk-weighted assets, the specific buffers for global and other systemically important institutions, and the countercyclical capital buffer. The latter is relevant for institutions that hold claims in countries where the countercyclical capital buffer has been activated.

interest rate risk can actually amplify other risks. For example, banks could reduce their interest rate risk by increasing their share of variable-rate loans, provided the competitive landscape allows for this

Rising interest rates also have an indirect impact on credit and liquidity risk.

type of contractual arrangement. In this case, however, the borrowers bear the adjustment costs in the form of rising interest expenditure. For particularly vulnerable enterprises, this raises the insolvency risk, and thus also banks' credit risk, which in turn leads to higher provisioning and impairments in banks' balance sheets.

In Germany, the bulk of loan agreements are traditionally concluded with rather long interest rate lock-in periods.³¹ According to the low-interest-rate survey, only 14% of loans issued by small and medium-sized institutions to non-banks are variable-rate loans (see Chart 4.11).³²

As the lion's share of outstanding loans have been issued with fixed interest rates, the interest expenditure for most borrowers is not likely to rise significantly as a result of a hike in interest rates.

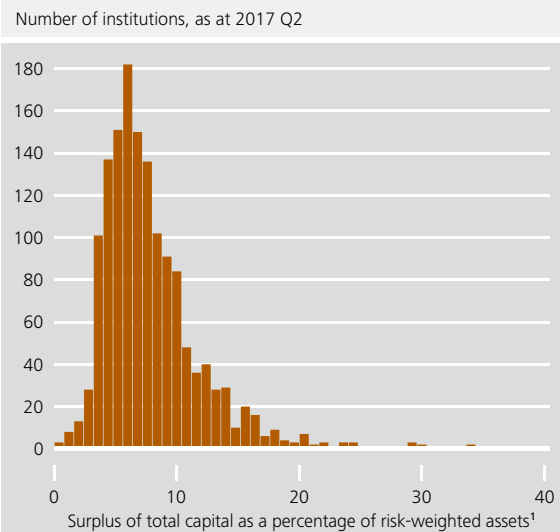
The valuation result could once again take a less favourable turn in future.

However, the valuation result, which on the whole has been extraordinarily good in recent years, could once again take a less favourable turn. The results of the low-interest-rate survey also indicate that banks tend to assume in their budgetary planning that there will be a normalisation of the valuation result in the coming years.

Stress tests have been carried out in order to examine interest rate risk concurrently with other

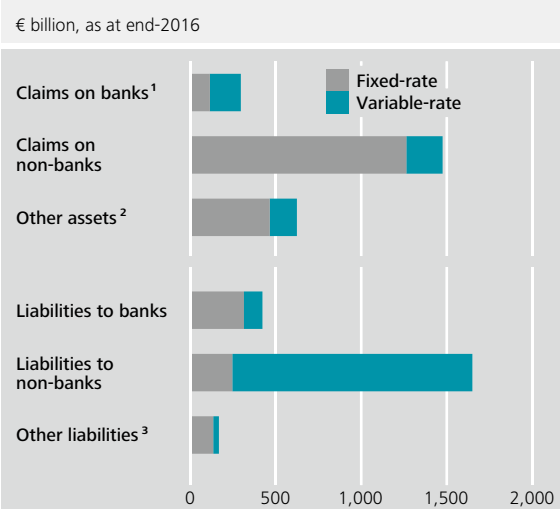
³¹ See Deutsche Bundesbank (2017), pp 93-103.
³² Source: 2017 survey on the profitability and resilience of German credit institutions and Bundesbank calculations.

Distribution of surpluses on total capital ratios Chart 4.10



¹ Calculated as the difference between the total capital ratio and the requirements pursuant to Pillar 1 and Pillar 2 plus the combined buffer requirement (capital conservation buffer of 1.25%, the relevant buffers for global and other systemically important banks and the countercyclical capital buffer). 21 significant institutions and 1,468 less significant institutions were taken into account. For presentation purposes, the distribution was cut off at 40%.
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Variable-rate versus fixed-rate balance sheet components of less significant banks Chart 4.11

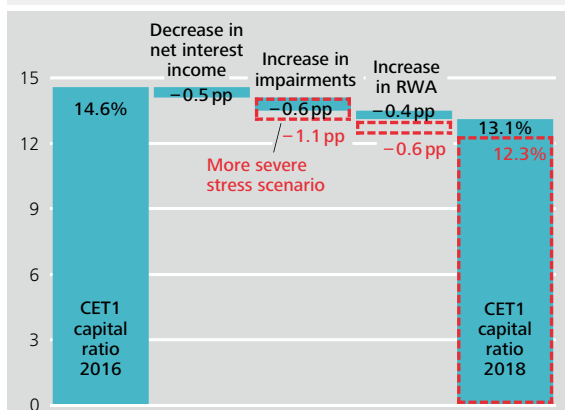


Source: 2017 survey on the profitability and resilience of German credit institutions in the low-interest-rate environment. ¹ Also includes balances with central banks. ² Debt securities and other fixed-rate securities, shares and other variable-rate securities, other interest-bearing assets. ³ Securitised liabilities, subordinated liabilities and participation rights capital as well as other interest-bearing liabilities.
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Impact of the stress effect on the common equity tier 1 capital of small and medium-sized banks*

Chart 4.12

% or percentage points (pp) of risk-weighted assets (RWA)



* The interest rate scenario simulates an increase in the 3-month EUR-IBOR of 190 basis points, while the interest rate level of ten-year Federal bonds (Bunds) falls to zero. For credit risk, the average impairment ratios (relative to total assets) and the average risk weights (RWA relative to total assets) for 2001 to 2006 for each bank are applied to total assets in 2016, with the risk weights only being applied for banks that use the internal ratings-based approach (IRBA). A more severe stress scenario (red) increases the average of both the impairments and the risk weights by one standard deviation. 1,294 small and medium-sized banks are examined.

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risks. As part of a combined top-down stress test³³ with a two-year horizon, an analysis was carried out on the effects of a slump in the interest margin on the back of a simultaneous rise in credit risk. For credit risk, it was assumed that impairments and risk weights would settle at the average levels between 2001 and 2006. This scenario was combined with an inversion of the yield curve, leading to a fall in the interest margin. Here, short-term three-month interest rates rise by 190 basis points and the yield on ten-year federal bonds falls to zero. As a result, the CET1 capital ratio of the examined banks would fall from 14.6% in 2016 to 13.1% in 2018 (see Chart 4.12). In the more severe stress scenario, in which the average value of the impairments and the risk weights are increased by one standard deviation in each case, the CET1 capital ratio would fall by a further 0.8 percentage point to 12.3%. While this is a noticeable effect, it seems manageable in light of the high level of the CET1 capital

ratio. The normalisation of impairments and the increase in the risk weights would make the largest contribution here to the fall in the CET1 capital ratio.

The stress test carried out as part of the 2017 low-interest-rate survey also combines several risks. It simulates an abrupt rise in the yield curve of 200 basis points as well as a simultaneous rise in credit risk and market risk. On aggregate, the CET1 capital ratio falls in a one-year stress horizon from 16.24% to 13.29%, ie by 2.95 percentage points. In disaggregated terms, small and medium-sized institutions prove to be largely resilient to a simultaneous rise in the three types of risk.

If interest rates change, liquidity risk also takes on a greater significance. It is precisely in the low-interest-rate environment that bank deposits have risen sharply. If interest rates were to rise, customers could withdraw their short-term deposits and shift them to higher-yielding investments. However, the microprudential indicators are not pointing to heightened risks.

If interest rates were to rise, customers could withdraw their short-term deposits and shift them to higher-yielding investments.

The median liquidity coverage ratio is well above 100%, having recently increased to just over 154% in September 2017 from just under 138% 12 months earlier.³⁴ Analyses of systemic liquidity risk do not currently indicate a heightened threat either.³⁵

³³ The calculations were carried out centrally by the Bundesbank on the basis of supervisory reporting data and Bundesbank statistical models.

³⁴ The liquidity coverage ratio (LCR) is a new banking supervision ratio introduced under the Basel III framework to measure a bank's holdings of short-term liquidity. The LCR is defined as the ratio of the stock of highly liquid assets to total net cash outflows within 30 days. The highly liquid assets and the net cash outflows are calculated from the stress scenario described in the framework.

³⁵ See Deutsche Bundesbank (2016), pp 38-39.

Low profitability increases incentive to take on greater risks

The persistent low-interest-rate environment is having a growing impact on the earnings potential of interest business. This concerns, in particular, savings banks and credit cooperatives, which are heavily geared towards traditional deposit and lending business (see Chart 4.13).

Interest income is likely to improve in the long term given a gradual rise in the interest rate level.

Assuming a continued economic recovery and a gradual rise in the interest rate level, interest income is likely to improve in the long term. However, there are also

signs that falling profits over the long term are largely driven by structural factors, such as intense competition. For example, compared to their peers internationally, German banks have had low profitability for years. As a trend-cycle analysis shows, the profitability of German banks is falling even over the business cycle (see Chart 4.14).

Structurally low profitability could pose a danger to financial stability, as it could increase the incentive to take on more risk in order to boost profits.

Low profitability could increase the incentive to take on more risk.

In addition, over the longer term, lower profits could cause difficulties to

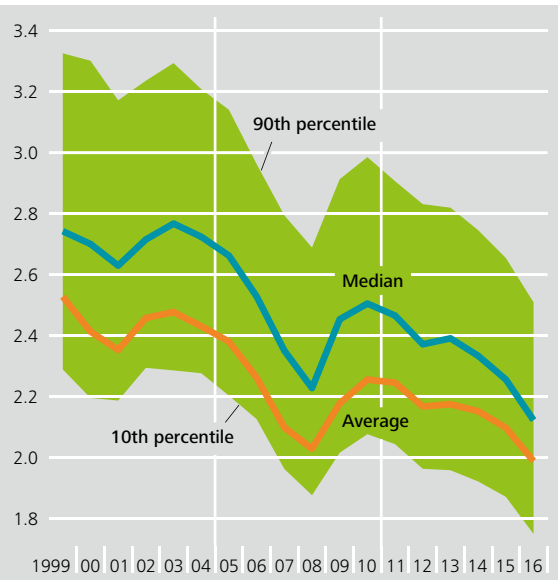
those banks in Germany that accumulate or maintain their capital primarily through retained earnings.

Interconnectedness in the banking sector

The interconnectedness of banks plays an important role in macroprudential oversight. In an interlinked banking system, mutual dependen-

Net interest income of savings banks and credit cooperatives Chart 4.13

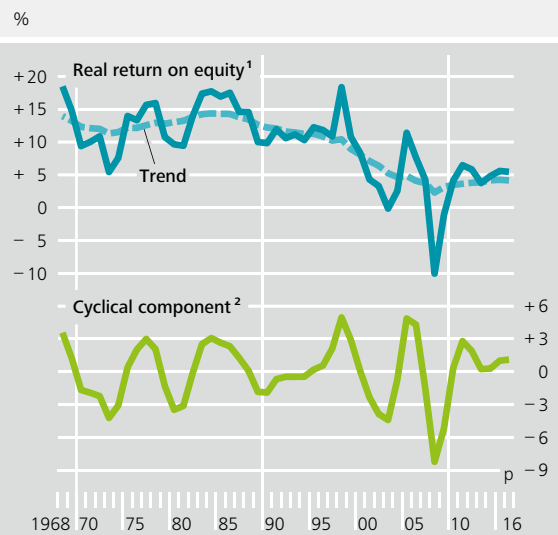
As a percentage of average total assets¹



¹ Accounting-related rise in aggregate total assets in 2011 due to the Accounting Law Modernisation Act (Bilanzrechtsmodernisierungsgesetz).

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Trend-cycle decomposition of real return on equity of German banks Chart 4.14



¹ Profit or loss for the financial year before tax in relation to balance sheet capital (excluding participation rights); until 1992, only former West German federal states; real terms less annual consumer price inflation. ² The cyclical component is estimated at business cycle frequencies on the basis of a trend-cycle decomposition using an unobserved components model, assuming a stationary stochastic cycle and a non-stationary stochastic trend.

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cy can amplify shocks affecting one or more banks and transmit them to other banks. This can ultimately diminish the stability of the entire system.

Banks are linked together by contractual arrangements in the interbank market, leading to contagion risk. For example, if one bank goes bust, other banks that have claims on this bank via the interbank market will be forced to make write-downs, leading to a fall in their capital ratio and creditworthiness (first-round effects). Because these lending banks, in turn, have obtained funding from other banks, this sets off a chain reaction of impaired claims and lower capital ratios, causing losses to spill over to other banks that were unaffected by the initial shock (second-round effects). This can ultimately adversely affect many banks in the system and lead to heavy losses in the banking system as a whole.³⁶

A high level of interconnectedness can therefore contribute to an intensification of shocks and to shocks being transmitted to the whole financial system. However, a high level of interconnectedness can also have a stabilising effect on the financial system. This is the case when negative shocks are spread more evenly over the entire system, thus allowing them to be better cushioned.³⁷

Whether a shock affecting one or more banks is intensified or absorbed as a result of interconnectedness depends, in particular, on its magnitude. Shocks that exceed a critical threshold have a destabilising effect because the losses that stem from them cannot be absorbed. In this case, the financial system would be better protected from

Better capital adequacy helps to reduce contagion effects.

the impact of the shock if interconnectedness via the interbank market were less pronounced.³⁸ Higher liquidity buffers and better capital adequacy also help to reduce contagion effects, as they improve banks' ability to shoulder losses.

German banks are directly and indirectly interlinked

Banks are directly and indirectly interlinked. Direct links between banks exist, in particular, through mutual claims and liabilities in the interbank market. In Germany, the interbank market is characterised by a pronounced core-periphery structure.³⁹ The core is predominantly formed by the large, systemically important institutions (O-SIs), which are closely interconnected. Together, they account for around 90% of the aggregate volume of the domestic interbank market. The small banks form the periphery. While the savings banks and the credit cooperatives are closely interconnected with their central credit institutions, the degree of their interconnectedness with each other is relatively low. According to the academic literature, the interbank markets with a core-periphery structure are better able to withstand negative shocks, provided the institutions belonging to the core are highly resilient.⁴⁰

In Germany the interbank market is characterised by a core-periphery structure.

In addition, banks are also indirectly linked to each other via information effects. Information effects are relevant, for example, when banks conduct the same type of business. If a bank suffers large losses in one line of business, say, depositors and

Information effects are relevant when banks conduct the same type of business.

³⁶ For information on modelling contagion via the credit quality channel, see K Fink, U Krüger, B Meller and L-H Wong (2016).

³⁷ See F Allen and D Gale (2000) as well as X Freixas, B Parigi and J-C Rochet (2000).

³⁸ See D Acemoglu, A Ozdaglar and A Tahbaz-Salehi (2016).

³⁹ The number of core banks has remained relatively constant over time, comprising roughly 40 banking groups. For the underlying calculation method, see B Craig and G von Peter (2014).

⁴⁰ See C-P Georg (2013).

investors could conclude that other banks in the same line of business are also encountering problems. These banks could then also find themselves in a precarious situation if depositors withdraw their deposits or investors choose not to renew their loans to these banks.

Indirect contagion channels are much more difficult to identify than direct ones. The reason for this is that information effects, unlike contractual relationships such as those in the interbank market, are not directly observable.⁴¹

Contagion risks via the interbank market have fallen

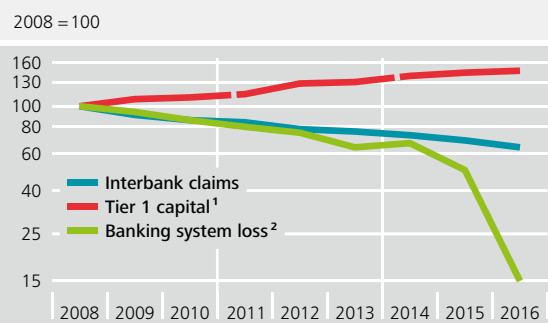
German banks have considerably reduced their mutual claims and liabilities in recent years (see Chart 4.15).

With the help of model-based network measures, it is possible to analyse the extent to which the reduction in interconnectedness via the interbank market has contributed to a fall in contagion risk in the German banking system. Measured in terms of banking system loss, the fall in interbank claims not only reduced the direct contagion effects of an adverse shock, but also considerably lowered the risk of possible second-round effects (see Chart 4.15).⁴² The significantly improved capital adequacy of banks in recent years has also contributed to this. Higher capital levels reduce the likelihood of other institutions experiencing difficulties as a result of contagion effects.

Unconventional monetary policy measures are likely to have had an impact on the interconnectedness of the German banking system.

The Eurosystem reacted with unconventional monetary policy measures over the course of the crisis.⁴³ These measures, alongside regulato-

Interbank claims and tier 1 capital of German banks Chart 4.15



¹ In 2011 and 2014 the valuation of tier 1 capital changed as a result of Capital Requirements Directives CRD III and CRD IV. ² Refers to the maximum banking system loss resulting from a credit default at a single institution.

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ry changes and improved access to other sources of funding outside the banking sector, are likely to have had an impact on the interconnectedness of the German banking system, both within Germany and with banks in other euro area countries. It is still too early to tell whether this reduced level of interconnectedness will persist in future.

Banks are scaling back their derivatives activities

Mutual claims on the interbank market are not the only way that banks are interlinked. Derivative financial instruments can also be a significant contagion channel through which an adverse shock in the financial system can spread. This has been shown not least by the global financial crisis. The G20 has therefore taken measures to increase transparency

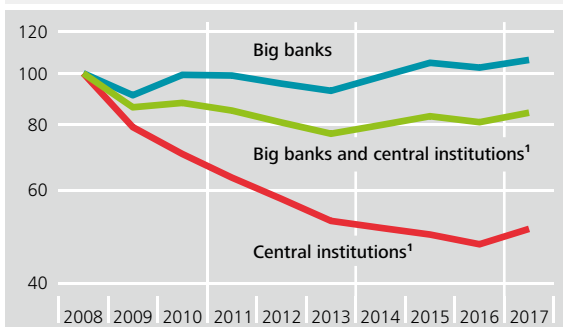
⁴¹ See V Acharya and T Yorulmazer (2008) as well as T Ahnert and C-P Georg (2017).

⁴² To quantify the contagion effect, the banking system loss model takes into account write-downs on defaulted bilateral claims (first-round effects) and contagion effects in the interbank market (second-round effects). See K Fink, U Krüger, B Meller and L-H Wong (2016) as well as Deutsche Bundesbank (2014), p 45.

⁴³ See U Bindseil, P Cour-Thimann and P König (2012), J Ulbrich and A Lipponer (2011) as well as Deutsche Bundesbank (2011), pp 34-35.

Foreign claims on industrial countries and emerging economies Chart 4.16

2008 = 100



¹ Central institutions of credit cooperatives and Landesbanken (excluding Landesbank Berlin, WestLB and Bremer LB). Deutsche Bundesbank

in the derivatives markets and to reduce systemic risk. For example, it was decided that standardised derivatives must be cleared via central counterparties and that there

Derivative financial instruments can also be a contagion channel.

must be a sufficient exchange of collateral between counterparties for non-centrally cleared derivatives.⁴⁴

The implementation of these reforms in the EU will probably take until 2020. In recent years, banks' balance sheets have also reflected a change in their derivatives trading.

According to monthly balance sheet statistics, derivative instruments recorded in the trading books of the large German banks fell by just over 49% between 2010 and 2016. The share of total assets accounted for by these derivatives fell by just under 10 percentage points to around 21%. The derivatives statistics of the Bank for International Settlements also show a decline, based on nominal amounts, of German reporting banks' holdings of over-the-counter derivative instruments, whereas the volume held internationally remained more or less stable over the same period.⁴⁵

At the same time, the significance of central counterparties has increased substantially in recent years.⁴⁶

At the moment, an international working group of the Financial Stability Board (FSB) is examining the extent to which the new rules have changed the incentives for central clearing.⁴⁷

The significance of central counterparties has increased substantially in recent years.

Banks are restructuring their foreign business

Since the crisis, the major German banks with an international focus have reduced not only their interbank business, but also their foreign business with enterprises and other financial intermediaries.

The drop in foreign business was largely attributable to the Landesbanken, which have markedly scaled back their foreign assets compared to their level at the onset of the crisis (see Chart 4.16). This happened not least due to conditions imposed by the European Commission as a result of state aid procedures.⁴⁸ Amongst other things, these conditions

⁴⁴ For more information on the significance of central counterparties, see Deutsche Bundesbank (2016), pp 79-90. For more on the incentives for central clearing, see S Ghamami and P Glasserman (2017).

⁴⁵ German reporting banks recorded a roughly 33% fall in their holdings of over-the-counter derivative instruments between the end of 2010 (€54.8 trillion) and the end of 2016 (€38.5 trillion). The global aggregate of all 74 reporting banks saw a slight increase from €420 trillion in 2010 to €430 trillion at the end of 2016. Part of the drop in the gross nominal figures is attributable to the use of trade compression, whereby a large number of derivatives contracts are replaced by a smaller number of contracts while net payment flows remain unaffected.

⁴⁶ See Bank for International Settlements (2017).

⁴⁷ See Financial Stability Board (2017). In parallel to this, a working group of the Basel Committee on Banking Supervision (BCBS) is looking into the impact of the leverage ratio on the supply of clearing services.

⁴⁸ Due to high losses, several Landesbanken received financial support from the state during the financial crisis. As this support was deemed to be state aid, the European Commission opened a state aid procedure. Under this procedure, state aid to the Landesbanken was approved subject to a number of conditions.

required Landesbanken to reduce their foreign business activities and concentrate on their core business in Germany.

After realigning their foreign business activities, German banks consolidated their activities on a national or regional basis. They therefore markedly cut back the number of their foreign subsidiaries (see Chart 4.17).

German banks markedly cut back the number of their foreign subsidiaries.

This development has also helped reduce the complexity of institutions – complexity being considered an obstacle to the resolution of distressed credit institutions.⁴⁹

However, banks' foreign business can also have a stabilising effect if it leads to a better distribution of risk and if financial resources are used efficiently. Internationally active banks perform an important funding function, particularly in a globally intertwined economy like Germany. Here, it is crucial that the respective banks have good risk management systems. For the German banking sector, there are, overall, no indications that internationally active banks are fundamentally riskier than domestically active banks.⁵⁰

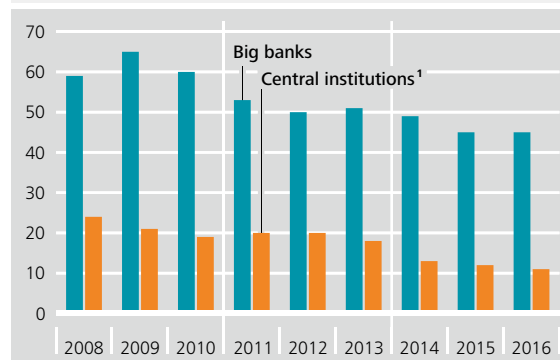
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Number of foreign subsidiaries

Chart 4.17



¹ Central institutions of credit cooperatives and Landesbanken (excluding Landesbank Berlin and West LB).
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⁴⁹ The number of subsidiaries is an indicator of the complexity of an institution. See J Carmassi and R Herring (2016) as well as N Cetorelli and L Goldberg (2014).

⁵⁰ See C M Buch, C T Koch and M Koetter (2013). The authors conclude that foreign expansion is beneficial as long as banks do not take on complex risks there that they are unable to control. In addition, they reason that the disadvantages of foreign business need to be weighed up against possible advantages. In an economy like Germany, where enterprises are very active internationally, foreign business could help institutions acquire or keep customers and thus increase their market power.

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Risks for insurers, pension institutions and investment funds

A gradual increase in interest rates would, generally speaking, strengthen the resilience of insurance companies and pension institutions. From a financial stability perspective, the persistence of the low-interest-rate environment is the main source of risk. Moreover, an abrupt interest rate hike harbours risks since, should interest rates exceed a critical threshold, an upsurge in life insurance policy lapses could ensue.

The introduction of Solvency II in 2016 and the persistently low interest rates have made a major contribution to structural changes in the German insurance industry. In the life insurance sector, this is manifesting itself, in particular, in incipient consolidation and an amended structure for guaranteed returns in insurance policies. Investment risk will, in future, be borne more strongly by policyholders. In addition, life insurers' new business is increasingly shifting towards single premium contracts. This could lead to rising liquidity risk compared with regular premium business.

German insurers have reduced their direct interconnectedness with the German banking system and are increasingly investing capital via investment funds, thus fostering the interconnectedness between insurers and investment funds.

Durations in the bond portfolios of German investment funds have increased. As fund holders, insurers and banks are affected by this in different ways. Insurers can close their duration gap, while banks are increasingly incurring higher interest rate risk. In addition, growing intrasectoral interconnectedness is making itself visible in the fund sector. This can amplify financial market shocks in periods of stress owing to herding behaviour and facilitate contagion between investment funds.

Risk assessment for different interest rate scenarios

For German life insurers and pension institutions, interest rate risk is one of the most significant types of risk. These intermediaries traditionally sell savings products which promise a nominal return¹ over a very long maturity period. Premium revenue is, for the most part, invested in fixed-income securities with significantly shorter maturities. This difference between maturities, known as the duration gap, means that the intermediaries are similarly exposed to interest rate risk² as, during the term of a savings product, the corresponding asset holdings often need to be re-invested several times. When interest rates are low, life insurers and pension institutions find it increasingly difficult to generate sufficient returns on their investments, measured in terms of their contractual commitments.

Life insurers and pension institutions are similarly exposed to interest rate risk.

In order to reduce these risks, many life insurers have for some years been increasing the maturity of their fixed-income asset holdings. This is how they shrink the duration gap and, thanks to term premiums, generate higher returns. Extending maturities, however, can also entail greater liquidity risk. If interest rates rise abruptly, in particular, more policyholders may lapse their policies (see the section entitled “Higher interest rates have a positive impact on the solvency situation but also harbour risks” on pages 85 and 86).

Extending maturities of asset holdings can entail greater liquidity risk.

Life insurers reporting sound solvency ratios

The Solvency II supervisory regime, which is risk and market value-oriented, was introduced in January 2016 and discloses how well insurers are capable of fulfilling their long-term policy obligations. This is quantified on the basis of the respective market interest rates and thus, implicitly, on market expectations on a given reference date. The value of asset holdings and the value of commitments can thus fluctuate widely in the short term.

The solvency ratio of German life insurers pursuant to Solvency II is defined as the ratio of own funds to own funds requirements. It was considerably higher than the minimum requirement of 100% for most life insurers at the end of 2016, when the median solvency ratio of life insurers stood at around 291%.³

Solvency ratio of German life insurers pursuant to Solvency II was considerably higher than the minimum requirement for most life insurers at the end of 2016.

These solvency ratios, however, currently do not yet fully disclose economic resilience. The vast majority (just over 70%) of German life insurance companies are using transitional measures to calculate their solvency ratios pursuant to Solvency II. The objective of these measures is to smooth any market turmoil that could be triggered by the abrupt transition to a market-consistent valuation of assets and liabilities.⁴

¹ Such a commitment can be explicit, for example, in the form of a guaranteed minimum return on the savings part of the policyholders’ premium payments, or implicit, such as in the form of a minimum benefit.

² See A Möhlmann (2017).

³ Median of the solvency ratios of the 69 life insurance companies for which quarterly reports are available for all reporting dates.

⁴ Insurers have to apply for and obtain permission to use transitional measures from the Federal Financial Supervisory Authority (BaFin). Transitional measures may be used until 2031, although they will be phased out gradually until then. For a more detailed description of the transitional measures, see BaFin (2016).

The solvency ratio without transitional measures can be interpreted as solvency in a scenario in which interest rates remain low. This reveals the risks to which insurers are exposed based on the yield

14 life insurers were reliant on transitional measures in order to achieve the solvency ratio required by regulators.

curve. Without transitional measures, the solvency ratios turn out to be considerably lower (see Chart 5.1). At the end of 2016, a total of 14 out of 87 life insurers were reliant on transitional measures in order to achieve the solvency ratio of 100% required by regulators.⁵ The range of solvency ratios illustrates the high level of heterogeneity among German life insurers.

Higher interest rates have a positive impact on the solvency situation but also harbour risks

Since Solvency II was introduced, the solvency ratio has fluctuated in line with the level of interest rates (see Chart 5.2). The rise in long-term interest rates since the fourth quarter of 2016 has been accompanied by an improvement in solvency ratios since higher interest income on asset holdings means that it is easier to fulfil

Over the short term, an abrupt and significant hike in interest rates could lead more policyholders to lapse their policies.

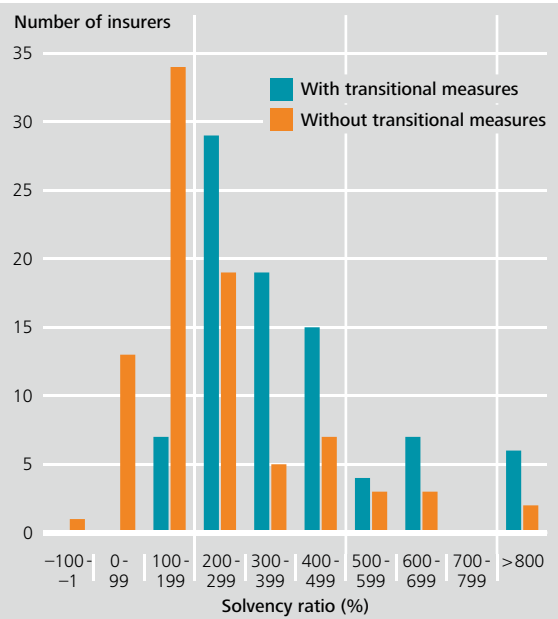
interest commitments. Over the short term, however, an abrupt and significant hike in interest rates could lead more policyholders to lapse their policies; in an extreme case, there may be an upsurge in policy lapses.⁶

⁵ In May 2017, all insurers were required to publish, for the first time, a solvency and financial condition report (SFCR). This report also contains information on the impact of transitional measures on the solvency ratio. There was no major market reaction to the publication of these company reports.

⁶ For more information on lapse risk, see Deutsche Bundesbank (2014b), pp 52-55, and E Berdin, H Gründl and C Kubitzka (2017).

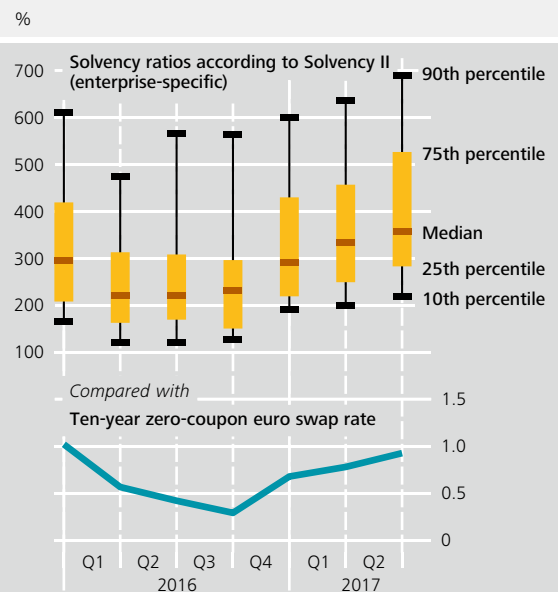
Impact of transitional measures on the solvency ratio of German life insurers Chart 5.1

End-2016 data



Sources: BaFin and Bundesbank calculations. Deutsche Bundesbank

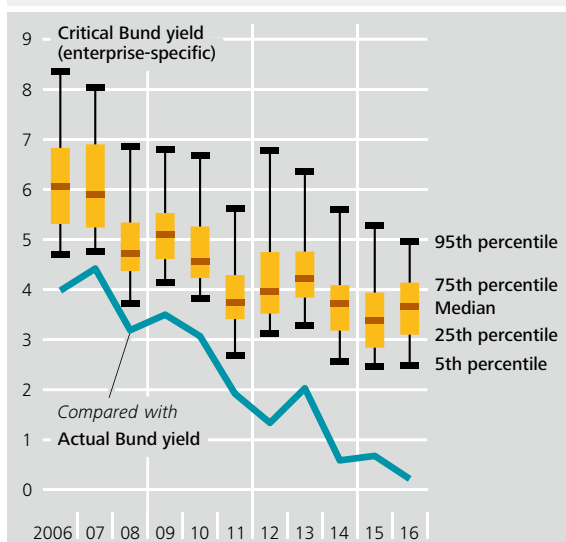
Solvency ratios of German life insurers according to Solvency II* Chart 5.2



Sources: BaFin and Bundesbank calculations. * The chart shows the solvency ratios of the 69 life insurance companies for which quarterly reports are available for all reporting dates. The first report was published on 1 January 2016. Deutsche Bundesbank

Critical interest rate level for life insurers given an upsurge in policy lapses* Chart 5.3

Year-end data (%)



* Yield on Bunds with a residual maturity of ten years, above which an upsurge in policy lapses could impair life insurers' stability. The analysis covered the approximately 55 largest German life insurance companies with a premium reserve of more than €1 billion each and for which data are available until 2016.

Deutsche Bundesbank

This is because German law implicitly dictates that the surrender values for insurance policies – as the policyholders' claims when they lapse their policies – are predetermined, ie independent of the market interest rate. From the perspective of a life insurer, however, these fixed payment obligations in the event of a policy lapse contrast with fixed-income asset holdings, the resale value of which depends on the interest rate.

If market interest rates rise above an enterprise-specific critical level, the market value of asset holdings drops to a level so low that the surrender values on aggregate are underfunded. Looking beyond the benefits of having insurance cover against biometric risks, the loss of tax advantages and the incurrence of lapse fees, it would, in this case, be rational for all policyholders to lapse their life insurance policy.⁷ This would lead to considerable outflows of funds, and insurers would be forced to sell off assets.

The median enterprise-specific critical interest rate levels for the larger German life insurance companies⁸ fell from 6.0% in 2006 to 3.7% in 2016 (see Chart 5.3). Part of the reason for this decline is that life insurers have extended the maturity of their fixed-income asset holdings, meaning that the market values now respond more strongly to changes in interest rates.⁹

Bucking this long-term downward trend, in 2016 the median critical interest rate level went back up slightly, from 3.4% to 3.7%. One reason for this is the relief afforded by the Life Insurance Reform Act (*Lebensversicherungsreformgesetz*), which entered into force in August 2014. Another is the role played by the considerable allocations to the additional interest provision.¹⁰ Both adjustments have capped outflows of funds from insurers.

Interest rate reversal and lagged balance sheet valuations

Inconsistencies in German accounting rules regarding the additional interest provision create a further risk relating to a rise in interest rates. In insurers' single-entity financial statements prepared according to the German Commercial Code (*Han-*

Life insurers, now and in future, will probably be forced to unlock hidden reserves.

⁷ For more detailed information on this topic, see M Feodorina and T Förstemann (2015) and Deutsche Bundesbank (2015), p 52.

⁸ The analysis covers life insurers with a premium reserve of more than €1 billion each.

⁹ The average modified duration of life insurers' assets, which reflects interest rate sensitivity and average residual maturities, nearly doubled between 2008 and 2016, from around 5 to 9.

¹⁰ The additional interest provision is a constituent part of the premium reserve which companies must put in place for policies for which the reference interest rate – derived from the ten-year average of yields on zero-coupon euro interest rate swaps with a maturity of ten years – is lower than the original technical interest rate of relevance for the premium reserves.

delsgesetzbuch), the additional interest provision adjusts the premium reserve stepwise to its higher market value when interest rates are low. According to BaFin's extended forecast, if interest rates remain unchanged, the additional interest provision will rise from €44 billion in 2016 to €153 billion in 2021. Capital investment income is nowhere near enough to cover these expenses.¹¹ That is why life insurers, now and in future, will probably be forced to unlock hidden reserves, ie to generate profit by selling off assets whose market values exceed their book values. The corresponding asset-side hidden reserves stood at around €191 billion in 2016, thus exceeding total equity by a factor of 12.

The additional interest provision is accumulated with a time lag, as the applicable discount rate is a moving average of market interest rates over the past ten years. An interest rate reversal would, therefore, be followed by a lagged effect since, even if market interest rates were to increase moderately, the applicable discount rate would initially continue to fall. The additional interest provision would consequently have to continue to be topped up at first following an interest rate hike. It would then keep growing as long as the historical market interest rate of ten years ago, eliminated from the mean, is higher than the new current market interest rate. According to BaFin calculations, even if interest rates were to rise abruptly by 200 basis points, the additional interest provision would have to be augmented by €35 billion in the next five years.¹²

If interest rates were to go up, however, the market value of insurers' fixed-income assets, and thus their hidden reserves, would fall. Life insurance companies would then have trouble funding a further increase in the additional interest provision. Should the level of interest rates be above its moving average, such allocations to the additional interest provision would actually no longer be necessary.¹³

This situation may create two types of risks to financial stability. The first is that, in particular, poorly capitalised insurance companies could be forced to adapt their investment strategy and to sell off long-dated, higher-interest bonds in order to realise capital gains.¹⁴ Insurers are currently selling, above all, liquid asset holdings. Once they go down to having only valuation reserves on illiquid asset holdings, however, they would be forced to sell those as well. This could send prices plunging if the supply of more illiquid, long-dated asset holdings encountered only meagre demand. The extent to which this happens depends ultimately on whether, if interest rates go up, other sectors step up their demand for illiquid, long-dated asset holdings.¹⁵ The fact that the insurers involved are similarly exposed with regard to the additional interest provision serves to fuel concerns that many companies would seek to act in a similar way.

Poorly capitalised insurance companies could be forced to adapt their investment strategy and to sell off long-dated, higher-interest bonds in order to realise capital gains.

¹¹ German life insurers' capital investment income in 2016 stood at €29 billion, thus covering only 84% of total interest expenditure amounting to €34 billion.

¹² The forecast is based on an increase in the ten-year swap rate from 0.3% to 2.3% on 1 October 2016.

¹³ In this case, there would be no more hidden losses in the premium reserves. This applies at least to payments in the next 15 years, for which reserves are to be built up using the additional interest provision.

¹⁴ Similar impacts of high hidden reserves when holding assets at historical cost are shown by A Ellul, C Jotikasthira, C T Lundblad and Y Wang (2015) for the United States. They find that more weakly capitalised insurers tend to sell securities with high unrealised gains in order to realise the gains. This has a perceptible impact on trading in such instruments.

¹⁵ H S Shin (2017) shows that German insurers' demand for very long-dated bonds has grown considerably in the past few years, while the holdings of banks and households have shown a trend decline. If interest rates were to rise, a change in insurers' investment behaviour would therefore be likely to impact on the bond market. However, it is to be expected that rising interest rates would rekindle banks' and households' interest in long-dated bonds, which means that these sectors would absorb the additional supply.

The second risk is that, in accounting terms, insurers could come close to overindebtedness. This happens

In accounting terms, insurers could come close to overindebtedness.

if the level of interest rates rises so sharply that there are no more hidden reserves, capital adequacy is low and, at the same time,

current income is no longer sufficient to fund the additional interest provision.¹⁶

From a financial stability perspective, the persistence of the low-interest-rate environment remains the main source of risk. However, the risk of an abrupt rise in interest rates must be borne in mind. This risk could be mitigated if surrender values were sensitive to interest rates¹⁷ and if the additional interest provision were reformed. BaFin is currently reviewing the calibration of the additional interest provision.¹⁸ A reform of the additional interest provision is, moreover, part of the upcoming evaluation of the Life Insurance Reform Act by the Federal Ministry of Finance.¹⁹

Structural change among insurers and occupational pension schemes

The regime shift in the regulation of insurance companies in Europe brought about by Solvency

Solvency II and the protracted period of very low interest rates have contributed heavily to structural change in Germany's insurance industry.

II and the protracted period of very low interest rates have contributed heavily to structural change in Germany's insurance industry. One place where this is evident is in the design of life

insurance contracts. The conventional guaranteed return throughout the entire lifetime of the policy,

for decades the prevailing form, is being partially superseded by new forms of guarantees.

The type of premium payment is another area in which change is taking place: single premium policies are gaining in importance at the expense of policies with regular premium payments. Single premium business involves an insurance policy under which the policyholder makes a once-only premium payment when the contractual relationship begins.

At the same time, life insurers are increasingly discontinuing their new business and winding down their portfolios. In the aftermath of the financial crisis, the protracted period of very low interest rates has – much like with banks – led to significant adjustments in life insurers' business activities.

Changes in contractual structures and shifting of investment risk to policyholders

German life insurers' business has traditionally consisted of long-term contracts with a fixed interest guarantee. In new business, a fixed technical interest rate guaranteed throughout the entire term of the policy, which in the past usually corresponded to the maximum technical interest rate, is being increasingly replaced by other types of guarantees. These guarantees differ, for instance, in the savings

¹⁶ In German life insurers' current situation, hidden reserves are necessary to stabilise gross profits and thus equity capital. Without the income from the realisation of capital gains, in 2016 over one-third of life insurance companies would have posted a gross loss. The aggregate figure for this is around 20% of the sector's balance sheet equity capital. The expense of making allocations to the additional interest provision would not drop by enough in the short term to return these insurers to profitability.

¹⁷ If surrender values are sensitive to interest rates, they respond inversely to the level of market interest rates. For instance, if the interest rate level rises, they fall. Surrender values that are sensitive to interest rates, therefore, reflect the market value of the fixed-income securities in insurers' portfolios and, thus, hedge them against the risk of an upsurge in policy lapses.

¹⁸ See, inter alia, BaFin (2017), p 155.

¹⁹ See Deutscher Bundestag (2017).

phase and the pension phase.²⁰ The long period of low interest rates was the main motivating factor behind this development. Unlike contracts with annual guaranteed payments, those with a one-off final guaranteed payment give insurance companies the option of offsetting profits and losses over time.

In new business, a fixed technical interest rate guaranteed throughout the entire term of the policy is being increasingly replaced by other types of guarantees.

Moreover, the traditional form of guarantee commitment is more expensive for life insurance companies under the new framework than it was under Solvency I, as it triggers a higher regulatory capital requirement owing to assessment according to the risks actually incurred. From the perspective of policyholders, whose primary purpose is provision for old age, the aforementioned adjustment can likewise make sense since companies direct the capital savings to higher-yielding long-term investment vehicles and can, therefore, achieve a higher total return on a life insurance policy.²¹ However, this is associated with greater uncertainty regarding the amount paid out.

Unit-linked products are increasingly playing a role in life insurance. These products can be combined with a guaranteed return. Although a large part of new business is still being concluded with conventional guarantee commitments, the changes which the insurance industry is undergoing are, nevertheless, likely to manifest themselves in the fact that investment risk – especially interest rate risk – will shift from enterprises to policyholders.²²

Run-off as a response to the market environment

The market adjustments are being reflected in declining numbers of life insurers still conducting new business. Currently, 8.6% of the insurance technical provisions in the German life insurance industry are accounted for by companies that have discontinued their new business and are thus in run-off. If the insurers in run-off are successful in better managing their costs and balancing their risks then, from a financial stability perspective, the consolidation in the life insurance sector associated with a run-off is likely to lead to increasing resilience within the sector.

8.6% of the insurance technical provisions in the German life insurance industry are accounted for by companies that have discontinued their new business.

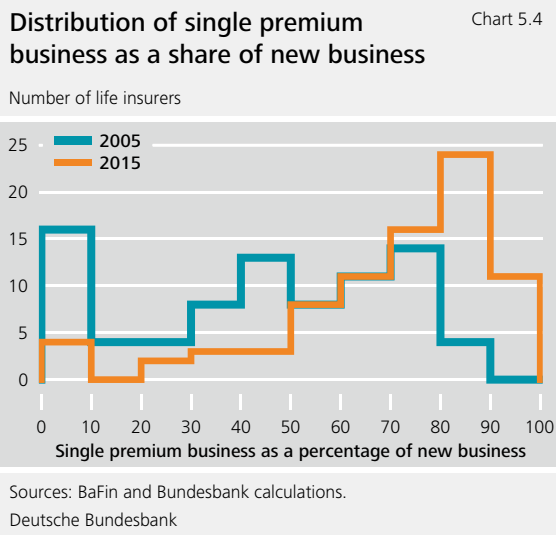
When insurers are in run-off, their variable costs fall since they are incurring no further expenses for selling new policies. At the same time, these insurers could also see their total expense ratios rise since their overhead costs will not drop in proportion to the size of their portfolios. A life insurance company can also cut costs by selling its portfolio to a “run-off platform”, which then winds down this business. These run-off platforms utilise economies of scale by merging multiple policy portfolios, which generally reduces (administrative) costs.

Insurers in run-off, freed from competitive pressures, are able to confine the policyholders’ profit participation share to only the statutory minimum amount. This opens up greater scope for fulfil-

²⁰ For more on the classification of new life insurance products, see DAV (2017), pp 12-13.

²¹ The total return comprises the guaranteed payment, the profit participation share and the maturity bonus.

²² See European Systemic Risk Board (2016).



ling their guarantee commitments. If the portfolio shrinks too much, however, it could well no longer be possible to ensure the adequate pooling of biometric risks within the community of policyholders.

New business characterised by single premium contracts

Structural change within the German life insurance industry has coincided with growth in aggregate total assets pursuant to the German Commercial Code of 36% in the 2005 to 2015 period. Given

Unlike new business in policies with regular premium payments, single premium business is contributing in great measure to the growth of total assets.

the long duration of contracts for life insurance products, existing policies are dominating balance sheets. These balance sheets are being extended by premium income on existing policies and earnings on the investment portfolio.²³ Insurance benefit payments shrink these balance sheets. Balance sheet growth attributable to new business comprises new policies with regular premium payments in the year the pol-

icy was underwritten and single premium business. Unlike new business in policies with regular premium payments, single premium business has been contributing in great measure to the growth of total assets.²⁴

In that vein, 20 life insurance companies reported a relatively small single premium business share of between 0% and 20% in 2005. Ten years later, in 2015, this number had dwindled to four life insurance companies (see Chart 5.4). By contrast, between 2005 and 2015, the number of life insurers with a single premium business share of between 80% and 100% rose from four to 35 companies.²⁵

Single premium policies are attractive particularly to those customers with more extensive financial resources, which they are seeking to invest. If, above all, the rationale for investment is to build up wealth above and beyond personal provision for old age, such policyholders

are likely to be more responsive to financial incentives. This single premium business would, thus, be more interest rate-sensitive than policies with regular premium payments. Non-financial

With the growing importance of single premium policies, the average policyholder is likely to be more sensitive to financial incentives and interest rate movements than previously.

corporations also use such business in order to fund their occupational pension scheme commitments. At

²³ The lion's share of these earnings are transferred to the premium reserve and the bonus and rebate provisions, to which policyholders are entitled. This figure has to be at least 90% pursuant to the German Minimum Allocation Regulation (Mindestzuführungsverordnung).

²⁴ Single premium business accounted for some 81% of balance sheet growth. The definition of new business here includes an increase in the insurance sum through profit participation shares and automatic adjustment. This share makes up about 20% of new business.

²⁵ The median figures in the group of enterprises which reported figures in both 2005 and 2015 were 47% (2005) and 77% (2015). Excluding the insurance sum from profit participation shares and automatic adjustments, these median figures were 41% (2005) and around 61% (2015).

the beginning of the prevailing period of low interest rates, it was particularly lucrative for investors to take out single premium policies because they were still able to benefit from the high coupons and profit participation shares offered by the existing portfolio of assets. Conversely, single premium policies are unattractive to investors in the event of an interest rate reversal because the profit participation shares increase more slowly than the returns on alternative investment forms owing to the lower coupon of the asset holdings. With the growing importance of single premium policies, the average policyholder is likely to be more sensitive to financial incentives and interest rate movements than previously. Vulnerability to an upsurge in policy lapses is, thus, likely to have risen in the past few years.²⁶

Rising interest rates could lead to a dearth of new single premium business, causing the growth in total assets seen in the past to diminish or even reverse itself.²⁷ Where this leads to liquidity bottlenecks, insurers would then have to sell off their asset holdings. Depending on the extent of these sales, they could entail adverse repercussions, eg via price effects, on funds and banks as well as on financial stability as a whole.²⁸

Against this background, BaFin, in its role as a micro-prudential oversight authority, already gave firms advice on how to shape contracts back in 2010.²⁹ This guidance includes adequate lapse deductions and counteracts the listed risks.

Funded pension provision torn between challenges and reforms

The challenges presented by the persistent low-interest-rate environment are not only affecting life insurers – they are no less of an issue for any other funded pension provider which has promised, either implicitly or explicitly, a guaranteed nominal return and, at the same time, has built up a duration gap.³⁰

Occupational pension plans are showing signs of shifting away from long-term guarantees as well. By adopting the Act to Strengthen Occupational Pensions (*Betriebsrentenstärkungsgesetz*), which will enter into force at the beginning of 2018, German legislators will allow employers to offer pure defined contribution (DC) pension plans, thereby potentially reducing employers' liability risk going forward.

Occupational pension plans are showing signs of shifting away from long-term guarantees as well.

In such pure defined contribution plans, employers and trade unions are both required to participate in operating and managing the pension plans. However, they are not liable for the level of the pension benefits paid to employees. The only risk that employers and trade unions are exposed to is reputational risk. That is because employees rate employers and trade unions in part according to how much pension they stand to receive, which, in the case of pure defined contribution plans, depends on how asset holdings perform. This reputational risk acts as an incentive for employers and trade unions to invest the capital efficiently in the best interests of the employees, although the performance of the invested assets sometimes materialises only with a very considerable time lag.

Employers and trade unions, therefore, need to be in a position to anticipate this reputational risk in good

²⁶ See M Feodoria and T Förstemann (2015).

²⁷ Owing to weak new business in policies with regular premium payments, premium growth from existing business is likely to be sluggish in the coming years, which will tend to foster stagnating or even falling total assets as defined in the German Commercial Code.

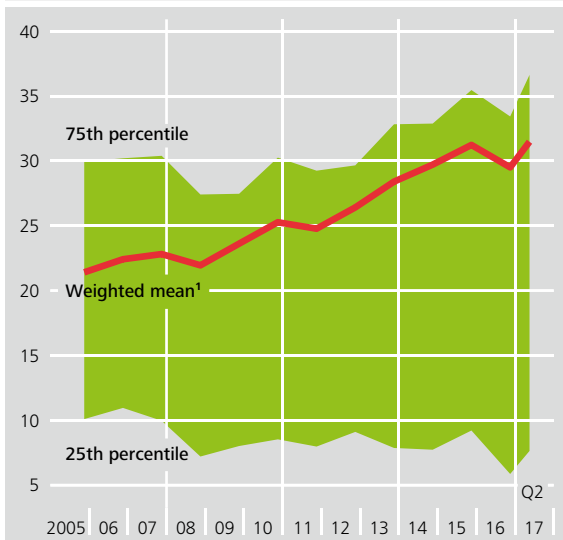
²⁸ See Deutsche Bundesbank (2014a), pp 67-75.

²⁹ See BaFin (2010).

³⁰ More information on the challenges which the low-interest-rate environment is presenting for professional associations' and supplementary income-related pension plans can be found in Deutsche Bundesbank (2016), pp 62-64, while J Clemens and T Förstemann (2015) provides an overview of the occupational retirement provision system.

German insurers' asset holdings in investment funds* Chart 5.5

As a percentage of total asset holdings



Sources: BaFin and Bundesbank calculations. * Market values. All insurance companies with asset holdings >€100 million (market coverage >99%). Solvency I data are used up to the end of 2015, Solvency II data (list of assets) thereafter. ¹ Weighted by volume of asset holdings.

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time and bear it in full; the possibility of a government guarantee needs to be credibly ruled out not just

A government guarantee needs to be credibly ruled out not just explicitly, but implicitly as well.

explicitly, but implicitly as well. Then it would appear that releasing employers from liability for investment performance is beneficial to financial stability

since it acts to prevent capital market risk from potentially spilling over into the corporate sector.

Shifting intermediation chain of insurers and funds driving structural change

German insurers are now less directly interconnected with the domestic banking system and have invest-

ed more of their assets via investment funds (see the chapter entitled “Risk situation of the German financial system” on pages 39 to 61). This shift within the intermediation chain has increased the importance of investment funds in the German financial system and has seen risk migrate away from banks’ balance sheets towards insurers. Three-quarters of insurers’ exposures to German banks had been secured, effectively giving insurers “belt and braces” protection (the banks’ liability plus the collateral provided), but now banks can no longer be held liable.³¹

German insurers are now less directly interconnected with the domestic banking system and have invested more of their assets via investment funds.

All in all, German insurers reduced their exposures (both their direct claims and those held indirectly via fund vehicles) to German banks from 23% (€331 billion) of their asset holdings in the first quarter of 2013 to 14% (€245 billion) in the fourth quarter of 2016. Their claims on foreign banks, by contrast, remained largely unchanged. This shift away from German banks has been observed among a large number of German insurers, with both debt and equity instruments being affected.

The increase in the volume of assets held in investment funds is a longer-term phenomenon. Funds accounted for just 21% (€271 billion) of the insurance industry’s total asset holdings back in the fourth quarter of 2005, swelling to as much as 31% (€622 billion; see Chart 5.5) by the second quarter of 2017.³² While the aggregate figure is up, there is

³¹ Even if banks’ assets held indirectly via fund vehicles are counted, it is still the case that insurers have scaled back their secured exposures to banks.

³² Although smaller insurers with asset holdings of less than €100 million were excluded, the market coverage nonetheless stands at more than 99%. The supervisory data used here might not always match up with the ESCB insurance statistics since the latter are reclassified.

a high degree of variation at the level of individual insurance undertakings. Growth is being driven primarily by a handful of large life insurers.

Germany's institutional framework sets incentives for life insurers in particular to invest their asset holdings in funds. Only fund earnings that are paid out are recognised as income under the accounting standards for life insurers set out in the German

Germany's institutional framework sets incentives for life insurers in particular to invest their asset holdings in funds.

Commercial Code and are required, under the Minimum Allocation Regulation, to be allocated among policyholders and shareholders.³³ Earnings which a fund retains, by contrast, are not taken to the insurer's income statement and can be used in full by the insurer to cushion future losses. These buffers can be tapped to fund future guaranteed payments and are thus positive from a financial stability perspective.³⁴

The tax treatment of specialised funds can create additional incentives to invest in funds, given that the tax payable on reinvested earnings is deferred if certain conditions are met. Furthermore, around one-quarter of the increase in fund investments observed since the end of 2005 can be explained by the growing importance of unit-linked life insurance policies in which the policyholder bears the bulk of the investment risk. Lastly, the superior asset management expertise which investment fund managers might possess can also play a role, not least for smaller insurers or where extensive or specialised investment is called for.

From a regulatory vantage point, assets held directly and indirectly via investment funds are treated equally under Solvency II as long as the "look-through" approach applies.³⁵ Where a fund fails to meet the look-through requirements, it is subjected to the maximum own funds requirements – a provi-

sion which aims to discourage regulatory arbitrage via insurers' fund investments.

As far as investment in German funds is concerned, to an increasing extent, German insurers and pension institutions are shifting their traditional mainstay investments in fixed-income funds into more flexible fund vehicles offering greater diversification. This might also be a reflection of the search for yield in a persistently low-interest-rate setting. The share of bond funds in their German

To an increasing extent, German insurers and pension institutions are shifting their traditional mainstay investments in fixed-income funds into more flexible fund vehicles offering greater diversification.

fund portfolio has, after all, dwindled from 37% in June 2014 to just over 27% in June 2017, while the share of mixed securities funds has climbed from 41% to roughly 48% during the same period.³⁶

At the same time, insurers and pension institutions raised the share of funds of funds in their German fund portfolio from just under 6% (€40 billion) to a little more than 8% (€77 billion).³⁷ Funds of funds enable insurers to bundle their fund investments

³³ Insurers invest predominantly in specialised funds. If these vehicles are held by just one investor or a small number of investors, insurers have a major say in how a fund's distribution policy is designed.

³⁴ Smoothing income by reinvesting earnings in investment funds works in much the same way as the aforementioned introduction of one-off final guaranteed payments for new life insurance policies; however, it is also available as a buffer for outstanding policies.

³⁵ Look-through enables supervisors to "see through" the fund wrapper at what specific asset holdings are held by a fund at a given point in time. Where a fund is managed according to a detailed set of investment objectives, supervisors can calibrate the capital requirements according to those investment objectives rather than the actual asset holdings (simplified look-through).

³⁶ According to the investment funds statistics and the securities holdings statistics.

³⁷ The funding raised by the insurer is first channelled via the fund of funds into different funds, from where it then flows into the real economy in the form of equity, bond or real estate investments, for instance.

in a single vehicle. These developments as well as increased investment in mixed securities funds, reflect a lengthening of the intermediation chain of insurers and pension institutions, and a higher degree of interconnectedness within the investment fund sector (see the following section entitled “Interest rate risk and intrasectoral interconnectedness at investment funds”). Increased interconnectedness need not be an additional source of risk provided funds of funds and target funds are held by a single enterprise and they are not leveraged.

Stronger fund investments by insurers and pension institutions have contributed to the growth of the German investment fund sector. Insurers and pension institutions have traditionally been major

Stronger fund investments by insurers and pension institutions have contributed to the growth of the German investment fund sector.

investors in specialised funds – an investment vehicle which is normally open only to institutional investors and which, with a volume of €1,495 billion, accounted for more than 75% of

the aggregate assets held under management in open-ended funds in June 2017.³⁸ Of the total issuance of specialised fund shares, the share held by German insurers and pension institutions has risen from just over 55% (or €483 billion) in June 2012 to just under 59% (or €877 billion) in June 2017.

Interest rate risk and intrasectoral interconnectedness at investment funds

Open-ended bond funds and mixed securities funds which hold fairly high stocks of interest-bearing securities are exposed to interest rate risk. They engage in maturity transformation because their longer-term assets are, for the most part, funded by liabil-

ities which can be redeemed at short notice. As soon as open-ended investment funds step up their maturity transformation and boost their exposure to interest

rate risk, this can give rise to financial stability risks, although these risks are different to those in the banking sector.³⁹ If a fund’s portfolio duration increases, its interest-rate-sensitive assets will shed more value in the event of an interest rate rise, which, all other things being equal, will result in a steeper drop in the value of the fund’s issued shares. A sharper decline in the value of

a fund’s shares, then, might prompt investors to redeem more of their holdings.⁴⁰ Generally speaking, shareholders’ incentives to redeem their shares ahead of their peers

(first-mover advantage), which might lead to larger redemptions, could be smaller for investors in funds with very few shareholders. If funds take on greater interest rate risk, they are more likely to be hit by stronger outflows and to be forced into sudden “fire sales” of their assets.

As soon as open-ended investment funds step up their maturity transformation, this can give rise to financial stability risks.

If funds take on greater interest rate risk, they are more likely to be hit by stronger outflows and to be forced into sudden “fire sales” of their assets.

German open-ended investment funds have increased the mean duration of their bond portfolios in the past years, both as an overall aggregate and in terms of sector aggregates (see Chart 5.6). Invest-

³⁸ Open-ended funds open to the general public managed roughly €468 billion in June 2017.

³⁹ See here and in the following Deutsche Bundesbank (2015), pp 61-62.

⁴⁰ More on the performance-flow relationship can be found, inter alia, in E R Sirri and P Tufano (1998), J B Berk and R Green (2004) and C Fricke and D Fricke (2017). The liquidity management opportunities offered by investment funds are also discussed in the box entitled “Liquidity risk in investment funds: toolkit and macroprudential stress tests” on pp 98-99.

ment funds held by insurers and the shadow banking system have recorded notable increases in duration since September 2009, of 54% and 60%, respectively. Those held by banks likewise have a longer duration. Only the interest-bearing securities held by non-financial corporations via investment funds saw their mean duration shorten, by just under 11%.

The longer duration affects insurers and banks, as investors in such funds, in different ways. For insurers, on the one hand, a longer duration helps to narrow their duration gap and to mitigate interest rate risk in this sector, which are welcome developments from a financial stability angle. Banks, on the other hand, would appear to be steadily increasing their exposure to interest rate risk (see the section “Significant interest rate risk” in the chapter entitled “Risks in the banking sector” on pages 69 to 71). Notably, as interconnectedness both within and across sectors has risen, so, too, has investment funds’ propensity to take on interest rate risk.

Indirect intrasectoral interconnectedness may be a possible amplifier of financial market shocks

Within the fund sector, interconnectedness can materialise in a direct and an indirect manner. Indirect interconnectedness arises when different funds have common asset holdings, exposing them to the same market price shocks (a phenomenon known as “price-mediated contagion”⁴¹).⁴²

A multitude of indirectly interconnected investment

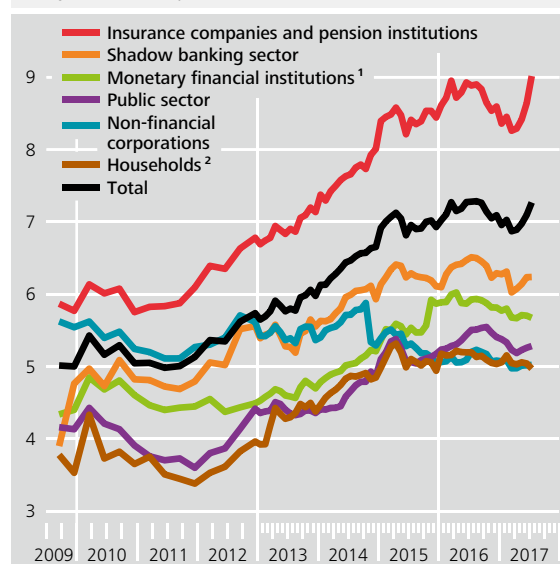
A multitude of indirectly interconnected investment funds can be a source of financial stability risk.

funds can be a source of financial stability risk. These investment funds’ portfolios then have a common risk structure,⁴³ which can encourage herding

during periods of stress. For instance, spells of acute financial market stress might force individual invest-

Portfolio duration of German open-ended investment funds by holder groups* Chart 5.6

Weighted means in years



Sources: Centralised Securities Database (CSDB), Deutsche Bundesbank primary statistics and Bundesbank calculations. * The mean (Macaulay) duration of the bond portfolio is reported here. ¹ Excluding money market funds. ² Including non-profit organisations.

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ment funds into fire sales of securities if their investors redeem substantial volumes of fund shares. Those fire sales can drive down prices, reduce the liquidity of the securities in question and thus ultimately impair the functioning of the markets.⁴⁴ In a reflection of indirect interconnectedness within the sector, investors in other investment funds which are invested in those now-less-liquid securities might now respond to the shift in the fund portfolios’ risk structure by likewise withdrawing their funding,

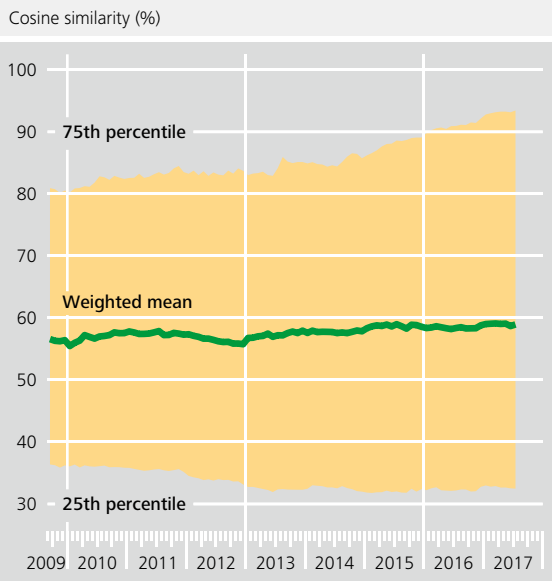
⁴¹ Price-mediated contagion is discussed in greater detail, inter alia, in R Cont and E F Schaanning (2017) and C Fricke and D Fricke (2017).

⁴² Direct interconnectedness and the financial stability risks it can trigger are presented in the section entitled “Increasing direct interconnectedness within the sector raises the risk of a systemic liquidity crisis” on pp 97-99.

⁴³ For more on the implications of common asset holdings for performance diversity, see D Fricke (2017).

⁴⁴ See Financial Stability Board (2015), p 25, and Y Baranova, J Coen, P Lowe, J Noss and L Silvestri (2017).

Portfolio overlap in German open-ended investment funds* Chart 5.7



* Portfolio overlap is calculated as the cosine similarity which quantifies fund portfolio overlap based on the quantity of identical securities as well as their respective portfolio weights; for more on this topic, see P N Tan, M Steinbach and V Kumar, Introduction to data mining, Boston, Pearson Addison-Wesley, 2006.
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which could then force other investment funds into fire sales as well (procyclicality).

The degree of indirect interconnectedness between investment funds can be determined on the basis of their portfolio overlap, where a value of 1 (0) denotes a complete (zero) overlap. An often-used overlap measure is the cosine similarity, since it incorporates not just the number of common asset holdings in the portfolios but also their respective portfolio weights, thus depicting the degree of overlap more accurately.⁴⁵ Given the heterogeneous investment policies pursued by investment funds such as equity and bond funds, this chapter will concentrate on each investment fund's maximum cosine similarity with all other investment funds.

The average cosine similarity of German open-ended investment funds, weighted by the value of each fund's securities portfolio, moved 2.4 percentage

points higher between September 2009 and July 2017 to stand at 58.9% (see Chart 5.7).⁴⁶ Much of this growth can be put down to the increasing interconnectedness of investment funds which have significant overlaps with other investment funds. In July 2017, 1,401 out of 6,374 investment funds had a portfolio overlap of at least 95% with another investment fund. These funds account for 20%, or €398 billion, of the fund sector's assets under management. In September 2009, it was just 892 out of 6,086 funds, and a share of 13%, or €130 billion, of the fund sector's total assets under management.

The indirect interconnectedness of German investment funds via their securities portfolios has intensified, then, which tends to facilitate the transmission of financial market shocks from one investment fund to another.

Viewed in isolation, the rise in the share of investment funds with a significant portfolio overlap discussed above suggests that investment funds are

Indirect interconnectedness tends to facilitate the transmission of financial market shocks from one investment fund to another.

now likely to behave more procyclically in stress situations⁴⁷ than had been the case in earlier crisis episodes. Insurers' increased investment in funds can have a compensatory effect, given their frequently countercyclical behaviour in similar situations in the past.⁴⁸

⁴⁵ Portfolio similarity is defined here as the quotient of the summed products of the individual securities' portfolio weights and the product of the respective root of the summed squared portfolio weights. See, inter alia, P N Tan, M Steinbach and V Kumar (2006).

⁴⁶ Source: Investment funds statistics and Bundesbank calculations.

⁴⁷ See C Fricke and D Fricke (2017).

⁴⁸ See Y Timmer (2017).

Increasing direct interconnectedness within the sector raises the risk of a systemic liquidity crisis

Direct interconnectedness between financial intermediaries is another potential channel of contagion for financial market shocks. Within the investment fund sector, those linkages materialise on both the asset and liability sides of the balance sheet when one investment fund invests in the shares of another. Fund A may be providing funding for fund B, but it is also directly exposing itself to any losses suffered by fund B.

Where significant direct linkages exist, one investment fund's liquidity situation will therefore also impact on the liquidity of any investment funds invested in it. If a shortage of liquidity, for example, forces a capital management company to stop redeeming shares in one of its funds, that

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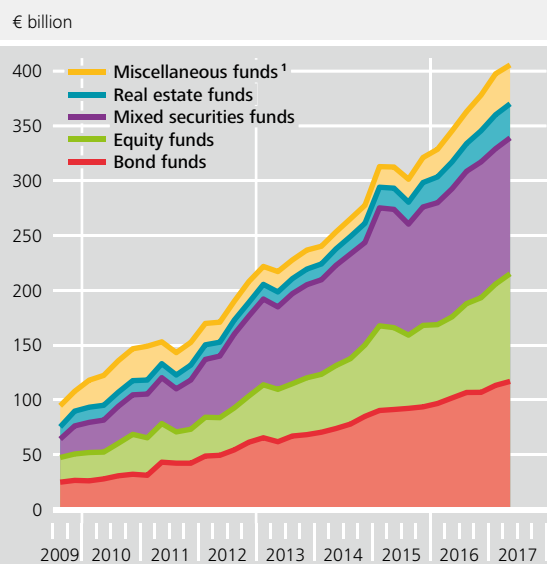
fund's shares would become illiquid. Any investment funds invested in that fund facing redemption requests from their own investors would be forced into selling more of their other

securities, thus pushing down the prices of those assets. At the same time, the unredeemable fund shares would automatically become larger exposures in those portfolios. Consequently, portfolio liquidity of these funds would decrease, giving their investors an incentive to redeem their fund shares ahead of their peers (first-mover advantage), thus impairing those funds' liquidity situation still further.⁴⁹

Direct linkages between German investment funds have gradually increased over the past years.

Direct linkages between German investment funds have gradually increased over the past years. In June 2017, the shares

Shares held by German open-ended investment funds in other investment funds by investment policy



Sources: Centralised Securities Database (CSDB), ECB, Deutsche Bundesbank primary statistics and Bundesbank calculations. ¹ Hedge funds, money market funds and funds with other investment strategies.
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held by investment funds in other investment funds came to €406 billion, or 23.5% of the fund sector's aggregate securities holdings (see Chart 5.8). Since September 2009, investments in mixed securities funds, in particular, have grown, soaring by 638% to €124 billion. As a result, they now rank as the most important type of investment among funds, accounting for 30.6% of all the holdings of fund shares.

Among German investment funds, mounting direct interconnectedness is increasing mutual dependencies, raising the risk of a systemic liquidity crisis. This phenomenon has sparked an international debate on the need for liquidity management tools for

⁴⁹ For more on how the liquidity of fund portfolios affects behaviour when investors redeem fund shares, see Q Chen, I Goldstein and W Jiang (2010) and I Goldstein, H Jiang and D T Ng (2016).

Liquidity risk in investment funds: toolkit and macroprudential stress tests

In Germany, fund managers have little scope in dealing with increased outflows from their funds. Cash resources and – to a limited extent – short-term loans are available as a buffer against liquidity stress. The fund managers' only other option is to sell assets in order to service share redemptions. However, particularly in the case of less liquid assets, this can lead to price mark-downs which, in turn, may trigger a liquidity spiral, with share redemptions, asset sales and falling asset prices reinforcing each other.

Capital management companies in Germany have only a limited liquidity management toolkit to address such liquidity spirals. All capital management companies that manage German undertakings for collective investment in transferable securities (UCITS) or alternative investment funds (AIF) may – while taking due account of investors' interests – include provisions for suspending share redemptions in their terms of investment. The Federal Financial Supervisory Authority (BaFin) may also order a capital management company to suspend share redemptions if this is deemed necessary in the interests of investors or the general public. Suspending share redemptions is the only liquidity tool available across the EU.

At an international level, the Financial Stability Board (FSB) and the European Systemic Risk Board (ESRB) are currently discussing whether to introduce further instruments for managing liquidity. The FSB has published corresponding recommendations. The following liquidity management tools are under discussion or already available in some countries.¹

- Redemption gates restrict share redemptions in order to give the respective investment fund's capital management company more time to sell assets in an orderly manner.
- Swing pricing uses a modified net asset value (NAV) of a fund to pass on the costs arising from the issue and redemption of fund shares to those who are buying and selling.
- Side pockets are used to separate liquid investment fund assets from illiquid ones. The illiquid part is wound up, meaning that it is no longer actively managed and that its assets are gradually sold off.
- Notice periods set out a minimum period of time between the investor giving notice of its intention to redeem shares and the capital management company calculating the NAV.

In addition, the FSB recommends that the authorities responsible for macroprudential oversight should also add macroprudential stress tests for the investment fund sector to their toolkit where necessary. Such sector-wide or system-wide stress tests are important for assessing investment funds' contribution to systemic risk and answering the question of the extent to which the investment fund sector may contribute to the instability of the financial sys-

¹ For a list of liquidity management tool availability according to jurisdiction, see International Organization of Securities Commissions, Liquidity Management Tools in Collective Investment Schemes: Results from an IOSCO Committee 5 survey to members, December 2015.

tem as a whole.² Current work in this direction is still at the development stage in many cases. The further enhancement of such macroprudential stress test approaches for the investment fund sector should be expedited. A greater diversity of models may address the issue of potential model uncertainty in the design of macroprudential stress tests.

² See also Financial Stability Board, Assessment methodologies for identifying non-bank non-insurer globally systemically important financial institutions, Consultative Document, March 2015, p 25, and Financial Stability Board, Policy recommendations to address structural vulnerabilities from asset management activities, January 2017.

funds, which would particularly allow liquidity risk and a possible set of dedicated tools to be evaluated, including in terms of how they relate to financial stability concerns (see the box entitled “Liquidity risk in investment funds: toolkit and macroprudential stress tests” on pages 98 and 99).

Among German investment funds, mounting direct interconnectedness is increasing the risk of a systemic liquidity crisis.

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AIF	Alternative Investment Fund
BaFin	Federal Financial Supervisory Authority
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
BLS	Bank Lending Survey
BRRD	Bank Recovery and Resolution Directive
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
CRSA	Credit Risk Standardised Approach
CSDB	Centralised Securities Database
EBA	European Banking Authority
ECB	European Central Bank
ESRB	European Systemic Risk Board
EU	European Union
FOLTF	Failing or Likely to Fail
FOMC	Federal Open Market Committee
FSB	Financial Stability Board
GDP	Gross Domestic Product
G-SIIs	Global Systemically Important Institutions
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
IRBA	Internal Ratings-Based Approach
LTV	Loan-to-Value ratio
MFI	Monetary Financial Institution
MREL	Minimum Requirement for Own Funds and Eligible Liabilities
NAV	Net Asset Value
OECD	Organisation for Economic Co-operation and Development
O-SIIs	Other Systemically Important Institutions
P/B ratio	Price-Book ratio
P/E ratio	Price-Earnings ratio
RDSC	Research Data and Service Centre of the Deutsche Bundesbank
RWA	Risk-Weighted Assets
SRB	Single Resolution Board
SREP	Supervisory Review and Evaluation Process
SRM	Single Resolution Mechanism
SSM	Single Supervisory Mechanism
UCITS	Undertakings for Collective Investment in Transferable Securities

Bundesbank publications concerning financial stability

This overview lists selected recent Bundesbank publications on the subject of financial stability. The Financial Stability Review and the Monthly Report are available in both German and English, while most discussion papers are only available in English. The publications are available free of charge to interested parties and may be obtained from the Bundesbank's External Communication Division. They can also be downloaded from the Bundesbank's website, as can updated time series for selected statistical datasets.

Financial Stability Reviews

Financial Stability Review, November 2016
Financial Stability Review, November 2015
Financial Stability Review, November 2014
Financial Stability Review, November 2013
Financial Stability Review, November 2012
Financial Stability Review, November 2011
Financial Stability Review, November 2010
Financial Stability Review, November 2009
Financial Stability Review, November 2007
Financial Stability Review, November 2006
Financial Stability Review, November 2005

Articles from the Monthly Report

September 2017	The performance of German credit institutions in 2016
September 2017	Distributed ledger technologies in payments and securities settlement: potential and risks
August 2017	Monetary policy and banking business
July 2017	The market for corporate bonds in the low-interest-rate environment
July 2017	The development of government interest expenditure in Germany and other euro-area countries
July 2017	The danger posed to the global economy by protectionist tendencies
July 2017	Return on private financial assets taking into account inflation and taxes
June 2017	Design and implementation of the European fiscal rules
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