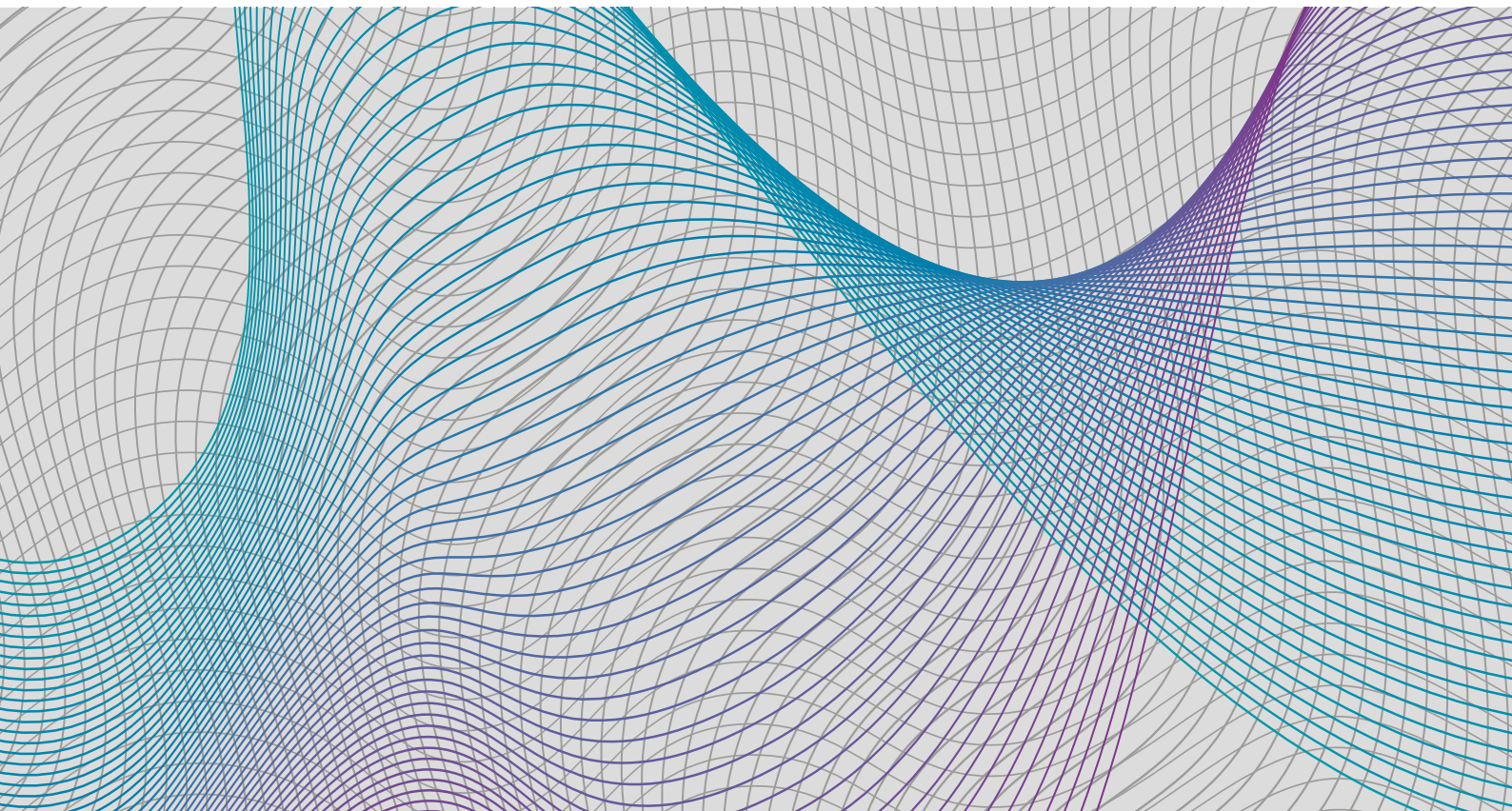




# Financial Stability Review 2016



Deutsche Bundesbank  
Wilhelm-Epstein-Strasse 14  
60431 Frankfurt am Main, Germany

Postfach 10 06 02  
60006 Frankfurt am Main, Germany

Tel +49 69 9566-0  
Fax +49 69 9566-3077

<http://www.bundesbank.de>

Reproduction permitted only if source is stated.  
ISSN 1861-8987 (print edition)  
ISSN 1861-8995 (online edition)

The German original of this *Financial Stability Review*  
went to press on 11 November 2016.

The *Financial Stability Review* is published by the  
Deutsche Bundesbank, Frankfurt am Main. It is  
available to interested parties free of charge.

This is a translation of the original German-language  
version, which is the sole authoritative text.



# ■ Financial Stability Review 2016

Introduction .....	5
<b>■ Overview</b> .....	7
<b>■ Macroeconomic and financial environment encouraging build-up of risks</b> .....	13
International environment characterised by persistently low rates and subdued economic growth .....	14
Environment encouraging build-up of risks .....	15
<b>■ Increased risks in the banking sector</b> .....	31
Effects of low interest rates on the banking system .....	32
Earnings outlook dampened .....	37
Stress resistance improved .....	42
<b>■ Funded pension providers continuing to face challenges</b> .....	49
Interest rate sensitivity increasingly entering the spotlight .....	50
Interest rate risk and return on investment .....	51
Macroprudential dimensions of Solvency II .....	57
Funded pension provision facing challenges and potential reforms .....	62
<b>■ Technology-enabled financial innovations: a source of opportunities and risks</b> .....	67
Fintechs – an innovative element in the financial system .....	68
Fintechs and their implications for financial system stability .....	69
Selected fintechs from a financial stability perspective .....	73
Need for macroprudential action .....	76

<b>Increased importance of central counterparties</b> .....	79
Significance of central clearing for financial stability .....	80
Implications for macroprudential policy .....	86
<b>Glossary</b> .....	91
<b>Bundesbank publications concerning financial stability</b> .....	93

## Boxes

Abbreviations and symbols	4
Macroprudential policymaking procedure	22
Cyber risks and financial stability	27
An indicator for measuring macroprudential liquidity risk	38
Magnitude and development of implicit government guarantees for banks	41
German banks' exposure to borrowers in selected European countries	43
Reciprocity of macroprudential policy measures in the EU	45
German life insurers' return on investment strongly affected by the interest rate setting	52
Regulation of crowdlending and robo advisory services in Germany	74
Quantitative methodology for identifying systemically important central counterparties	83

## Abbreviations and symbols

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

Discrepancies in the totals are due to rounding.

# Introduction

Given its public mandate to safeguard monetary stability, the Bundesbank has an inherent interest in ensuring a stable financial system. As an integral part of the European System of Central Banks, it also has an explicit mandate to contribute to financial stability.

The Bundesbank's shared responsibility for safeguarding financial stability stems, above all, from its involvement in macroprudential supervision. 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 the factors relevant to the stability of the financial system, based on the Bundesbank's analyses. When faced with threats that may harm financial stability, the Committee can issue public or non-public 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 super-

vision 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. The identification of systemic risks plays a major role in this approach. Such risks arise when the distress of a systemically important market participant (such as a bank, insurer or other financial intermediary, but possibly also an infrastructure provider) jeopardises the functioning of the entire system. This can occur when the distressed market player is very large (too big to fail) or closely interlinked with other market actors (too connected to fail). But systemic risk may also arise when a plurality of small market participants are exposed to similar risks (too many to fail).

The aim of the ongoing analysis of the stability situation is the timely detection of underlying changes and emerging risks in Germany's financial system that may endanger its stability. 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 for the efficiency and smooth functioning of the financial markets. The Bundesbank's stability analysis follows a risk-oriented approach based on downside scenarios.

Account has been taken of developments up to the cut-off date of 11 November 2016.



# Overview

Low interest rates coupled with muted growth potential can encourage the build-up of risks to financial stability. The longer the low-interest-rate level persists, the larger the share of low-yielding assets on financial institutions' balance sheets will become. This increases the potential risks associated with a subsequent rise in the interest rate level, especially for banks and life insurance companies. The search for yield prompted by low interest rates may also induce investors to systematically underestimate risk, thus skewing risk premiums downwards. This can encourage the build-up of latent risks in other sectors of the economy, too. In addition, low interest rates may also help to trigger a credit-financed real-estate boom, thus giving rise to systemic risk.

## Macrofinancial setting shaped by subdued euro-area economic momentum and low interest rates

Recessions triggered by financial crises usually entail high economic and social costs. Economic growth often slumps and recovers very slowly, unemployment soars and remains high for longer, while private and public debt expands. Some of these costs were less immediately felt and evident in Germany than in the countries that were hit especially hard by the global financial crisis and the European sovereign debt crisis. Even so, the German economy was directly affected owing to its close financial and real economic ties with other countries. In particular, some financial institutions had to be supported by large sums of taxpayers' money.

*Recessions triggered by financial crises usually entail high economic and social costs.*

Some of these costs were less immediately felt and evident in Germany than in the countries that were hit especially hard by the global financial crisis and the European sovereign debt crisis. Even so, the German economy was directly affected owing to its close financial and real economic ties with other countries. In particular, some financial institutions had to be supported by large sums of taxpayers' money.

The operational setting for the German financial sector is heavily influenced by the economic situation in the euro area as a whole. The euro area's current muted economic momentum not only reflects longer-term demographic and structural factors, it is also a legacy of the preceding financial crisis.

This is the backdrop to the low rates of inflation. An expansionary monetary policy stance is appropriate in such an environment; non-standard monetary policy measures are generally a suitable instrument when rates are hovering around the zero bound. The low interest rate level, which fell further in 2016, should be seen in this context.

*The current muted economic momentum is also a legacy of the preceding financial crisis.*

A trend towards declining longer-term nominal and real interest rates has actually been observable in all major industrial countries since the 1990s. This trend intensified in the wake of the debt crisis.

The German economy's basic dynamics are fairly robust. Gross domestic product (GDP) is forecast to grow by 1.7% in 2016, which is higher than the country's potential growth rate.

## Interest rate changes affect the entire financial system

The decline in interest rates seen over the last few years has so far boosted the profitability of banks because their interest expenditure has fallen more rapidly than their interest income. By contrast, declining interest rates have a direct negative impact on life insurers because lower earnings from investing and

reinvesting their funds do not match their relatively high nominal guaranteed returns to policyholders.

A protracted period of low interest rates also harbours risks that increase with time. The longer interest rates remain low, the larger will be the share of low-yielding loans or securities in financial institutions' portfolios. If interest rates go up in future, either because the central bank raises rates on the basis of macroeconomic developments or because higher risk premiums are demanded in general, this could impair the earnings of the entire financial system in the short to medium term, although the transmission channels function differently in the various segments of the financial system.

Thus banks and life insurance companies are affected to varying degrees by the current low interest rates and the risk of future interest rate changes. Banks typically grant long-term loans funded by short-term deposits. Life insurers, by contrast, have long-term liabilities in the form of guaranteed returns to their policyholders. Their investments tend to have shorter maturities than their liabilities.

The fact that banks and life insurers are exposed to interest rate risk in different ways also has a stabilising effect on the overall financial system. However, systemic risk can still occur if many enterprises within a single sector are exposed to similar risks. The interest rate risks for banks and life insurers, especially, are strongly correlated because the business models of the enterprises of each sector are similar.

In addition, a sudden interest rate rise would put pressure on both banks and life insurance companies. Many banks in Germany have agreed long interest rate lock-in periods with their borrowers. If refinancing becomes more expensive for banks later on, their net interest income could fall accordingly. Life insurers would see a decline in the value of their investments if interest rates were to rise in the future. At first, this would probably be more than off-

set by larger income from newly invested funds. At the same time, insurers cannot symmetrically adjust their liabilities because

policyholders are guaranteed fixed surrender values if their policies are cancelled. A future rise in interest rates could therefore simul-

taneously affect many financial institutions across sectors, acquire a systemic dimension and jeopardise financial stability (see the chapters entitled "Increased risks in the banking sector" on pages 31 to 48 and "Funded pension providers continuing to face challenges" on pages 49 to 66).

*A sudden interest rate rise would put pressure on both banks and life insurance companies.*

#### **Need to keep an eye on developments in all sectors of the economy**

The macroeconomic and financial environment affects all sectors of the economy. To gauge whether and how potential risks to financial stability might accumulate and what their impact might be, it is important to keep an eye on developments.

*Macroeconomic and financial environment affects all sectors of the economy.*

The non-financial corporate sector in Germany is benefiting in many ways from the current macroeconomic environment, eg in the form of low financing costs. On the whole, the fact that insolvency rates are declining at present is likely to have eased the burden stemming from payment defaults. In addition, the projected costs of future loan defaults incorporated into the risk provisioning of German banks have decreased. For instance, the share of non-performing loans fell from 2.6% at the end of 2008 to 2.1% at the end of 2015.<sup>1</sup> During the



same period, the ratio of credit risk provisioning to net lending fell from 1.4% to 1.0% (see the section “Earnings outlook dampened” in the chapter entitled “Increased risks in the banking sector” on pages 37 to 42).

Households are affected by low interest rates and subdued inflation in different ways, depending on their relative wealth and consumption behaviour. On the one hand, households’ financial assets are earning less nominal interest than before the crisis, which is a reflection of the real economic environment. On the other, financing conditions – eg for long-term mortgage loans – are at a historic low and may therefore fuel investment in residential property. Residential property prices in Germany have risen sharply over the last few years, particularly in the big cities, climbing by 5.5% in the first half of 2016 alone.<sup>2</sup> However, there are no clear indications that banks are over-lending or lowering their credit standards. In September 2016, the annual growth rate in loans for house purchase was 3.7% (see the section “No immediate risks from developments in the German housing market” in the chapter entitled “Macroeconomic and financial environment encouraging build-up of risks” on pages 19 to 21).

The public sector is in a similar situation. The very favourable refinancing conditions are making it easier to comply with fiscal and debt targets. The global volume of negative-yielding government bonds tripled from the end of 2015 to the end of the first half of 2016 to just under US\$6 trillion or 23% of the outstanding total volume of government bonds. However, this cheap funding is also creating incentives to pursue a generally laxer fiscal policy, which masks the structural deficits that may have a negative mid to long-term impact on the sustainability of public finances.

### Potential collective misjudgement of risk

There is a risk that, in the current environment, future macroeconomic developments may be misjudged. Expectations that interest rates will remain low for an extended period of time may encourage financial market players to take higher risks. This search for yield can, in turn, result in the mispricing of assets. On the one hand, there is a risk of an abrupt price correction. On the other, mispricing can also have indirect consequences if risk premiums in the financial markets are systematically too low and are used as the basis for calculating prices. Loan collateral could be misvalued which, together with an increase in lending, could give rise to systemic risks to financial stability (see the section “Incentives for increased risk-taking” in the chapter entitled “Macroeconomic and financial environment encouraging build-up of risks” on pages 21 to 26).

*Search for yield can result in the mispricing of assets.*

A case in point is real estate financing. If the risks associated with the financing of real estate are underestimated, this may result in unsustainable credit portfolios. In this context, the mortgage rate lock-in period determines how the risks of future interest rate changes are shared between the borrower and the lender. While in Germany private mortgage loans tend to have long interest rate lock-in periods, in other countries, such as Spain or the United Kingdom, mortgages are more commonly subject to variable interest rates that move in line with market rates. In the first case, the resulting in-

*If the risks associated with the financing of real estate are underestimated, this may result in unsustainable credit portfolios.*

<sup>1</sup> Measured as a share of total gross lending (net lending plus risk provisioning).

<sup>2</sup> This figure is based on data provided by the Association of German Pfandbrief Banks (Verband deutscher Pfandbriefbanken).

terest rate risk is borne by the banks until the end of the lock-in period. In the second case, by contrast, it is borne by the households which have taken out the mortgage (see the section “Risks stemming from maturity transformation have increased” in the chapter entitled “Increased risks in the banking sector” on pages 32 to 35).

### **Resilient financial sector is prerequisite for sustainable growth**

Sustainable private and public finances are, not least, the essential prerequisite for enabling monetary policy to successfully fulfil its mandate of ensuring price stability without coming under pressure from or facing a conflict of interest with fiscal policy or with regard to financial stability. The financial sector’s pivotal importance for future developments in the real sector as well as price dynamics may engender risks to price stability and financial stability in the medium term. These risks need to be tackled today.

It is not possible to predict when the currently favourable financing conditions will change. There is considerable uncertainty surrounding the magnitude and timing of future risks that could impact multiple market participants

*It is not possible to predict when the favourable financing conditions will change.*

symmetrically. This is reflected in the broad range of microprudential and macroprudential stress tests and risk models used to estimate risk. Each individual market participant is therefore primarily responsible for examining the sustainability of its own financing models, which includes taking into account changes to the macroeconomic setting.

The state of the financial sector itself has a major impact on how strongly emerging risks have a knock-on effect on the real economy. Appropriate

risk buffers mitigate self-reinforcing processes in the financial system. An adequate capital ratio can act as a risk buffer to cushion against sudden price and interest rate changes. What is more, a sufficient capital base is a precondition for enabling the financial markets to perform their function as service providers to the real sector and can promote the real economic activity needed to achieve sustained growth. Better capitalised banks are more competitive and tend to grant more loans (see the section “Stress resistance improved” in the chapter “Increased risks in the banking sector” on pages 42 to 47).

*An adequate capital ratio can cushion against sudden price and interest rate changes.*

Besides adequate capital buffers, contractual arrangements can also influence which financial system segment ultimately bears risks – particularly macroeconomic risks. The fact that contractual obligations can have long-term implications is illustrated by the recent experience of

the German life insurance segment. Policies written in the past guaranteeing long-term fixed nominal returns are no longer

*Returns guaranteed by the life insurance sector in the past are no longer compatible with current economic developments.*

compatible with current economic developments. In the case of German life insurers, for example, 48% of the premium reserve is attributable to policies that were taken out 15 years ago or earlier and that have a nominal guaranteed return of up to 4% (see the chapter entitled “Funded pension providers continuing to face challenges” on pages 49 to 66).

### **Structured evaluation process needed**

It is ultimately down to the contracting parties themselves to assess risk adequately, factor this into the contracts and choose a robust financing structure.

Decisions made by the private sector thus have a major impact on the resilience of the financial system. However, they are not sufficient by themselves to align private and public-sector interests and

*Important reforms have been adopted in the field of financial market regulation since the financial crisis.*

reduce misplaced incentives. Important reforms have therefore been adopted in the field of financial market regulation since the financial crisis. These attempt to remedy the deficits that led to the global financial crisis by increasing the resilience of the financial system, reforming the derivatives markets, monitoring shadow banks more closely and resolving the too-big-to-fail problem. Against this background, macroprudential policy – which focuses on the stability of the financial system as a whole – was established as a new policy area alongside the traditional microprudential supervision of individual institutions.

It is too early to completely and conclusively gauge the impact of the reforms. Many individual measures have not yet been fully implemented; the task of adapting the entire financial system to the new framework has not yet been concluded. Some reform elements, such as the macroprudential framework for central counterparties, are still in the process of being developed (see the chapter entitled “Increased importance of central counterparties” on pages 79 to 90). At the same time, the underlying conditions are changing, eg through the emergence of fintechs (see the chapter entitled “Technology-en-

abled financial innovations: a source of opportunities and risks” on pages 67 to 78).

Even so, a structured evaluation process can help to progressively monitor the advances made and identify any unintended side effects at an early stage. The process should track the individual steps in the overall macroprudential policy cycle. The first step in this cycle is defining the objective of “financial stability”. Next, suitable risk indicators are defined and, where appropriate, instruments are chosen on the basis of analysing the expected impacts. Finally, where one or more macroprudential instruments are applied, their actual impact is evaluated (see the box entitled “Macroprudential policymaking procedure” on pages 22 to 24).

*A structured evaluation process should track the overall macroprudential policy cycle.*

With regard to the evaluation process, it must be remembered that the overarching objective of increasing the resilience of the financial sector is particularly difficult to measure, whereas accompanying adjustment burdens are felt immediately in some cases. It is thus a question of weighing the short-term cost of regulation against the long-term return in the form of reducing the likelihood and impact of future financial crises. The crucial contribution that such a structured evaluation process can make is to enhance overall regulatory efficiency without calling into question the objectives of the regulatory agenda or weakening the resilience of the financial system.



# Macroeconomic and financial environment encouraging build-up of risks

*The international environment is shaped by the persistently low interest rates, which fell further this year, and subdued global economic growth. This allows risks to build up and potentially materialise within the international financial system.*

*First, there is an increased risk that the profitability of the banking system in the euro area will be lastingly weakened. The low interest rates and the accompanying pressure on margins as well as the still subdued economic growth in individual euro-area countries are, however, not the only reasons for the difficult situation facing banks in the euro area. In fact, these factors are merely aggravating existing structural issues.*

*Second, low interest rates increase the incentives for a further accumulation of debt. At the same time, subdued global growth makes it more difficult to reduce existing private and public debt from their already high levels. This jeopardises debt sustainability and raises credit risk.*

*In addition, the low interest rates create incentives for greater risk-taking. At the same time, the moderate global growth prospects affect enterprises' profitability. This increases the risk of an abrupt repricing on the international financial markets, which may, in turn, be problematic for financial stability if investors do not have sufficient risk provisions to cover losses. Market indicators currently suggest heightened risk-taking in various financial market segments.*

## International environment characterised by persistently low rates and subdued economic growth

The international environment is shaped by ongoing subdued global economic growth together with low interest rates. The International Monetary Fund forecasts that global economic growth will amount to 3.1% in 2016, unchanged from 2015.<sup>1</sup> This muted rate of growth is being influenced by the relatively moderate pace of growth in China and other emerging market economies. Economic momentum in the industrial countries has also waned somewhat of late. Overall, the fact that potential growth has been declining for years is having an effect.<sup>2</sup> Within the euro area, the economic recovery is set to continue with expected growth of 1.7% in 2016. The economy of the monetary union is therefore on a moderate recovery path overall. However, individual euro-area countries continue to experience relatively weak economic activity. Germany's gross domestic product (GDP) is forecast to grow by 1.7% in 2016, which is more than the country's potential growth.<sup>3</sup>

### Interest rates historically low

The low interest rates, which fell further this year, remain a key determinant of the international environment. The interest rate lows in many areas fell to unprecedented levels, in part reflecting overall subdued real economic growth. Yields on medium and longer-term government bonds in the United States, Japan, the United Kingdom and Germany fell noticeably over the course of the year. As a consequence, the global volume of government bonds with a negative yield rose considerably (see Chart 2.1). While the amounts of

*The low interest rates, which fell further this year, remain a key determinant of the international environment.*

outstanding government bonds trading at negative yields was less than US\$2 trillion at the end of 2015 (roughly 8% of the overall government bond volume considered here), this figure had tripled to just under US\$6 trillion by the end of the first half of 2016 (approximately 23%). In the second half of 2016, the volume of negative-yielding government debt has continued to swell, reaching around US\$8 trillion at last count (roughly 31%).<sup>4</sup>

There has been a trend towards declining longer-term nominal and real interest rates in all major industrial countries since the 1990s (see Chart 2.2). This trend has accelerated further following the global financial and European debt crisis.

There are a number of structural reasons for falling interest rates. An excess of planned savings over investment demand is often identified as a main cause. This is blamed, amongst other things, on factors such as global demographic developments, with the associated heightened propensity to save, slowing growth in total factor productivity as well as an increased demand for safe financial assets.<sup>5</sup>

The interest rate level has fallen further since the global financial crisis. For one thing, investment momentum in the industrial countries weakened perceptibly during the recession. The lower funding requirements in turn dampened interest rates.<sup>6</sup> For another, central banks around the world, including the Eurosystem's, have responded to the persistently low rates of inflation by introducing exceptionally

<sup>1</sup> Source: International Monetary Fund, World Economic Outlook Database (as at October 2016).

<sup>2</sup> See International Monetary Fund (2016a), p 27.

<sup>3</sup> See Deutsche Bundesbank (2016c), p 13.

<sup>4</sup> This information covers all government bonds included in the Bloomberg Global Developed Sovereign Bond index.

<sup>5</sup> For a more detailed discussion of the causes of the low-interest-rate environment, see, inter alia, C Bean, C Broda, T Ito and R Kroszner (2015) and L Rachel and T Smith (2015). For an additional overview of the literature, see European Systemic Risk Board (2016).

<sup>6</sup> See International Monetary Fund (2014), p 82.

expansionary monetary policies. This has contributed to driving nominal interest rates lower still.

## Environment encouraging build-up of risks

The current environment of low interest rates and muted economic growth may encourage the build-up and materialisation of risks to the stability of the international financial system in various ways.

### Structural problems in the euro area's banking system are being aggravated

Euro-area banks must resolve existing structural problems, while at the same time confronting the challenges of the international environment.<sup>7</sup> This is illustrated by developments in the market valuation of listed euro-area banks (see Chart 2.3). Uncertainty on the financial markets rose sharply, especially after a majority of the UK public voted to leave the EU in the referendum at the end of June 2016, and bank stocks within the

*Euro-area banks must resolve existing structural problems and adapt to the changed conditions.*

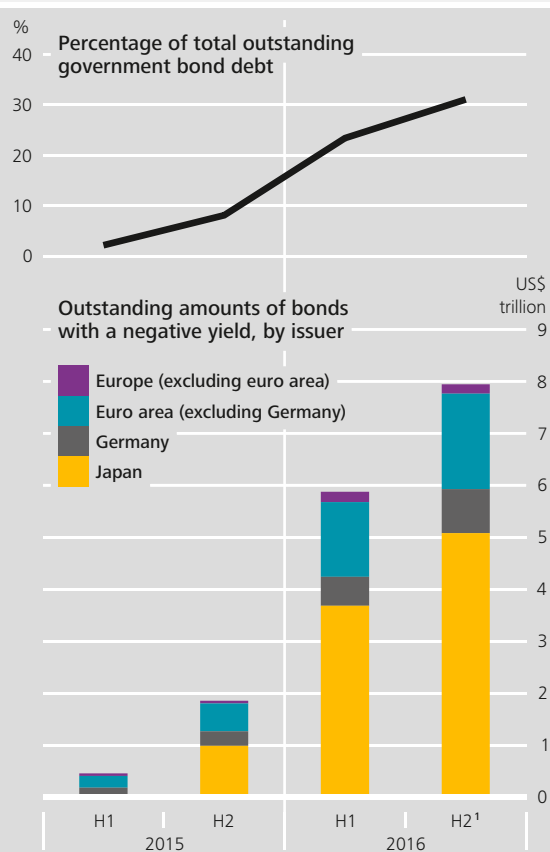
euro area suffered a further decline in value within a short space of time.<sup>8</sup> These losses were only partially offset in the subsequent rally.<sup>9</sup> However, stock prices for banks in the individual countries had already diverged considerably in the first half of the year. This might reflect an increasingly differentiated perception of the risks and earnings prospects of the individual national banking systems within the euro area.

These market trends also reflect the challenges faced by the euro-area banking sector. The subdued economic growth in several euro member states is having a negative impact on demand for loans as

### Government bond debt\* with a negative yield

Chart 2.1

Semi-annual data



Sources: Bloomberg and Bundesbank calculations. \* The analysis covered all government bonds included in the Bloomberg Global Developed Sovereign Bond Index. 1 Data as at 7 November 2016.

Deutsche Bundesbank

well as on the quality of banks' existing loan portfolios. The very low interest rates and a flattening of the yield curve may also reduce banks' net interest margin.<sup>10</sup> At the same time, the Eurosystem's expansionary monetary policy is likely to have supported

<sup>7</sup> See also the chapter entitled "Increased risks in the banking sector" on pp 31-48.

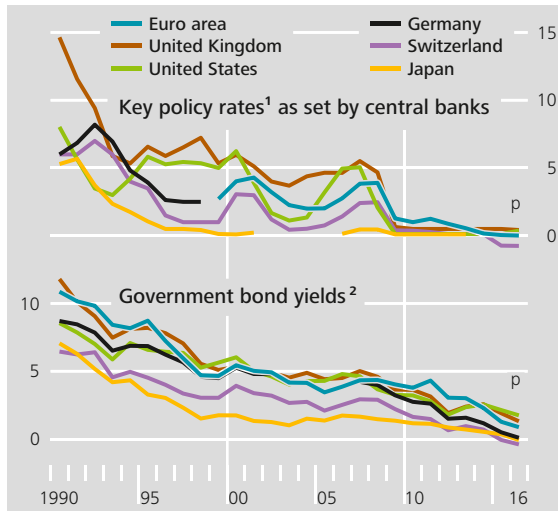
<sup>8</sup> For instance, EURO STOXX Banks, a stock index covering important listed euro-area bank shares, fell perceptibly following the referendum.

<sup>9</sup> EURO STOXX, which includes other euro-area business sectors besides bank stocks, initially suffered clear losses following the referendum result, but recouped these losses.

<sup>10</sup> See S Claessens, N Coleman and M Donnelly (2016); C Borio, L Gambacorta and B Hofmann (2015).

**Global interest rate environment** Chart 2.2

Annual averages in %

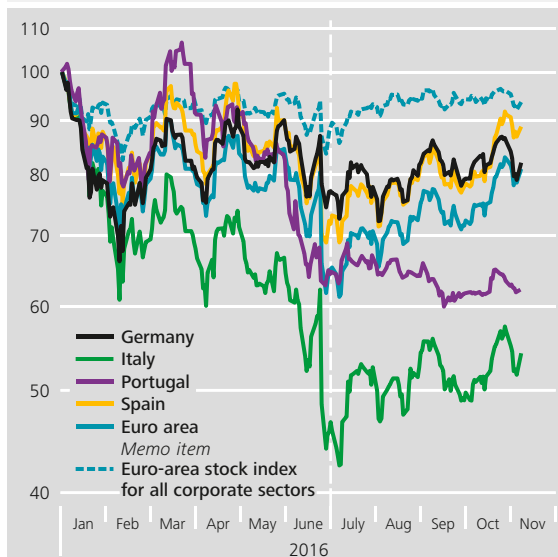


Sources: Information provided by central banks, OECD, Thomson Reuters Datastream and Bundesbank calculations. **1** Where there is a target range for key interest rates, the average between the upper and lower bound is shown. Japan: from March 2001 to March 2006, the Bank of Japan's monetary policy decisions were based on banks' outstanding current account balances with the central bank as well as, from April 2013, on the monetary base. In September 2016, it also introduced yield curve control. **2** With a residual maturity of ten years.

Deutsche Bundesbank

**Bank stock indices in the euro area\*** Chart 2.3

1 January 2016 = 100, daily data, log scale



Source: Bloomberg. \* DAXsector All Banks for Germany, FTSE Italia All-Share Banks for Italy, Euronext Lisbon PSI Financials (predominantly banks) for Portugal, IBEX 35 Banks for Spain, and EURO STOXX Banks and EURO STOXX respectively for the euro area.

Deutsche Bundesbank

banks in several countries by lowering funding costs and encouraging demand for credit. Although euro-area banks slightly improved their earnings position overall in 2015 as compared to 2014, profitability ultimately remained relatively low.<sup>11</sup>

However, these factors are not the sole reasons for the difficult situation that banks in the euro area face, but rather aggravate existing structural problems. First, persistent excess capacity in the banking systems of several countries can, combined with greater competition, increase the pressure to cut costs.<sup>12</sup> This heightened competition may occur both between banks and as a result of new financial services.<sup>13</sup> A key challenge for banks will therefore be to adjust their business models to these altered conditions.<sup>14</sup>

Second, banks within the euro area still have considerable amounts of non-performing loans on their balance sheets. The volume of impaired loans in the euro area as a whole amounted to €900 billion as at the end of the first half of 2015 (approximately 9% of euro-area GDP).<sup>15</sup>

*Euro-area banks still have considerable amounts of non-performing loans on their balance sheets.*

Some of these problematic loans are a legacy of the financial crisis. A significant percentage of non-performing loans can, however, be attributed to the weak economic performance of several euro-area member states in recent years. The potential losses from these loan portfolios can lower banks' profitability. Large holdings of non-performing loans may, however, also

<sup>11</sup> See European Central Bank (2016), p 60.  
<sup>12</sup> See European Central Bank (2016), p 65.  
<sup>13</sup> See also the chapter entitled "Technology-enabled financial innovations: a source of opportunities and risks" on pp 67-78.  
<sup>14</sup> Another costly challenge for both banks and other financial system players is the necessary implementation of precautionary measures to fight cyber risks (see the box entitled "Cyber risks and financial stability" on pp 27-28).  
<sup>15</sup> See International Monetary Fund (2016b), p 46.



cause banks to increasingly take on risks in a bid to boost profitability. Affected banks might be hoping that the volume of impaired loans shrinks again as economic activity gains momentum.<sup>16</sup> At the same time, a large percentage of non-performing loans may reduce banks' ability to issue new loans, which, in turn, slows the economic recovery.<sup>17</sup>

Adequate equity capitalisation of banks is a precondition for the extension of credit to the real economy. Following the global financial crisis, euro-area

*Adequate equity capitalisation of banks is a precondition for the extension of credit to the real economy.*

banks have increased their capital levels overall, not least in response to stricter regulations. In July 2016, the European Banking

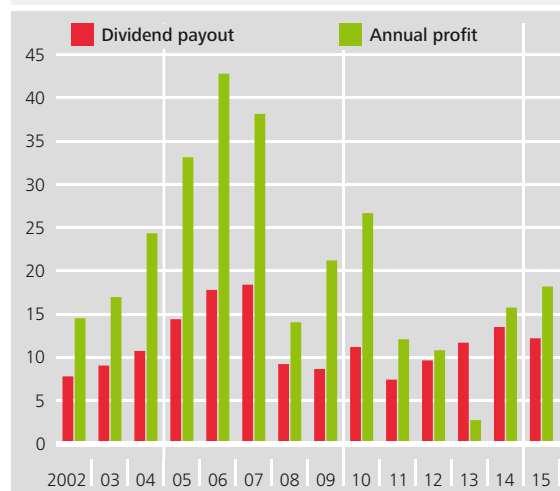
Authority published the results of the stress test for 51 European banks, showing that the individual large banks are more resilient to macroeconomic shocks than they were just a few years ago. However, capital levels could have been raised more, had banks not distributed a considerable percentage of their profits in the form of dividends (see Chart 2.4).<sup>18</sup>

Higher capital requirements and reforms in the financial sector are frequently cited as reasons for the low profitability of the banking sector,<sup>19</sup> which is, in turn, regarded as a risk to financial stability. Higher capital requirements and lower implicit government guarantees have, however, generally lowered the incentives for banks to take on risk (see the box entitled "Magnitude and development of implicit government guarantees for banks" on pages 41 and 42). Lower profitability may therefore be a consequence, in part, of improved capitalisation and reduced risk and thus of an overall strengthening of banking sector resilience. The assessment of banking sector resilience should therefore be based, above all, on capital levels and not exclusively on profitability.

**Dividend payout versus annual profit for systemically important euro-area banks\***

Chart 2.4

€ billion



Sources: Bloomberg and Bundesbank calculations. \* Aggregate dividend payouts and annual profits (before extraordinary items and discontinued operations; after minority interests, preferential dividends and other adjustments) of listed global systemically important banks (G-SIBs) in the euro area. For ING Bank, data for ING Groep NV were used.

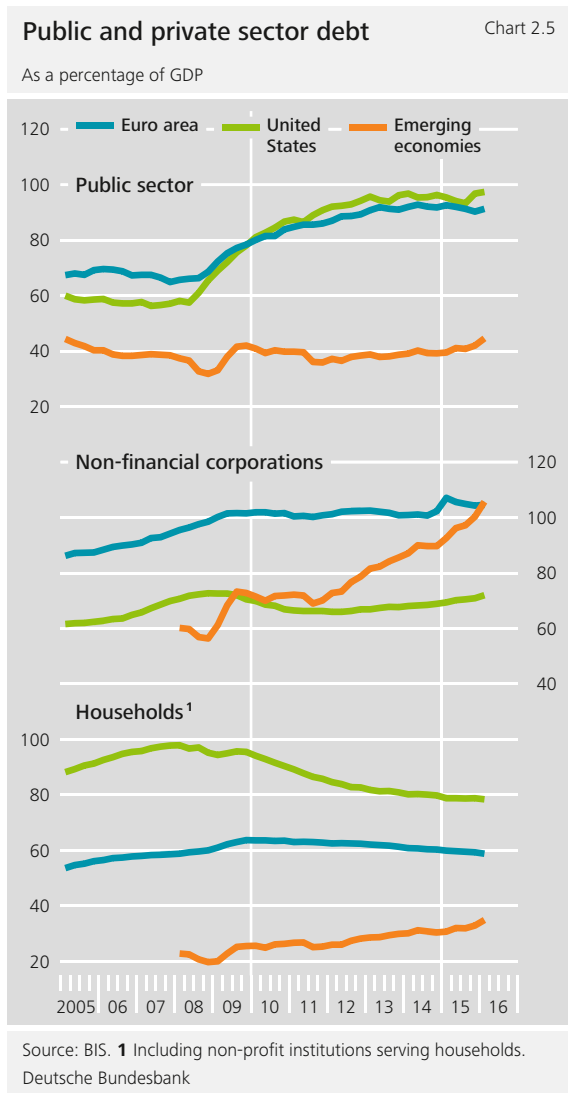
Deutsche Bundesbank

### High debt levels of public and private sector entail risks

Low interest rates and subdued economic growth not only have an impact on the banking sector. In the medium term, they also entail risks for the sustainability of public and private sector debt. The favourable funding conditions create incentives to take on more debt, and necessary fiscal consolidation may be put off. The willingness to implement growth-enhancing structural reforms may also be reduced. The subdued

*In the medium term, low interest rates and subdued economic growth entail risks for the sustainability of public and private sector debt.*

<sup>16</sup> See R Caballero, T Hoshi and A Kashyap (2008).  
<sup>17</sup> See European Central Bank (2016), p 64.  
<sup>18</sup> See H S Shin (2016).  
<sup>19</sup> See Association of German Public Sector Banks (2016).



economic growth, moreover, makes it more difficult to reduce the level of outstanding debt.

Within the euro area, aggregate public debt declined slightly in 2015 for the first time since the onset of the global financial crisis (see Chart 2.5). However, the ratio of government debt to GDP totalled 91% in the first quarter of 2016, still well above its level before the onset of the global financial crisis, when it amounted to 65% of GDP at the end of 2007. On average, countries still clearly breach the debt ceiling of 60% of GDP specified in the Stability and Growth Pact. Moreover, the speed of fiscal consolidation has

slowed in recent years despite the favourable funding conditions. In particular, some of the euro-area member states which were particularly hard hit by the crisis continue to have high budget deficits and debt levels. The leeway for fiscal policy thus remains limited. In the event of a significant deterioration in economic conditions, for instance as a result of a macroeconomic shock or a sharp increase in funding costs, some countries' debt sustainability could be seen as being jeopardised.

The aggregate indebtedness of non-financial corporations in the euro area rose from 99% as at end-2008 to 105% of GDP in the first quarter of 2016. There was a clear increase in Belgium, France and Ireland, for instance. By contrast, in several of the countries worst affected by the sovereign debt crisis, such as Portugal and Spain, debt in this sector declined over the same period. Germany's non-financial corporate sector, too, reduced its debt ratio to 53% of GDP in the specified period.

Aggregate household debt in the euro area remained relatively constant. In the first quarter of 2016, it amounted to 59% of GDP. The gradual increase in household debt seen before the global financial crisis did not, therefore, continue in recent years. In Germany, households cut back debt levels by 6 percentage points from the end of 2008 to 53% of GDP in the first quarter of 2016.

Non-financial corporations in the United States initially brought aggregate indebtedness down from a historically high level of 73% of GDP at the end of 2008 to 66% by mid-2012. However, it subsequently rose by 6 percentage points again to stand at 72% of GDP in the first quarter of 2016. The Office of Financial Research (OFR) warns that the high and rapidly rising debt could cause a spike in default rates for non-financial corporations and thus jeopardise

financial stability in the United States.<sup>20</sup> In particular, rising default rates could be associated with falling share prices and losses on commercial real estate loans. Among US households, by contrast, there has been clear and sustained deleveraging since the onset of the global financial crisis. Between the end of 2008 and the first quarter of 2016, their debt levels fell by more than 16 percentage points to 78% of GDP at last count.

In several emerging market economies, the non-financial corporate sector used the easier financing terms to ramp up borrowing. The aggregate indebtedness of non-financial corporations in this group of countries rose from 56% at the end of 2008 to 106% of GDP in the first quarter of 2016. China, in particular, saw a clear rise in corporate debt from 96% to 167% of GDP over this period. Aggregate household debt in the emerging market economies also experienced a significant expansion over the same period, by more than 15 percentage points to 35% of GDP at last count. A deterioration in financial and economic conditions could cause credit risks in these countries to spike.

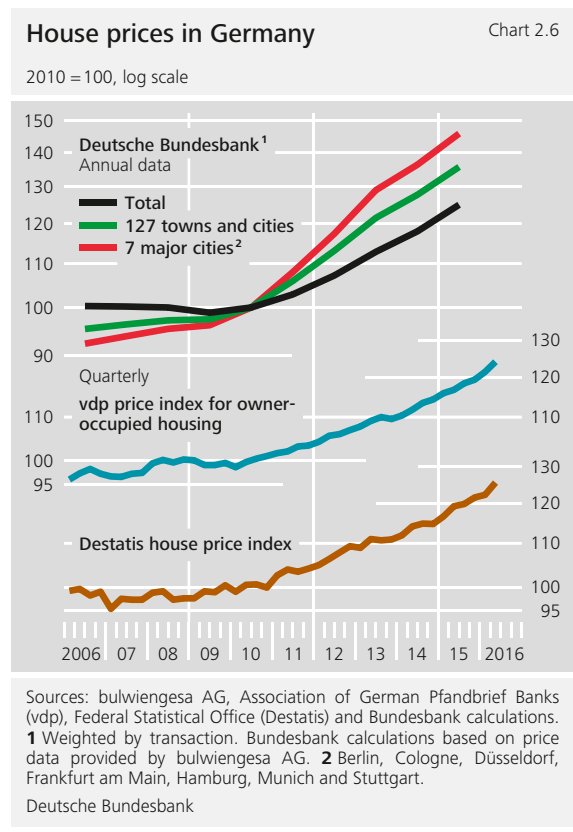
### No immediate risks from developments in the German housing market

The upward trend in German house prices since 2010 continued in the year to date. In the first half

*The upward trend in house prices continued in the year to date.*

of 2016, house prices rose by 5.5%, according to the Association of German Pfandbrief Banks (vdp). Last year, prices for residential property in Germany accelerated by an average of 4.5% (see Chart 2.6), with the price increase being regionally more broad-based than in previous years.<sup>21</sup>

Higher prices are largely the result of undiminished strong demand for housing, reflecting households'



good income prospects, continued favourable loan conditions and high immigration. Nonetheless, residential property valuations still appear high in urban areas, as measured by the fundamentals. Bundesbank estimates based on a regionally differentiated model suggest that residential properties in German towns and cities were overvalued by 10% to 20% in 2015, the most recent year for which regional price data are available.<sup>22</sup>

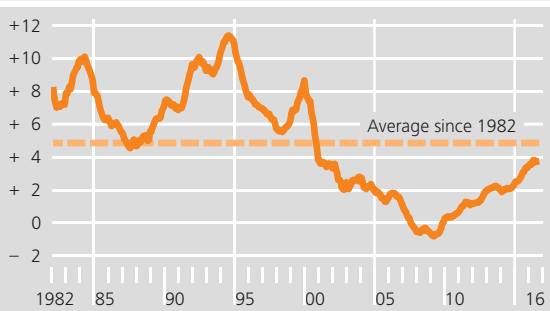
<sup>20</sup> See Office of Financial Research (2016), p 6. The OFR is based at the US Department of the Treasury. Its central task is to support the work of the Financial Stability Oversight Council (FSOC) and its member organisations.

<sup>21</sup> See Deutsche Bundesbank (2016a). Further information on the German housing market is also available at: [http://www.bundesbank.de/Navigation/EN/Statistics/Enterprises\\_and\\_households/System\\_of\\_indicators/system\\_of\\_indicators.html](http://www.bundesbank.de/Navigation/EN/Statistics/Enterprises_and_households/System_of_indicators/system_of_indicators.html) For more information on the German housing market, see also A Dombret (2016).

<sup>22</sup> See F Kajuth, T Knetsch and N Pinkwart (2016) and Deutsche Bundesbank (2016b).

**German banks' loans for house purchase to domestic households\*** Chart 2.7

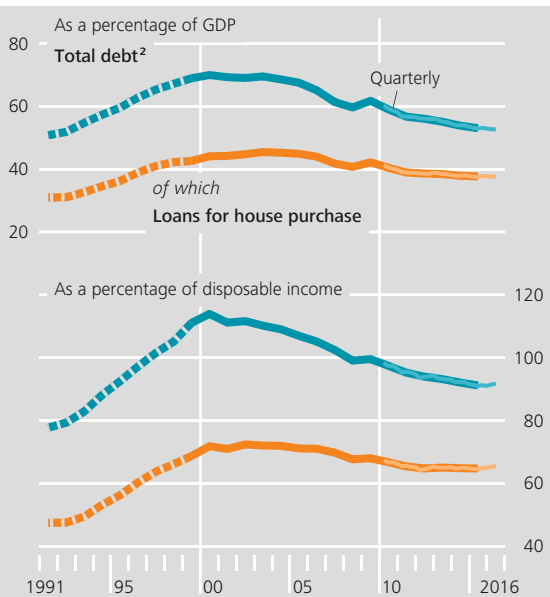
Year-on-year percentage change, seasonally adjusted, month-end data



\* Including non-profit institutions serving households. Up until 1991, data only for West Germany.  
 Deutsche Bundesbank

**Household debt in Germany** Chart 2.8

Annual averages<sup>1</sup>



Source: Financial accounts of the Deutsche Bundesbank. <sup>1</sup> Up until 1998 pursuant to ESA 1995; from 1999, pursuant to ESA 2010. <sup>2</sup> In the form of loans.  
 Deutsche Bundesbank

Risks to financial stability can occur if a strong rise in house prices coincides with a strong expansion in credit volumes and an easing of credit standards. Such a development is particularly likely if a lot of market participants form excessively positive expectations regarding future developments in debt sus-

tainability and do not give due consideration to the possibility that prices may fall and interest rates may rise. These macroeconomic risks are often difficult for individuals to assess and may result in a declining awareness of risk. This is why the real estate market is subject to macroprudential oversight (see also the box entitled "Macroprudential policymaking procedure" on pages 22 to 24).

The described price momentum caused credit growth, too, to accelerate steadily since the start of the upturn on the German property market; as at September 2016, it was up by 3.7% on the year (see Chart 2.7).

*In line with price momentum, growth in loans for house purchase has accelerated continuously.*

Nonetheless, this looks rather moderate when compared with the average annual growth rate of real estate loans since the early 1980s, of 4.9%.<sup>23</sup> Moreover, there has been a trend decline in aggregate household debt in recent years (see Chart 2.8). Overall, loans for house purchase are important in Germany for both households and banks. Mortgage loans represent around 71% of household debt, while in the first quarter of 2016 some 50% of all outstanding bank loans to domestic enterprises and households<sup>24</sup> were loans for house purchase.

According to the Eurosystem's quarterly survey on commercial banks' lending policies (Bank Lending Survey), credit standards for mortgage loans have been tightened somewhat overall since 2010, although detailed quantitative data are not available. Analyses by market participants suggest that loan-to-value and debt service-to-income ratios have remained relatively constant,<sup>25</sup> though this is largely

<sup>23</sup> In a longer-term comparison of nominal credit growth, however, the historically higher rates of inflation should be noted.

<sup>24</sup> These are loans to domestic enterprises and households excluding holdings of negotiable money market paper and excluding holdings of securities.

<sup>25</sup> For more on this issue, see, for instance, vdpResearch (2015) or the Europace index (EPX) on real estate financing.

attributable to higher collateral values and lower interest costs.

In addition, the percentage of mortgage loans where the interest rate is initially fixed for more than ten years has increased in new business. As interest rate fixation periods are already high and are currently even increasing, the percentage of income households spend on existing mortgages is unlikely to rise provided income remains unchanged, meaning that the risks for households are limited. Conversely, banks assume the interest rate risk during the interest rate fixation period (see the chapter entitled "Increased risks in the banking sector" on pages 31 to 48). Overall, the indicators show that developments on the German residential property market do not currently present any immediate risks to financial stability.

### Incentives for increased risk-taking

Low interest rates have an impact not only on financial institutions' earnings and the debt levels of governments, households and enterprises – they also influence the financial markets. If a protracted low-interest-rate environment is expected, this can encourage financial market participants to take greater risks in their search for yield.<sup>26</sup> This may be problematic for financial stability, especially if investors do not set aside sufficient reserves. This search for yield can, in turn, result in the mispricing of assets with the concomitant risk of an abrupt price correction, potentially aggravated by insufficient market liquidity.

*The search for yield can result in the mispricing of assets.*

Tensions on the international financial markets rose in the spring of 2016 as a result of investors' uncertainty about the situation of banks in Europe. Over the summer, the outcome of the UK referendum led

to further stress. Since then, volatility on the global financial markets has declined noticeably again, and prices have risen despite weak developments in corporate profits and moderate global growth prospects. Metrics on valuation levels and data on issuance and non-price terms in various market segments allow inferences to be made about investors' attitude to risk.

On the European and US markets for corporate bonds, yields have – similar to government bond yields – fallen close to their historical lows. Despite moderate growth prospects since the market tensions in the first quarter of 2016, risk premiums have narrowed and are now mostly below their ten-year averages. This is particularly true of non-investment-grade corporate bonds, which are considered relatively risky. Implied default rates, which are derived from risk premiums, also point to high valuations. They suggest that model-implied default rates are currently below realised long-term default rates in most cases.<sup>27</sup> Looking at European corporate bonds, the expansion of the Eurosystem's asset purchase programme to include corporate bonds that was decided upon in March also supported relatively high valuations.

*Yields on corporate bonds have fallen close to their historical lows.*

Another argument suggesting that investors' appetite for risk remains high is their continued willingness to fund enterprises at very favourable conditions. Issuance volumes for corporate bonds and

<sup>26</sup> For more on the risk-taking channel of monetary policy, see also Deutsche Bundesbank (2016c), pp 51-52.

<sup>27</sup> Implied default rates are calculated from risk premiums using a model based on an average level of risk aversion for market participants and average liquidity risk premiums. Under the model assumptions, the implied default rates reflect the average default rates anticipated by market participants. For more on the calculation method, see P Rappoport (2001).

## Macroprudential policymaking procedure

Far-reaching regulatory and institutional reforms were adopted across the world in response to the global financial crisis. These include the creation of institutions tasked with safeguarding the stability of the financial system. The macroprudential policymaking process implemented in this context is facing major challenges. First, the identification of risks to financial stability is subject to uncertainty. There is therefore a risk of countermeasures being deployed too late or of the wrong “dose” being administered. In addition, experience with the use of macroprudential instruments is limited so far, which makes it difficult to properly gauge their impact and potential side-effects in advance.

### Components of a structured policy cycle<sup>1</sup>

A structured policy cycle can help to provide a framework for macroprudential policy, improve risk monitoring, apply macroprudential policy measures efficiently and analyse their effects. An efficient deployment of instruments should address any identified systemic risks effectively and minimise side-effects (principle of proportionality). Alongside “hard” (ie legally binding) macroprudential instruments, “soft” instruments are also often used. In addition to communication with the public or market participants, these “soft measures” include warnings and recommendations, for example. Overall, clear communication is essential to ensure that discussions about risks to financial market stability and possible macroprudential countermeasures do not contribute to uncertainty among market participants.<sup>2</sup> A macroprudential policy cycle has four stages. First, the overarching goal of macroprudential policy is defined, although it is difficult to establish a

uniform definition of the term “financial stability” and to measure it directly. The Bundesbank defines financial stability as a state in which 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.

Furthermore, the degree of financial stability in an economy is not directly observable. The second stage of the policy cycle therefore specifies indicators which can be used to assess whether risks to financial stability are building up. These indicators are monitored and analysed so as to identify risks which can potentially be addressed through targeted action using appropriate instruments.

If the implementation of macroprudential instruments is being considered, their likely effects are analysed at the next stage of the policy cycle. *Ex ante* impact analyses estimate the expected side-effects of deploying an instrument on the financial system and the real economy. Based on such analyses, the relevant instruments can then be selected and adjusted (calibration).

Should instruments ultimately be implemented because the stability of the financial markets would otherwise be in jeopardy, the real effects of their deployment would be examined in the

<sup>1</sup> What follows is a general overview of the multi-stage decision-making process within macroprudential institutions.

<sup>2</sup> See European Systemic Risk Board, *The ESRB Handbook on Operationalising Macroprudential Policy in the Banking Sector*, March 2014, pp 181-196.



fourth stage (*ex post* impact analysis). The insights gained in the fourth stage can then be incorporated into future decisions at stages one to three, enabling macroprudential policymakers to improve their identification of risks in the future and to combat them efficiently.

### The example of the real estate market

The approach outlined above can be – and is – applied to various macroprudential policy areas, for example when setting a capital buffer for other systemically important institutions (O-SIIs).<sup>3</sup> Below, we seek to illustrate this kind of structured macroprudential policy approach using the example of the real estate market. In general, developments on this market can be of particular relevance for financial stability. The objective of macroprudential policymaking in this area is therefore to prevent an excessive build-up of credit risks for the economy as a whole (stage one) in the interests of financial stability.

Consequently, macroprudential oversight pays particularly close attention to the real estate sector (stage two). In terms of the indicators, this close monitoring is based on the experiences of past financial crises in other countries. Depending on the structural features of these markets, the combination of overvalued real estate markets and a sharp increase in real estate lending has often been the trigger for systemic financial crises.<sup>4</sup>

The reason for this is that rising prices, increased lending and laxer credit standards can be mutually reinforcing. The subsequent correction process on the real estate market is then at risk of becoming even more painful if some borrowers are no longer able to meet their obligations and

lenders have to resort to repossessions. Empirical analyses confirm that a bursting real estate bubble that involves a strong build-up of household debt can be expected to have substantial economic and social costs.<sup>5</sup>

These insights were considered when setting up the system of indicators used by the Bundesbank in its ongoing monitoring of the German real estate market.<sup>6</sup> Indicators are available for (aggregated) price and lending developments. However, there is no accessible information on changes in credit standards that is meaningful for the economy as a whole. Analysts can only employ the Eurosystem's quarterly Bank Lending Survey (BLS).

If the regular monitoring process were to identify systemic risks which should be addressed with macroprudential measures, the most appropriate instruments would need to be selected in the third stage and adjusted with the greatest possible precision (calibration). Appropriate instruments are therefore needed to address systemic risks. Under the EU Capital Requirements Regulation and Capital Requirements Directive IV (CRR/CRD IV), the macroprudential framework cur-

<sup>3</sup> See Deutsche Bundesbank and Federal Financial Supervisory Authority, Main features of the method for the identification of other systemically important institutions (O-SIIs), November 2015.

<sup>4</sup> See M K Brunnermeier and I Schnabel, Bubbles and central banks: historical perspectives, GSME/IPP Discussion Paper No 1411, October 2014; A M Taylor, Credit, financial stability, and the macroeconomy, NBER Working Paper No 21039, March 2015.

<sup>5</sup> See O Jordà, M Schularick and A M Taylor, Leveraged bubbles, *Journal of Monetary Economics* 76 (2015), Supplement, pp 1-20; International Monetary Fund, *World Economic Outlook*, chapter 3, April 2012.

<sup>6</sup> The Bundesbank provides general information on the German housing market at [http://www.bundesbank.de/Navigation/EN/Statistics/Enterprises\\_and\\_households/System\\_of\\_indicators/system\\_of\\_indicators.html](http://www.bundesbank.de/Navigation/EN/Statistics/Enterprises_and_households/System_of_indicators/system_of_indicators.html)

rently envisages capital-based instruments which can be used to enhance capital requirements and thus increase resilience in the banking sector. However, these instruments do not have a direct influence on credit standards for new housing loans. To date, the responsible authorities in Germany lack the means to set minimum standards for the issuance of housing loans as a targeted macroprudential policy measure.<sup>7</sup> Germany's Financial Stability Committee (*Ausschuss für Finanzstabilität*) and international organisations have therefore recommended that these types of instruments should be introduced in Germany as a precautionary measure.<sup>8</sup>

Should these instruments be activated in the future in response to a looming threat to financial stability, their impact would need to be assessed in a fourth stage.<sup>9</sup> The aim of this *ex post* impact analysis is to assess whether and to what extent deploying the instrument has fulfilled the goal of effectively limiting the risks to financial stability and to evaluate any side-effects. Ultimately, imposing minimum credit standards constitutes an intervention into private contractual arrangements. It should therefore be ensured that the measures taken obey the principle of proportionality and that their effect can be monitored.

For the last two stages of the policy cycle, too, the extent and quality of analyses regarding the real estate market depend essentially on the availability of not only aggregated but, in particular, granular data. It will be extremely difficult to conduct the appropriate impact analyses without access to better information on the distribution of risks and the binding effect of the instruments at the micro level. This would have direct repercussions, in particular, on the ability to calibrate new instruments in a way that minimises side-effects.

For this reason, in June 2015 the Financial Stability Committee recommended a sustained improvement in the availability of data on real estate lending.<sup>10</sup> The recommendation aims not only to improve risk monitoring in the area of mortgage lending but also to create the necessary regulatory foundation for macroprudential policy.

---

<sup>7</sup> The minimum standards applicable when activated aim to reduce the probability of default for housing loans as a result of the borrower's inadequate debt service capacity, and to lower the loss given default. See Financial Stability Committee, Recommendation on new instruments for regulating loans for the construction or purchase of residential real estate, 30 June 2015.

<sup>8</sup> See Financial Stability Committee, op cit, and the corresponding recommendations by the International Monetary Fund, the Financial Stability Board and the European Systemic Risk Board. Moreover, in the light of past experiences with financial stability problems emanating from the housing market, many countries (both within and outside the European Union) have created and already deployed such instruments. The design of the national instruments takes account of country-specific characteristics with regard to market and financing structures.

<sup>9</sup> See Financial Stability Committee, op cit, pp 16-17.

<sup>10</sup> See Financial Stability Committee, op cit, p 3.



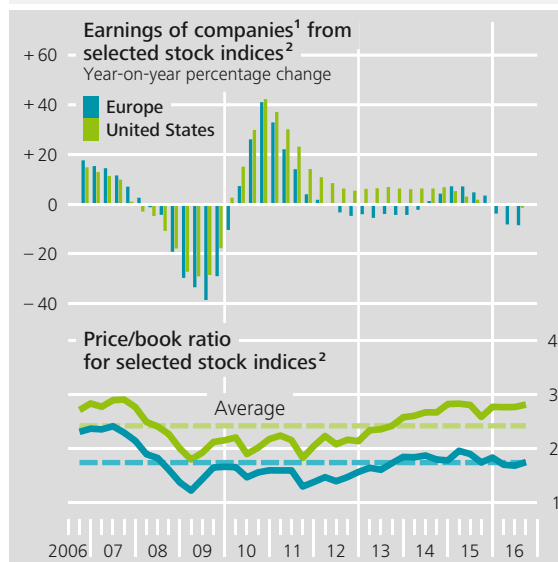
syndicated loans were again at record levels in 2015, in some cases, in both the euro area and the United States.<sup>28</sup> Figures for the first half of 2016 suggest that bond issuance is still expanding this year in the

*Investors' appetite for risk appears to be remaining relatively strong.*

euro area, while the United States is seeing increased issuance of syndicated loans, in particular. Non-price terms, too, point to a stronger appetite for risk. Over the last two years, a large percentage of syndicated loans granted to companies with poor credit ratings were equipped with only weak investor protection clauses (covenant lite loans) in the United States and Europe.<sup>29</sup> According to the rating agency Fitch, in Europe, this share rose from 30% in 2013 to above 90% in the third quarter of 2016.<sup>30</sup> Moreover, investors have been increasingly willing in recent years to invest in long-dated bonds. This has amplified the potential for price losses should yields rise.

On the stock markets, major European indices are again trading well below their high levels of the second quarter of 2015. US indices, by contrast, reached new highs in recent months, despite falling corporate profits. Implied equity risk premiums are a model-based gauge of stock valuations.<sup>31</sup> They are currently above their historical averages for both European and US indices, which suggests equities are not highly valued. However, equity risk premiums give a relative valuation of equities as compared to safe government bonds. This measure is therefore probably currently distorted by the very low and in some cases even negative yields on the government bond markets.<sup>32</sup> Price-earnings (P/E) and price-book (P/B) ratios for the German stock index DAX and other important European stock market indices are currently close to their ten-year averages. For US shares in the S&P 500, by contrast, these metrics have risen appreciably since 2011 and are now well above the averages of the last ten years. However, they are still below the historical highs they reached in

**Listed companies' earnings and stock market valuation** Chart 2.9



Sources: Bloomberg, Thomson Reuters Datastream/Institutional Brokers' Estimate System (I/B/E/S) and Bundesbank calculations. **1** Aggregate earnings per share for the last four quarters. **2** STOXX Europe 600 for Europe and S&P 500 for the United States.  
Deutsche Bundesbank

1999. The valuation level for US shares thus appears to be relatively high (for more on the P/B ratio, see Chart 2.9). In the United States, companies are also

**28** In 2015, non-financial corporations' funding via bond issues and syndicated loans in the United States was up on the year again, reaching new highs of roughly US\$960 billion and US\$1,390 billion gross respectively. In addition, roughly half of outstanding syndicated loans in the United States are currently to enterprises with weak credit ratings (known as leveraged loans). In the euro area, too, issuance of syndicated loans reached a new high, of €490 billion, in 2015. By contrast, the volume of bonds issued did not change much and remained at a high level, at €267 billion. Source: Dealogic.

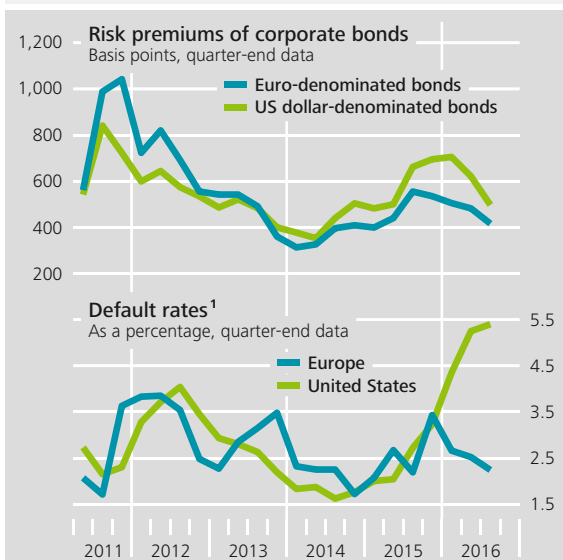
**29** Investor protection clauses usually refer to certain financial metrics (such as debt ceilings), which companies must adhere to after taking out a loan.

**30** See Bank of America Merrill Lynch (2016) and Fitch (2016).

**31** Calculated as the difference between a market implied return and the yield on government bonds. The market implied return is calculated from book values of capital, residual income ((return on equity minus cost of equity) x book value of equity in the previous period) and the prices of stock market indices.

**32** See Financial Stability Committee (2016), p 6; Deutsche Bundesbank (2016b), pp 15-29.

**Risk premiums and default rates in the non-investment-grade segment** Chart 2.10



Sources: Moody's and Thomson Reuters Datastream (Bank of America Merrill Lynch). <sup>1</sup> Refers to bonds and loans and includes insolvencies as well as past-due interest and redemption payments. Moving average of the last four quarters.  
 Deutsche Bundesbank

buoying high valuations through large-scale share buy-backs.<sup>33</sup> Nonetheless, econometric analyses of the stock markets in the United States and Europe do not suggest that bubbles are forming.<sup>34</sup>

### Risk of an abrupt repricing has risen

Overall, the risk of a potentially abrupt repricing on the markets for corporate bonds and equities has risen.

*Relatively high valuation levels and subdued growth prospects increase the risk of an abrupt repricing.*

Alongside the fact that some valuation levels are currently fairly high, contributing factors are subdued growth prospects and significantly higher debt levels for enterprises active on the capital markets. The earnings of enterprises listed in the US S&P 500 and European STOXX Europe 600 indices,

for instance, have fallen perceptibly on the year (see Chart 2.9). Towards the end of the third quarter of 2016, market participants were, by contrast, expecting earnings growth of 7.2% and 8.3% respectively for S&P 500 and STOXX Europe 600 enterprises in 2017, which could prove overly optimistic given the poor performance of recent years and the macroeconomic risks outlined above.<sup>35</sup>

Developments in the leveraging of enterprises active on the capital markets were similar to those in the non-financial corporate sector as a whole. The leverage ratio (defined here as the ratio of financial debt to total assets) for the European enterprises included in the STOXX Europe 600 rose only slightly in 2015, from 23.5% to 24.2% of total assets. It is close to

*The percentage of corporate bonds and syndicated loans with a poor credit rating has increased perceptibly.*

its long-term average. By contrast, the leverage ratio for non-financial corporations listed in the S&P 500 climbed by more than 3 percentage points to almost 31%, the highest level in more than ten years. At the same time, the issuance boom of recent years was associated with a clear increase in the percentage of corporate bonds and syndicated loans with a poor credit rating, both in Europe and in the United

<sup>33</sup> Bureau van Dijk data show relatively high volumes of share buy-backs in the United States in recent years. In Europe, share buy-backs have also risen in the last few years, but they are at a much lower level.

<sup>34</sup> For more on the method used, see U Homm and J Breitung (2012). The test is based on the assumption that share prices contain no time-varying risk premiums and usually follow a random walk. An emerging bubble, by contrast, is characterised by explosive price growth. The test therefore examines whether share price developments have moved from a random to an explosive path.

<sup>35</sup> Sources: Bloomberg, analyst consensus estimate, as at 30 September 2016.

## Cyber risks and financial stability

Cyber risks result from attacks on data and IT systems and can compromise their confidentiality, integrity and availability. This has the potential to impair the functional viability of the financial system. By manipulating the accounts or payment transactions of agents in the financial system, cyber criminals are able to make away with funds or with data to be used for fraudulent purposes. A prominent example of a cyber fraud victim was the Central Bank of Bangladesh at the beginning of 2016. Cyber criminals managed to initiate a number of bogus credit transfer orders from the central bank's accounts in the amount of almost US\$1 billion and were ultimately able to transfer US\$81 million of this amount to their own accounts. Cyber attacks are also used as a means of spreading misinformation and to manipulate share prices, for example.

There has been a sharp increase in the number of cyber attacks.<sup>1</sup> From a financial stability perspective, cyber attacks on systemically important market participants are particularly significant, as disruptions to their IT infrastructures could destabilise the financial system as a whole. A concrete threat to financial stability exists, for instance, in cases where systemically important services or transactions between banks are either no longer possible or subject to considerable restrictions. This can result in the emergence of liquidity and credit risks, which can spread throughout the financial system. Cyber attacks can also have an impact on the reputation of market participants and threaten stability owing to a loss of customer confidence, for example. Targeted attacks on an institution's reputation can also occur. If, for example, rumours are spread on social media networks that banks are at risk of becoming in-

solvent, this could trigger a run on the banks, ie large-scale withdrawals of customer deposits.

The Bundesbank addresses the issue of cyber risks in various ways and is directly involved in developing the appropriate regulatory standards. This includes both microprudential and macroprudential aspects, ie the supervision of individual institutions and infrastructures as well as the financial system as a whole.

Within the framework of microprudential banking supervision and the oversight of financial market infrastructures, cyber risks are one of the factors considered when assessing an appropriate level of IT security. With regard to financial market infrastructures, the Committee on Payments and Market Infrastructures (CPMI) – which is based at the Bank for International Settlements (BIS) – collaborated with the International Organization of Securities Commissions (IOSCO) to publish the relevant details for the application of the Principles for Financial Market Infrastructures (PFMI) in June 2016.<sup>2</sup> These principles describe the measures that financial market infrastructures should adopt in order to improve their resilience to cyber risks. One of the points raised is that critical services need to be identified and protected and that measures should be taken to detect cyber attacks and respond to them in an appropriate manner.

---

<sup>1</sup> See, for example, PricewaterhouseCoopers, The Global State of Information Security® Survey 2016. According to this survey, the number of global IT security incidents in 2015 rose by 38% on the year.

<sup>2</sup> See Committee on Payments and Market Infrastructures and International Organization of Securities Commissions, Guidance on cyber resilience for financial market infrastructures, June 2016.

In Germany, the Financial Stability Committee (*Ausschuss für Finanzstabilität*) is also increasingly focusing on the macroprudential aspects of cyber risks. In addition to analysing incidents that are relevant to financial stability, the committee members hold regular discussions with major players. These discussions take place, for instance, with the Federal Office for Information Security, market participants and foreign supervisory authorities.

At the international level, the G7 countries have established a working group that likewise focuses on cyber security in the financial sector. This working group was responsible for developing the “fundamental elements of cybersecurity for the financial sector”, which were endorsed by the G7 finance ministers and central bank governors at the beginning of October 2016.<sup>3</sup>

<sup>3</sup> See G7, Fundamental elements of cybersecurity for the financial sector, October 2016.

States. The risk of credit defaults has therefore risen, especially in the United States.<sup>36</sup> According to information provided by the rating agency Moody's, the trailing 12-month default rate for non-investment-grade enterprises in the United States has gone up sharply in the year to date and stood at 5.4% in September 2016. Moody's expects a further

*Risk premiums appear to not yet fully reflect the heightened default risk.*

increase at least until year-end. Over the next few months, too, companies in the oil and gas sector are likely to make up the lion's share of defaults, even though the price of oil has picked up again from its level at the start of 2016.<sup>37</sup> Risk premiums, by contrast, have narrowed in the year to date and appear to not yet fully reflect the heightened default risk (see Chart 2.10). In Europe, the default rate for non-investment-grade enterpris-

es fell slightly to 2.2% over the same period and is forecast to come down further still by end-2016.

Various events could result in a repricing of risk and an increase in risk premiums. There is greater uncertainty on the markets regarding the capitalisation and profitability of European banks, the future design of the agreements regulating the relationship between the United Kingdom and the EU and political risks in the United States. Moreover, the relatively high levels of debt and the increase in the default rates of non-financial corporations suggest that the

<sup>36</sup> In the particularly risky non-investment-grade segment, the leverage ratio (financial debt to total assets) of US non-financial corporations, proxied by the median debt of companies listed in the CDX North America High Yield Index, rose to a new ten-year high of 53% of total assets in the first quarter of 2016. Towards the end of the third quarter of 2016, the figure was 49%, still high by historical standards.

<sup>37</sup> See Moody's (2016), p 1.

US credit cycle has reached an advanced stage. A further rise in default rates could hurt lenders and financial markets. Because of the signal function and significance of the US financial markets for the rest of the world, this might spill over to other regions.

Overall, it is evident that the persistently low interest rates favour the materialisation of risks in the international financial system. The most important areas of risk include low earnings at banks, incentives to take on more debt and the search for yield on the financial markets.

## ■ List of references

Association of German Public Sector Banks (Bundesverband Öffentlicher Banken Deutschlands) (2016), *Zusammenspiel von Regulierung und Profitabilität – eine quantitative Impact-Studie für die deutschen Top-17-Banken*, June 2016.

Bank of America Merrill Lynch (2016), *The US fixed income weekly – fixed income strategy*, July 2016.

Bean, C, C Broda, T Ito and R Kroszner (2015), *Low for long? Causes and consequences of persistently low interest rates*, Geneva Reports on the World Economy, No 17, October 2015.

Borio, C, L Gambacorta and B Hofmann (2015), *The influence of monetary policy on bank profitability*, Bank for International Settlements, Working Paper No 514, October 2015.

Caballero, R, T Hoshi and A Kashyap (2008), *Zombie lending and depressed restructuring in Japan*, The American Economic Review, Vol 98, No 5, pages 1943 to 1977, December 2008.

Claessens, S, N Coleman and M Donnelly (2016), *Low-for-long interest rates and net interest margins*

of banks in advanced foreign economies, Federal Reserve Board, IFDP Notes, April 2016.

Deutsche Bundesbank (2016a), *Monthly Report*, February 2016.

Deutsche Bundesbank (2016b), *Monthly Report*, April 2016.

Deutsche Bundesbank (2016c), *Monthly Report*, June 2016.

Dombret, A (2016), *Blase oder nicht – wo steht der deutsche Wohnimmobilienmarkt?*, ifo Schnelldienst 16/2016, pages 20 to 25, August 2016.

European Central Bank (2016), *Financial Stability Review*, May 2016.

European Systemic Risk Board (2016), *Report on macro-prudential issues and structural change in a low interest rate environment*, forthcoming.

Financial Stability Committee (2016), *Dritter Bericht an den Deutschen Bundestag zur Finanzstabilität in Deutschland*, June 2016.

Fitch (2016), *European leveraged loan chart book – 3Q16*, October 2016.

Homm, U and J Breitung (2012), *Testing for speculative bubbles in stock markets: a comparison of alternative methods*, Journal of Financial Econometrics, Vol 10, No 1, pages 198 to 231, December 2012.

International Monetary Fund (2014), *Perspectives on global real interest rates*, World Economic Outlook, April 2014.

International Monetary Fund (2016a), *World Economic Outlook*, April 2016.

International Monetary Fund (2016b), Euro area policies, 2016 Article IV Consultation, July 2016.

Kajuth, F, T Knetsch and N Pinkwart (2016), Assessing house prices in Germany: evidence from a regional dataset, *Journal of European Real Estate Research*, forthcoming.

Moody's (2016), Monthly default report, August 2016.

Office of Financial Research (2016), Risks still in the medium range, but pushed higher by U. K. referendum result, *Financial Stability Monitor*, July 2016.

Rachel, L and T Smith (2015), Secular drivers of the global real interest rate, *Bank of England Staff Working Paper No 571*, December 2015.

Rappoport, P (2001), Rock-bottom spread mechanics, *JP Morgan Portfolio Research*, August 2001.

Shin, H S (2016), Bank capital and monetary policy transmission, panel remarks at The ECB and its Watchers XVII Conference, Frankfurt, April 2016.

vdpResearch (2015), *Strukturen der Wohneigentumsfinanzierung 2015*, November 2015.

# Increased risks in the banking sector

*German banks, whose earnings are to a large extent derived from interest income, responded to the continuing fall in interest rates by expanding maturity transformation. This enabled them to bolster their net income from interest-related business. Moreover, they benefited from historically low expenditure on risk provisioning.*

*However, the stabilisation of their profitability by expanding maturity transformation is being accompanied by increasing interest rate and liquidity risks in the banking sector. A hike in interest rates would therefore lead to valuation losses on the assets side of bank balance sheets, and would increase funding costs on the liabilities side, with such a situation therefore posing the threat of falling profits or even losses. Adequate capitalisation of the banking system is thus necessary to cushion shocks, thereby ensuring that banks remain able to supply credit to the real economy in future, too, when interest rates rise.*

## Effects of low interest rates on the banking system

In the wake of the financial and sovereign debt crisis, central banks lowered interest rates in order to limit the effects on economic growth and the inflation rate. Lower funding costs additionally supported the banking sector. German banks also benefited from this, since interest income did not initially fall to the same extent as interest payable on deposits.

Even so, falling lending rates put increasing pressure on the business model of those financial institutions which are heavily dependent on lending and deposit business. In this situation, many banks ex-

*Falling lending rates put increasing pressure on the business model of those financial institutions which are heavily dependent on lending and deposit business.*

expanded their maturity transformation and stepped up lending in order to stabilise their net interest income. This, however, led to a marked increase in systemic risks in the form of liquidity and interest

rate risks.

Banks encounter liquidity bottlenecks if their matured short-term liabilities are not renewed. If they are unable to liquidate their assets to fulfil their payment obligations (or are able to do so only with large haircuts), they may experience distress. Liquidity risks arise, above all, in connection with high maturity transformation and are seen as one of the major causes of the recent financial crisis.<sup>1</sup>

Expansion of maturity transformation also heightens interest rate risks. Especially in a situation where interest rates go up unexpectedly, this can give rise to substantial losses in interest business (which is important for many German banks) as well as losses on market price-based assets. Interest rate risks are often underestimated precisely following an extended

period of low interest rates. When interest rates rise, it is typically funding costs that increase first, whereas interest income from long-term asset holdings remains unchanged, thus leading to an overall decline in the net interest income. The fact that many German banks tend to have a similar set-up in their interest business adds a systemic dimension to interest rate risk. Such systemic risk can be further aggravated by a state of collective moral hazard. This means that individual banks base their investment policy on the – individually rational – expectation that the central bank will not raise interest rates (or not so much) in a situation where there are major systemic risks, since the central bank's decisions will be "dominated" by the situation of the financial sector.<sup>2</sup> Against this background, the onus is on the microprudential and macroprudential supervisory authorities and the institutions themselves to ensure that the banks' interest rate risks have no negative effects on financial stability, even given adverse interest rate scenarios.

### Risks stemming from maturity transformation have increased

The expansion of maturity transformation over the past few years has made German banks more vulnerable to a hike in interest rates. The average Basel interest rate coefficient has risen significantly since 2011. The interest rate coefficient measures the present-value depreciation of interest-dependent assets and liabilities following a hypothetical standardised interest rate

*The expansion of maturity transformation over the past few years has made German banks more vulnerable.*

<sup>1</sup> See M K Brunnermeier and L H Pedersen (2009).

<sup>2</sup> See E Farhi and J Tirole (2012).



shock.<sup>3</sup> Current banking supervisory standards define heightened interest rate risk as the interest rate coefficient exceeding 20% of the regulatory own funds. Applying this metric, savings banks and credit cooperatives, in particular, are subject to heightened

*The interest rate risk has reached a significant magnitude.*

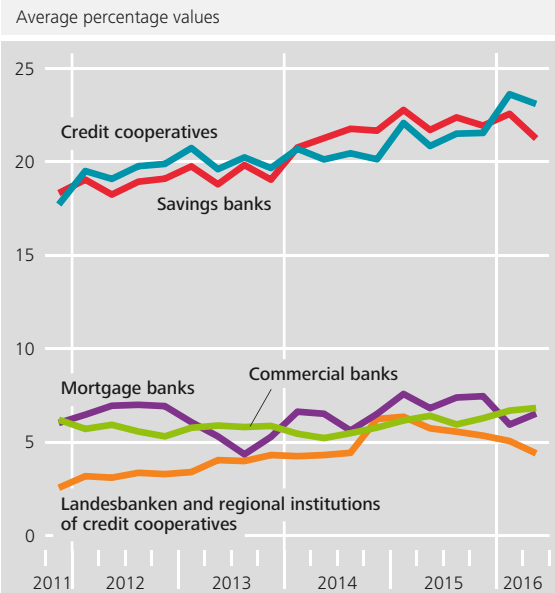
interest rate risk: since 2015, the present-value loss for these categories of banks has stood at an average of over 20% of their own

funds (see Chart 3.1). In the second quarter of 2016, as many as 55% of savings banks and 68% of credit cooperatives exceeded this figure. The interest rate risk has, therefore, reached a significant magnitude.

According to the new standards of the Basel Committee on Banking Supervision, an amendment to the definition is scheduled to be introduced by 2018. The new definition will classify interest rate risks as heightened if the present-value loss amounts to 15% of the regulatory core (tier 1) capital.<sup>4</sup> On the basis of this specification, more than 90% of savings banks and credit cooperatives would exhibit heightened interest rate risks.

Interest rate risks are considerably lower for large banks. In particular, banks which are active in the capital market generally hedge their interest-bearing positions by means of interest rate swaps. The Basel risk coefficient of larger banks which are directly supervised by the Single Supervisory Mechanism therefore stands at 6.6%. Little is known of the systemic effects, however, since interest rate risks are only redistributed through interest rate derivatives but remain in the financial system. Currently available data do not allow a more precise analysis of the distribution of interest rate risks within the system. Furthermore, the Basel interest rate coefficient only covers the banking book and not the trading book. The trading book risk positions of large banks may be comparatively high. In the case of these banks,

Comparison of interest rate risk coefficients\*  
 Chart 3.1



\* The interest rate risk coefficient sets the present-value loss resulting from an abrupt rise or fall in interest rates of 200 basis points across all maturities in relation to the banks' regulatory own funds, with the less favourable result being considered in each case.

Deutsche Bundesbank

market risks account for an average of 8% of their total risk-weighted assets.

Interest rate risks in the banking book are not at present captured in Pillar 1 of the regulatory guidelines for minimum capital.<sup>5</sup> However, a microprudential capital premium can be charged in the context of the supervisory review and evaluation process; this is currently the case for several institutions. Taking into account the complete present-value losses resulting from the Basel interest rate shock, however,

<sup>3</sup> These shocks are parallel shifts in the yield curve by 200 basis points up or down, with the less favourable result for the banks being used in each case. The derived present-value losses comprise changes in economic value in the banking book. Existing valuation rules stipulate that, in the majority of cases, these losses do not have to be reported on the balance sheet.

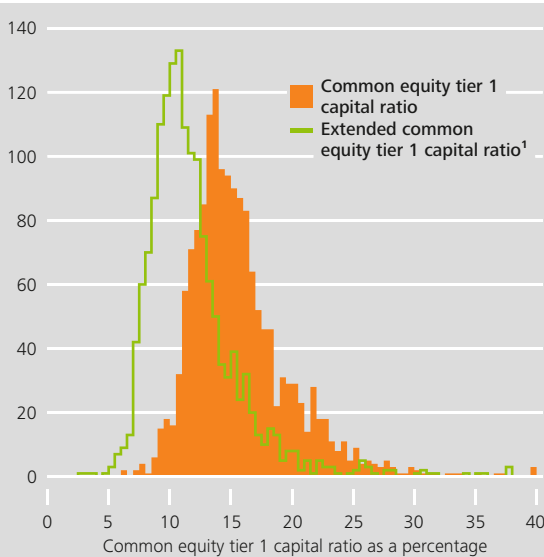
<sup>4</sup> See Basel Committee on Banking Supervision (2016).

<sup>5</sup> The possibility of backing interest rate risks with equity capital under Pillar 1 was also discussed in the relevant consultation process. See Basel Committee on Banking Supervision (2015) and (2016).

### Distribution of German banks' common equity tier 1 capital ratios\*

Chart 3.2

Number of institutions as at end 2016 Q2



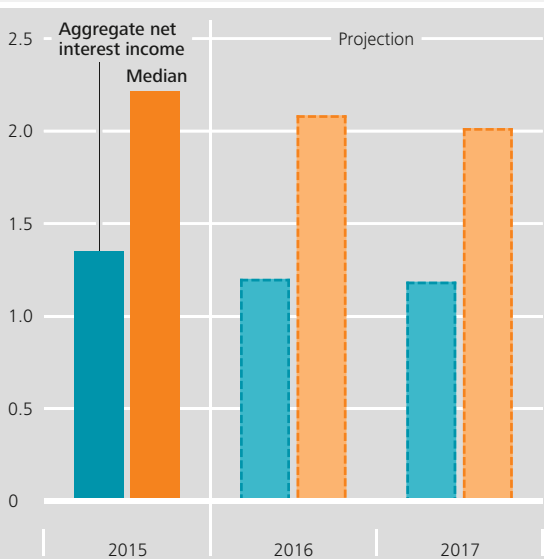
\* The analysis covers 1,609 German banks. For presentation purposes, the distribution was cut off at a common equity tier 1 capital of 40%.  
 ¹ Contains a deduction of the hypothetical losses resulting from the Basel interest rate shock, which is used to measure interest rate risks.

Deutsche Bundesbank

### Net interest income given a Euribor rise of 2 percentage points\*

Chart 3.3

As a percentage of total assets



\* The chart shows the net interest income of German universal banks and mortgage banks given a rise in the three-month Euribor. The projections of net interest income are based on a linear panel regression model.

Deutsche Bundesbank

the aggregate common equity tier 1 capital ratio of the German banking sector would fall from 14.3% to 12.4% (position: 2016 Q2).<sup>6</sup> The adjusted capital ratios would deteriorate on average by around 4 percentage points in the case of savings banks and credit cooperatives, and by roughly 1 percentage point for other banks. This would represent a significant decline, even though the hypothetical capital shortfall when failing to meet the minimum capital ratio would be comparatively small at €57 million, or 0.01%, of the common equity tier 1 capital (position: 2016 Q2; see also Chart 3.2).<sup>7</sup> This calculation may well underestimate the systemic risks resulting from maturity transformation. The maturity transformation of the entire financial system may be considerably higher as a result of borrowing and lending between financial institutions.<sup>8</sup>

Alongside present-value losses, interest rate hikes threaten banks with losses from future interest-related business. Income risks can be determined by means of a scenario analysis.<sup>9</sup> Scenarios with an interest rate hike at the short end of the yield curve are particularly relevant for standard positive maturity transformation, since funding costs then rise more steeply than returns. Assuming that the three-month Euribor rises by 200 basis points and that long-term interest rates remain unchanged (see Chart 3.3), the expected interest rate margin of an average bank (median) will fall by 20 basis points. This roughly corresponds to a moderate profit for the financial year after tax for all categories of banks (in the period from 2010 to 2015, this amounted to between 0.16% and 0.27% of total assets<sup>10</sup>). This

<sup>6</sup> In this calculation, the hypothetical present-value losses are deducted from the common equity tier 1 capital.

<sup>7</sup> The basis for this is a common equity tier 1 capital ratio of 4.5%, the capital conservation buffer of 1.25% which is relevant for 2017, and the capital buffers relevant to global and other systemically important institutions.

<sup>8</sup> See M Hellwig (1998).

<sup>9</sup> The scenario analysis is an alternative approach to the present-value method. For a discussion of the pros and cons of each approach, see C Memmel (2014).

<sup>10</sup> See Deutsche Bundesbank (2016), p 85.

marked decline is caused by the differing maturities and interest rate fixation periods of assets and liabilities. These have increased in the past few years in the case of customer loans. Chart 3.4 illustrates this development using the example of loans for house purchase. In this segment, the share of loans in new business with an interest rate fixation period of over ten years has risen.

The liabilities side of the bank balance sheets, on the other hand, reveals a mixed picture. Overall, the significance of overnight deposits has increased. The actual retention period for customer deposits, though, is far longer than their contractual maturity. Nevertheless, a rapid hike in interest rates can change the situation quickly if there is a change in the relative prices of alternative investments and investors convert their money into higher-yielding forms of investment. This would result, *ceteris paribus*, in a higher liquidity and interest rate risk. Contrary to the general trend of shorter maturities for liabilities in customer business, the maturities of bank bonds have increased (see Chart 3.5).<sup>11</sup> The fact that banks use them as a means of safeguarding liquidity in the long term may have played a role in this.

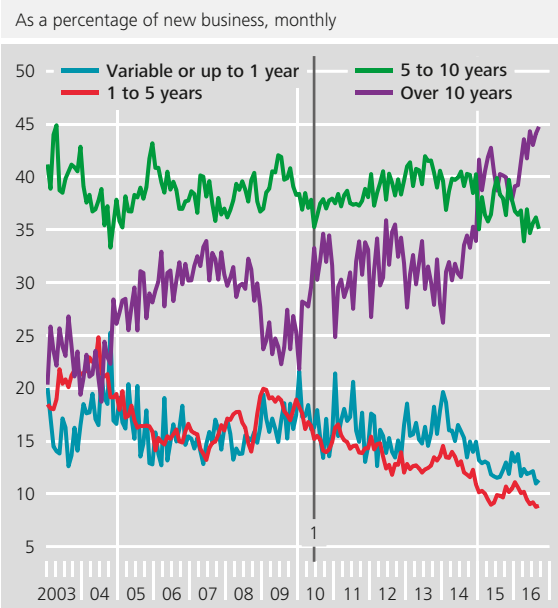
### Regulatory handling of maturity transformation risks

The Basel Committee on Banking Supervision has drafted new banking supervisory standards with the aim of curbing the maturity transformation risk.<sup>12</sup> The objective of introducing the net stable funding ratio (NSFR) is that banks will be able to back their

<sup>11</sup> The significance of individual funding sources such as customer deposits or capital market funding is heavily dependent on the individual bank's business model.

<sup>12</sup> See Basel Committee on Banking Supervision (2010) and (2014).

**German banks' lending to households for house purchase\* by interest rate fixation period** Chart 3.4



\* Within the euro area and including non-profit organisations serving households. 1 Change in the extrapolation since June 2010. Deutsche Bundesbank

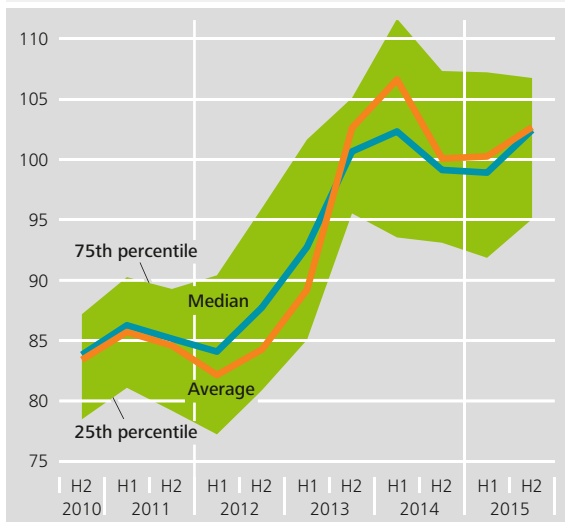
**Residual maturities of bank bonds of selected categories of banks\*** Chart 3.5



\* The chart shows all bank bonds with the exception of certificates and warrants as well as bonds with a redemption option. Big banks are included among the commercial banks; savings bank and cooperative sector institutions include regional and primary institutions. Deutsche Bundesbank

**Net stable funding ratio (NSFR)\* of German SSM banks\*\*** Chart 3.6

As a percentage



Source: Basel Committee on Banking Supervision (Basel III Monitoring, Quantitative Impact Study). \* Calculated as a quotient of the available and required amount of stable funding. Since the Basel III Monitoring reports are not binding, the number of reporting banks fluctuates between 15 and 20 depending on the half-year. \*\* Banks which are supervised under the Single Supervisory Mechanism.

Deutsche Bundesbank

illiquid assets fully through secure funding sources.<sup>13</sup> The net stable funding ratio measures the relation of stable funding sources to longer-term, illiquid assets over a time horizon of one year. The minimum ratio is 100%. This is designed to ensure a sustainable and stress-resistant funding structure throughout the year. The NSFR is to be introduced in the EU in 2018. At the end of 2016, the European Commission will submit a proposal for transposing the NSFR into European law.

Until now, the NSFR has been used only for observation purposes with a group of selected banks. In the case of the 21 German banks directly supervised by the European Central Bank, the NSFR has increased overall during the observation period.<sup>14</sup> At the end of 2015, more than half of the banks under consideration were already fulfilling the minimum ratio of 100% (see Chart 3.6).<sup>15</sup>

In its current form, the NSFR only covers liquidity risks on the basis of the respective institution's business operations. However, the financial crisis has shown that it is precisely systemic liquidity risks, in the form of negative externalities, which banks do not take into adequate account when making their investment and funding decisions.<sup>16</sup> While liquidity and the market prices of assets cannot be influenced directly by a single, not systemically important bank, they are nevertheless determined by the investment and funding decisions of all institutions taken as a whole.

In a boom period, the liquidity risk typically seems small to the individual institutions. Contract durations are short, and funding is cheap. At the same time, individual decisions can lead to the emergence of a systemic liquidity risk for which market participants do not make adequate provision (negative externality). For instance, banks with acute funding difficulties could sell securities in order to service their maturing liabilities. If such fire sales achieve a certain magnitude, price declines could subsequently force other banks to make write-downs on the same or similar securities. Fire sales would spiral as a result (see the box entitled "An indicator for measuring macroprudential liquidity risk" on pages 38 and 39).<sup>17</sup>

To contain such systemic liquidity risks, the European Capital Requirements Regulation (CRR) provides for the option of a macroprudential application of

<sup>13</sup> Put more simply, all the liabilities of a bank are given weights, whereby the more stable the type of liability is, the higher is the weight (available stable funding). They are then set in relation to the assets, which are, in turn, weighted according to their respective illiquidity (required stable funding).

<sup>14</sup> The NSFR reports are not obligatory; this statement therefore applies to those banks which produced a report (between 15 and 20 banks, depending on the half of the year).

<sup>15</sup> This does not conflict with the development of the Basel interest rate coefficient, since banks are defined in a different way.

<sup>16</sup> See International Monetary Fund (2011), pp 75-110.

<sup>17</sup> Another example of negative externality is that banks expect to be propped up by the central bank in the event of a systemic liquidity crisis and therefore take excessive liquidity risks (moral hazard).

the NSFR, which is designed as a microprudential tool. Pursuant to Article 458 CRR, a macroprudential supervisory authority can, under certain conditions, tighten the CRR's liquidity requirements<sup>18</sup> – if such risks cannot be adequately addressed by certain other measures. However, there is a considerable procedural workload involved in applying measures pursuant to Article 458 CRR.<sup>19</sup>

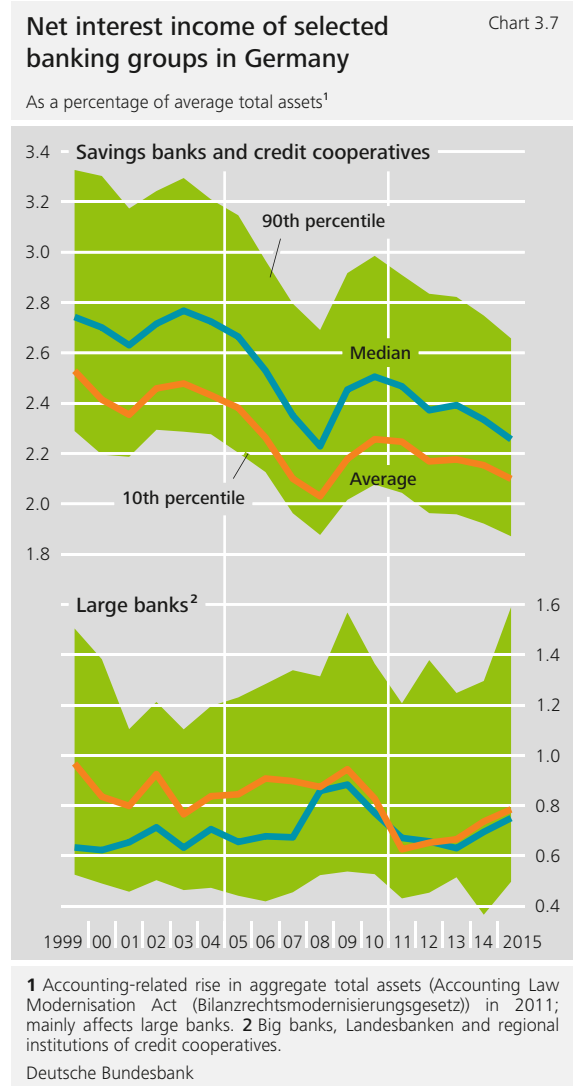
## Earnings outlook dampened

For a long time now, the German banking sector has been characterised by weak profitability by international comparison. In 2015, persistently low interest rates and a further flattening of the yield curve<sup>20</sup> led to a further decline in the net interest margin for savings banks and credit cooperatives (see Chart 3.7). Their earnings are particularly heavily dependent on interest business.<sup>21</sup> At 2.1%, the interest margin reached its lowest level in the last two decades (with the exception of the crisis year of 2008).

*Persistently low interest rates and a further flattening of the yield curve led to a further decline in the net interest margin for savings banks and credit cooperatives.*

led to a further decline in the net interest margin for savings banks and credit cooperatives (see Chart 3.7). Their earnings are particularly heavily dependent on interest business.<sup>21</sup> At 2.1%, the interest margin reached its lowest level in the last two decades (with the exception of the crisis year of 2008).

By contrast, the interest margin of large banks has, in fact, recovered slightly over the past few years. This is largely attributable to developments on the funding side. The interbank market plays a relatively important role for these banks. These institutions therefore benefited comparatively strongly from a marked decline in interest rates for interbank loans (see Chart 3.8), which had increased significantly earlier during the crisis. However, this development now seems to be coming to an end. The interest margin of the large banks is therefore expected to fall if the decline in funding costs is no longer able to offset the decline in profit margins in lending business. A reduction of implicit government guar-



antees for large banks, which was one of the aims of regulatory reforms in the wake of the international financial crisis, could also contribute to this (see the box entitled “Magnitude and development of implicit government guarantees for banks” on pages 41 and 42).

**18** These relate to liquidity coverage requirements and to stable funding requirements.  
**19** The adoption of measures pursuant to Article 458 CRR requires coordination with the European Systemic Risk Board (ESRB), the European Banking Authority (EBA), the European Commission and the European Council (Article 458 (4) CRR).  
**20** See the chapter entitled “Macroeconomic and financial environment encouraging build-up of risks” on pp 13-30.  
**21** See Deutsche Bundesbank (2015), p 42.

## An indicator for measuring macroprudential liquidity risk

Liquidity shortages at individual banks can materialise within just a few days and rapidly spread to the entire financial system. Such shortfalls are often the root cause of serious financial crises, which means that monitoring systemic liquidity risk is an important aspect of macroprudential analysis.

Measuring these risks is difficult, however, since the nature of liquidity is complex and shortages can occur abruptly. An exogenous shock that initially has only a limited negative impact on the liquidity of the banking system may give rise to a systemic liquidity crisis when amplification and feedback mechanisms are at play.

For example, if a bank were to experience financing difficulties, it might attempt to offload assets that can be liquidated at short notice. If an extensive portfolio is to be sold in this context, the market value of the securities concerned could fall significantly as a result of the sudden oversupply – especially if several banks take action at the same time. Other banks holding the same securities may likewise come under pressure to sell. This would trigger the onset of a selling spiral and further intensify the decline in prices.

In order to identify a build-up of systemic liquidity risk at an early stage, the Bundesbank is currently developing a new indicator based on the latest academic research.<sup>1</sup> What is known as the systemic liquidity buffer (SLB) describes the difference at the individual bank level between assets that can be sold at short notice (ie unencumbered assets) and are valued at fire sale prices and the net payment outflows expected in the event of a systemic liquidity shock.<sup>2</sup> If the difference is substantial enough, the banking system can be

deemed sufficiently resistant to a liquidity shock of this kind. By contrast, a low or even negative value would suggest an insufficient level of resilience. What is referred to as the systemic liquidity shortfall (SLS) supplements the SLB and provides additional information in this context. The SLS only takes into account the SLB's negative amounts, thus capturing only those banks with insufficient liquidity if a systemic stress scenario is assumed.<sup>3</sup> This ensures that, at the aggregated level, institutions with sufficiently large liquidity positions do not offset illiquid institutions and the potential market-relevant selling pressure is not underestimated. Moreover, vulnerable segments of the banking system can be identified.

When calculating the indicator, it is assumed that banks cannot roll over their debt and that their deposits are partially withdrawn. It is also presumed that banks cannot raise any new capital in the short term. This creates a payment outflow that is modelled based on the available regulatory reports on the banks' liquidity situation and is determined by the duration of the shock, the maturity structure of the liabilities and the holders of the liabilities (eg customer deposits or interbank loans).<sup>4</sup>

<sup>1</sup> See M K Brunnermeier and A Krishnamurthy (2014), Risk topography: systemic risk and macro modeling, University of Chicago Press, August 2014.

<sup>2</sup> The timeframe for net outflows depends on the degree of severity of the chosen stress scenario and ranges from a few days to one month. The SLB thus adds a macroprudential dimension to the existing ratios used to monitor short-term liquidity risk, such as the liquidity buffer pursuant to the Liquidity Regulation (Liquiditätsverordnung) or the liquidity coverage ratio (LCR). The net stable funding ratio (NSFR), on the other hand, monitors longer-term liquidity risk.

<sup>3</sup>  $SLS_{Bank} = \min\{0, SLB_{Bank}\}$

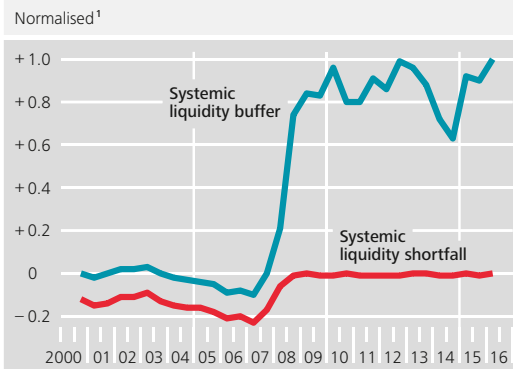
<sup>4</sup> Off-balance-sheet payment obligations (eg loan commitments) are also taken into account.

The model on which the indicator is based assumes that banks will liquidate their assets in order to service the expected payment outflows.<sup>5</sup> In the model, the banks take into account the impact that their activities have on the behaviour of other banks and on the price of the securities sold. The optimal sales strategy is calculated numerically by means of a game theory model, simulating a fire sale spiral together with the corresponding price declines in the banking system. The shorter the maturity structure of the liabilities and the more similar the banks' portfolios of securities sold, the higher the momentum.<sup>6</sup>

In this process, two opposing incentives determine the decisions that banks are forced to take when under acute pressure to act. On the one hand, banks will individually strive to sell their assets as quickly as possible in order to beat competing banks to the chase and secure favourable prices. On the other, they will try to divide the sale up into small portions and to extend it over a longer period of time so as not to single-handedly accelerate the price drop. Banks with a large portfolio will therefore tend to act more cautiously than banks that have little influence over the market price (coordination failure).

The above chart shows the changes in the normalised SLB<sup>7</sup> aggregated across the German banking system.<sup>8</sup> The blue line shows that the aggregated SLB remained at a relatively low level from the beginning of the period under review to the outbreak of the financial crisis, with values even dipping into negative territory at times. The aggregated SLB climbed sharply over the course of 2008. This increase was attributable to a significant decline in short-term liabilities and to a noticeable rise in central bank reserves in the banking system.

### Aggregated liquidity ratios of German banks



<sup>1</sup> Maximum systemic liquidity buffer = 1. Maximum systemic liquidity shortfall = 0.  
 Deutsche Bundesbank

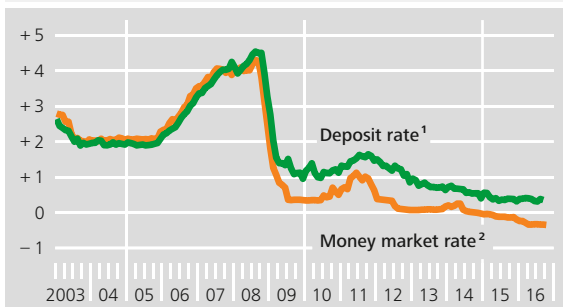
The changes in the normalised SLS<sup>9</sup> aggregated across the German banking system (red line) indicate a steady build-up of risks from mid-2003 to mid-2007. In the course of 2008, the shortfall decreased in parallel with the build-up of the SLB.

<sup>5</sup> The model excludes alternative ways of generating cash in the short term via securities lending transactions.  
<sup>6</sup> Potential adjustments made by the central bank in a stress scenario (eg in the form of additional liquidity-supporting measures) are disregarded in the model in order to capture the level of resilience factoring out possible interventions.  
<sup>7</sup> The normalised SLB is standardised at the maximum amount of the SLB in the period under review, which means that its values are limited to fluctuations between -1 and 1.  
<sup>8</sup> All of the banks endure a liquidity shock of one week.  
<sup>9</sup> Here, too, the values are normalised according to the maximum level of the SLB in the period under review.



**Money market rate compared with German banks' deposit rate** Chart 3.8

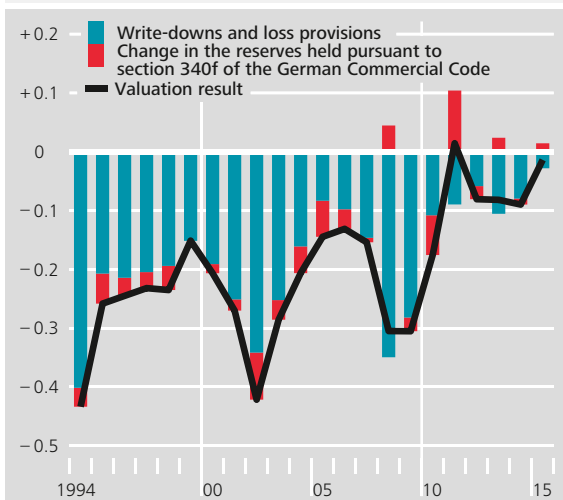
As a percentage, monthly averages



**1** Effective interest rate for deposits of households (including non-profit organisations serving households) with an agreed maturity of up to two years. **2** Eonia for overnight money in interbank business.  
 Deutsche Bundesbank

**Components of the valuation result\* of German banks** Chart 3.9

As a percentage of total assets<sup>1</sup>



\* Negative (positive) values, such as transfer to (liquidation of) reserves held pursuant to section 340f of the German Commercial Code, signify a negative (positive) contribution to the profit for the financial year. **1** Up to and including 1998 as a percentage of the business volume. In 2011, accounting-related rise in aggregate total assets by around 10% (Accounting Law Modernisation Act (Bilanzrechtsmodernisierungsgesetz)).  
 Deutsche Bundesbank

At the same time, the banks' valuation result will probably worsen again. A historically favourable valuation result has been bolstering the profitability of German banks since 2011 (see Chart 3.9). Savings banks and credit cooperatives, in particular, have formed fewer hidden reserves of late. Furthermore,

they have released existing hidden reserves and generated profit by reallocating them as visible reserves, which are recognised as regulatory tier 1 capital.<sup>22</sup> Seen in this light, the favourable valuation result is not due to cyclical factors alone but also a result of the effort to report higher capital ratios.

Furthermore, ongoing positive economic developments at home, as well as low interest rates, have perceptibly lowered the loan default rates of German banks in the last few years. The operating result would have been far less favourable in recent years if the valuation result had corresponded to the long-term average (see Chart 3.10 on page 44). Under relatively mild stress assumptions,<sup>23</sup> the institutions' consolidated operating result in 2015 would have been slightly negative, in fact, for the first time since 1994 (with the exception of the crisis year of 2008).

Risk provision reflects, on the whole, the current economic circumstances. For example, non-performing loans and credit risk provisioning by German institutions show a similar movement over time (see Chart 3.11 on page 44), with changes to risk provisioning closely following insolvency rates in the real economy (see Chart 3.12 on page 47).

For system stability, it is crucial that risk provisioning should not be cut back excessively in good times, so as not to intensify the procyclical effect in a subsequent downturn.

*For system stability, it is crucial that risk provisioning should not be cut back excessively in good times.*

According to a survey on the profitability and resilience of German financial institutions in a low-interest-rate environment, which was undertaken by the Bundesbank and the Federal Financial Supervisory Authority (BaFin) in 2015, banks are ex-

<sup>22</sup> See Deutsche Bundesbank (2012), pp 27-28.  
<sup>23</sup> The valuation result corresponds to the long-term average with one standard deviation lower.



## Magnitude and development of implicit government guarantees for banks

Systemically important financial institutions, which the market assumes would be propped up by the government in the event of financial distress on account of their size and significance (“too big to fail”), benefit from an implicit government guarantee, which is associated with a substantial funding cost advantage.<sup>1</sup> This finding is confirmed by a study conducted by the Organisation for Economic Co-operation and Development (OECD), which quantifies these advantages during the financial crisis at over 100 basis points relative to payable interest.<sup>2</sup> Furthermore, the German Council of Economic Experts found that being explicitly designated as systemically important financial institutions by the Financial Stability Board (FSB) reinforced their implicit government guarantees.<sup>3</sup>

This funding cost advantage is problematic for various reasons. Implicit government guarantees not only distort competition with regard to institutions that do not benefit from such guarantees and the accompanying funding cost advantage, they potentially jeopardise financial stability. This implicit guarantee means that systemically important financial institutions have an incentive to take greater risks.

In response to the international financial crisis, major regulatory measures were initiated in the subsequent years to solve the “too big to fail” problem, and are now being steadily implemented. Capital and liquidity requirements have been tightened and a new recovery and resolution regime has been set up. This should make it possible also for systemically important institutions to exit the market in the event of financial distress without major dislocations.

Effect of bank size on rating uplift\*



Bundesbank calculation based on data from Markit, Moody's and SNL Financial. \* A separate regression is estimated for each quarter. The estimation coefficient measures the additional rating uplift observable for a bank with total assets that are greater by €1 trillion. The underlying regression model takes into account information from different ratings, credit default swaps and total assets.

Deutsche Bundesbank

Whether and how much such measures have helped to reduce implicit government guarantees can be deduced from the assessments of rating agencies. These agencies routinely take explicit account of implicit government guarantees in their rating process. A “rating uplift” from various rating categories may therefore be calculated as

<sup>1</sup> See International Monetary Fund, Global Financial Stability Report, Chapter 3, pp 101-132, April 2014.

<sup>2</sup> See S Schich and Y Aydin, Measurement and analysis of implicit guarantees for bank debt: OECD survey results, OECD Financial Market Trends 2014/1, October 2014.

<sup>3</sup> See German Council of Economic Experts, 2014-15 Annual Report (Jahresgutachten), Chapter 5, pp 168-214, November 2014.

a measure of implicit government guarantees.<sup>4</sup> As a result, ratings can supply important clues for assessing the market view regarding the likelihood and scale of potential government support for banks.

A regression analysis based on a panel of 51 banks (23 global systemically important banks and 28 smaller to medium-sized institutions) from 13 countries was carried out to examine the extent to which the size of banks has an effect on their ratings. The size of a bank, measured by its total assets, serves as a measure of its systemic importance. A positive effect would indicate the presence of implicit government guarantees. The results suggest that implicit government guarantees were particularly high during the stress periods of 2011, 2012 and late 2014. Since then, the connection between a bank's size and rating has been steadily diminishing. This indicates a re-

duction of implicit government guarantees (see the chart on page 41). The regulatory measures therefore seem to be taking effect. A key factor in this is the new regulatory framework for the recovery and resolution of banks. Given that the framework is only just being implemented, however, it is too early to definitively gauge its role in reducing implicit government guarantees.

<sup>4</sup> The rating uplift is the difference between the overall rating and the stand-alone rating excluding the assumption of government support.

pecting an increasing need for provisioning.<sup>24</sup> Risk provisioning for loans granted to households and firms abroad constitutes a special case in this connection. In this area, the percentage of non-performing loans in some countries has risen noticeably in recent years (see the box entitled "German banks' exposure to borrowers in selected European countries" on page 43).

## ■ Stress resistance improved

A bank's resilience is quite fundamentally determined by its ability to bear losses. Absorbing losses, in turn, is the function of capital. Capital adequacy is thus the key factor determining a bank's resilience.

After the global financial crisis, German banks increased their aggregate regulatory tier 1 capital ra-

tio by just under 7 percentage points (from 8.8% to 15.7%) between the end of 2007 and the end of 2015. During this period, their tier 1 capital rose by just over 47%.

Banks also improved their tier 1 capital ratio to a considerable degree by investing in assets with lower capital requirements,

such as government bonds. This led to a decline in risk-weighted assets of just under 18%, whereas total assets remained virtually unchanged.<sup>25</sup> The unweighted capital ratio (tier 1 capital in relation to total assets) therefore rose by just 2.7 percentage

*After the global financial crisis, German banks increased their regulatory tier 1 capital ratio by just under 7 percentage points.*

<sup>24</sup> See [https://www.bundesbank.de/Redaktion/EN/Pressemitteilungen/BBK/2015/2015\\_09\\_18\\_bafin\\_bbk.html](https://www.bundesbank.de/Redaktion/EN/Pressemitteilungen/BBK/2015/2015_09_18_bafin_bbk.html)

<sup>25</sup> The introduction of the Accounting Law Modernisation Act (Bilanzmodernisierungsgesetz) in 2009 led to a temporary increase in total assets. Scaling back of positions reduced total assets again in the following years.

## German banks' exposure to borrowers in selected European countries

The creditworthiness of borrowers in some euro-area countries<sup>1</sup> has deteriorated significantly since the start of the financial crisis in 2008. This is also impacting on the credit portfolios of German banks in these countries. At the same time, German banks have reduced their exposure to borrowers in the household and corporate sectors of these countries in relation to tier 1 capital. However, their outstanding portfolios of loans granted to Italy and Spain, in particular, remain substantial (see left-hand chart below).

Since the first quarter of 2009, the share of non-performing loans in German banks' lending to the aforementioned six countries in the right-hand chart below has strongly increased, al-

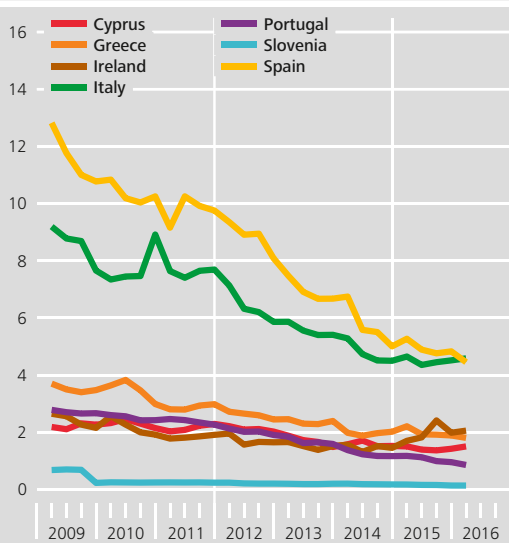
though it is now universally declining again. The share of non-performing loans in five of these countries stands at 10% or above.

However, the credit quality of German banks' portfolios has improved in the last one to three years. Balance sheet development in the selected countries' domestic banks is more heterogeneous.

<sup>1</sup> These countries are Cyprus, Greece, Ireland, Italy, Portugal, Slovenia and Spain.

### German banks' balance sheet exposure to the private sector\* of selected countries\*\*

As a percentage of tier 1 capital

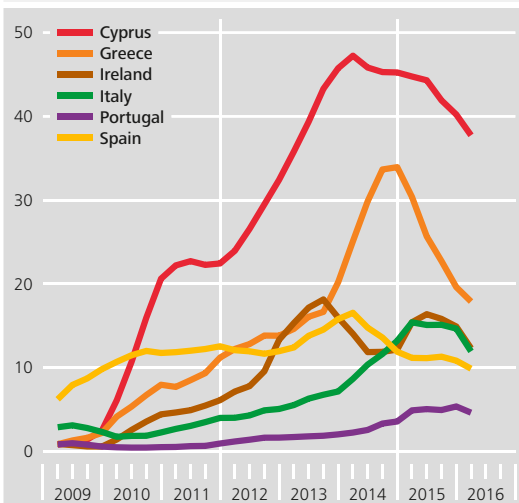


Source: Deutsche Bundesbank's credit register for loans of one million euro or more. \* Business enterprises and households. \*\* Selection based on countries with a high share of non-performing loans.

Deutsche Bundesbank

### German banks' non-performing loans\* to the private sector of selected countries

As a percentage of German banks' total exposure to the private sector of these countries



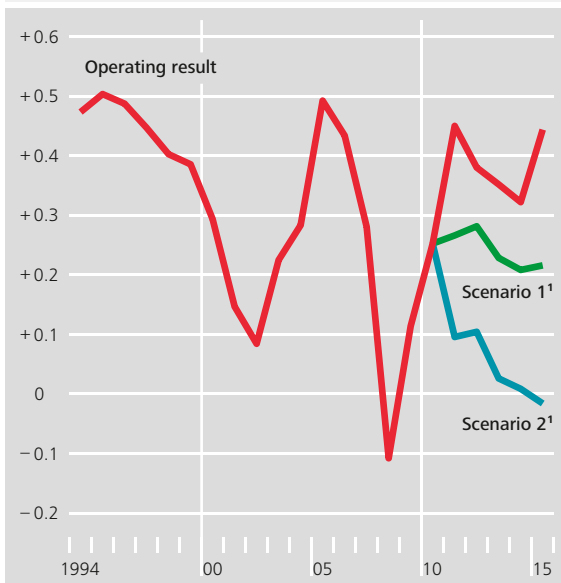
Source: Deutsche Bundesbank's credit register for loans of one million euro or more. \* Past-due loans and loans for which full repayment is not expected. Calculations based on the moving average of the base series over four quarters.

Deutsche Bundesbank

### Counterfactual operating result of German banks

Chart 3.10

As a percentage of total assets

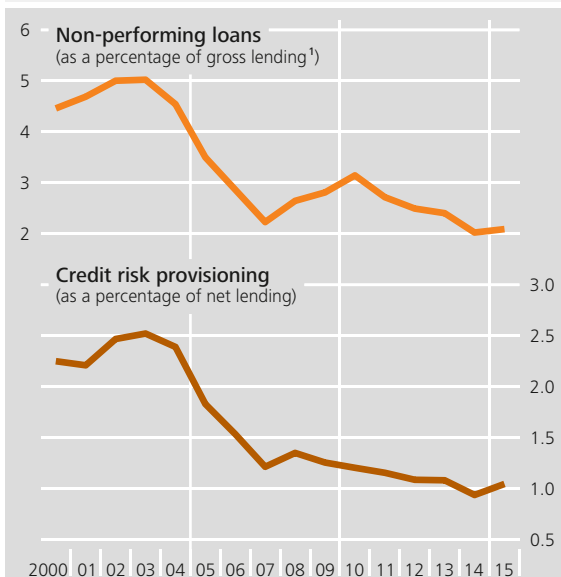


1 The valuation result in the period from 2011 to 2015 corresponds to the long-term average of the period from 1994 to 2010, with scenario 2 shown as one standard deviation lower.

Deutsche Bundesbank

### Non-performing loans and risk provision of German banks\*

Chart 3.11



\* These are non-performing loans as defined in the IMF's Financial Soundness Indicators (FSI) project. The definition of non-performing loans was amended in 2009. 1 Net lending plus risk provisioning  
 Deutsche Bundesbank

points (from 3.2% to 5.9% in the aggregate). In the second quarter of 2016, the tier 1 capital ratio was slightly up on the year at 15.7% (for the percentiles, see also Chart 3.13 on page 47). The regulatory tier 1 capital ratio – a genuinely microprudential indicator – thus points to a higher stress resistance overall in comparison with the period before the financial crisis. However, this ratio has only limited information value for gauging the banking system's resilience to macroeconomic risks, since the risk weights used to determine the risk assets do not capture macroeconomic risks, or do so only inadequately. In this context, macro stress tests can make an important contribution.

In July 2016, the European Banking Authority (EBA) published the results of its stress test for 51 European banks. The results confirmed overall that the participating banks would be able to fulfil the regulatory minimum capital requirements even in an adverse macroeconomic scenario. At 9.4%, the common equity tier 1 capital ratio of the German banks participating in the stress scenario was slightly higher than the European average of 9.2%. However, the capital ratio of two large German institutions dropped more steeply, although it did not go below the minimum capital ratio. These results are of only limited informative value with regard to systemic stability, however. For one thing, the selection of participating banks is confined to the large institutions in Germany. For another, the results do not take account of destabilising contagion or feedback effects.

More stringent capital requirements have made the financial system more stable on the whole. However, public discussion sometimes raises the fear that banks are cutting back their lending as a result of higher capital requirements and related costs. What is often overlooked is that improved

*More stringent capital requirements have made the financial system more stable on the whole.*

## Reciprocity of macroprudential policy measures in the EU

In the EU, primary responsibility for macroprudential policy lies at the national level. This makes sense as most systemic risk typically originates from developments that are macroeconomic in nature and influenced by domestic economic policy. Notwithstanding this fact, it is important to bear in mind the close ties that exist between European markets. To make sure that risks of the same nature are handled consistently across the EU, fundamental national responsibility for macroprudential policy needs to be accompanied by regulations that ensure the reciprocity of macroprudential policy measures among EU countries.

If macroprudential policy measures were not reciprocated within the EU, a regulatory gap would arise both within the activating country and vis-à-vis other EU member states. This is because national regulations only apply to domestic banks<sup>1</sup> and subsidiaries of foreign banks domiciled in that country. They do not cover the activities in that country of banks headquartered in other EU member states (and their branches). Reciprocity is therefore essential to ensure that any given macroprudential policy measure can have an impact on a systemic risk in its entirety.

To cite an example, if the tightening of a macroprudential policy measure in a specific country were to target the regulation of lending, foreign banks might exploit the resulting regulatory advantage and expand their lending activity in that country – either through their branches or via cross-border lending.

From the domestic vantage point, such an expansion of the business activities of banks subject to foreign oversight may undermine the effectiveness of the national macroprudential policy

measure. Overheating of the affected market segment would be dampened less significantly by this measure if foreign institutions were to expand their lending in response to the change in regulation.<sup>2</sup> Moreover, shifts in lending behaviour would also be accompanied by a transmission of underlying risks to banks subject to foreign oversight. Any stability-related problems encountered by these banks may have a knock-on effect on domestic banks owing to the highly integrated nature of the European banking system.

With a view to ensuring the effectiveness of national macroprudential policy measures and containing the transmission of risk to other EU member states, the European Systemic Risk Board (ESRB) issued a recommendation at the beginning of 2016 in which it advocated voluntary reciprocity for macroprudential policy measures.<sup>3</sup> Under this arrangement, any EU member state modifying one of its macroprudential instruments can call on fellow member states – via the ESRB – to apply that particular measure recip-

---

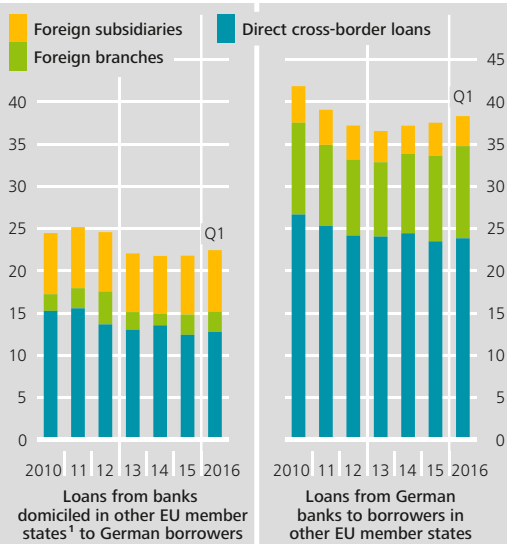
<sup>1</sup> Under section 53 of the Banking Act (Kreditwesengesetz), domestic branches of institutions domiciled in a non-EEA state are treated like domestic institutions.

<sup>2</sup> See J F Houston, C Lin and Y Ma, Regulatory arbitrage and international bank flows, *The Journal of Finance*, Vol 67, No 5, October 2012, pp 1845-1895; F Bremus and M Fratzscher, Drivers of structural change in cross-border banking since the global financial crisis, *Journal of International Money and Finance*, Vol 52, April 2015, pp 32-59; S Aiyar, C W Calomiris and T Wieladek, Identifying channels of credit substitution when bank capital requirements are varied, *Bank of England Working Paper 485*, January 2014.

<sup>3</sup> See European Systemic Risk Board, Recommendation ESRB/2015/2 on the assessment of cross-border effects of and voluntary reciprocity for macroprudential policy measures, January 2016.

### Cross-border lending

As a percentage of domestic lending by German banks; end-of-year levels



Sources: BIS, ECB, primary statistics compiled by the Bundesbank and Bundesbank calculations. <sup>1</sup> Including their foreign subsidiaries and branches in Germany.  
 Deutsche Bundesbank

rocaly.<sup>4</sup> The ESRB then determines whether and in what form it will recommend reciprocity by the national supervisory authorities of the other EU member states. Where a recommendation has been made, the national authorities are required to implement it within a predefined time frame or explain why they have decided not to do so (the “act or explain” mechanism). Thus far, the ESRB has recommended reciprocity for two national macroprudential policy measures.<sup>5</sup>

For Germany in particular, which has a banking system that is closely interlinked with those of other EU member states, such mutual recognition of macroprudential policy measures is of vital importance. In the absence of reciprocity, potential macroprudential policy measures would not have captured credit amounting to more than 15% of total lending by German banks to German borrowers at the end of the first quarter

of 2016 (see the data on foreign branches and cross-border loans in the left-hand panel of the adjacent chart).

At the end of the first quarter of 2016, credit extended by the German banking system to other EU member states accounted for more than one-third of its domestic lending (see the right-hand panel of the adjacent chart). Without reciprocity, the macroprudential policy measures of other EU member states would only capture lending by German subsidiaries in these countries. On this count, a study conducted by the International Banking Research Network (IBRN) is significant as it shows that lending by foreign subsidiaries of German banks reacts more sensitively to other countries’ regulatory measures than lending by foreign branches of German banks.<sup>6</sup>

<sup>4</sup> The ESRB recommendation distinguishes between measures that tackle the roots of the underlying risk (eg higher risk weights or caps on loan-to-value (LTV) ratios when granting credit) and for which reciprocal application is consequently deemed necessary, and institution-specific instruments for which no reciprocity is envisaged. Furthermore, EU law already provided for mandatory recognition of macroprudential policy measures for selected instruments (eg the countercyclical capital buffer up to a buffer level of 2.5%) prior to the publication of Recommendation ESRB/2015/2.

<sup>5</sup> These were macroprudential policy measures taken in Belgium (a five-percentage-point risk-weight add-on applied to Belgian mortgage loan exposures of credit institutions using the internal ratings-based approach) and Estonia (a 1% systemic risk buffer rate applicable to domestic exposures).

<sup>6</sup> See J Ohls, M Pramor and L Tonzer, International banking and cross-border effects of regulation: lessons from Germany, Deutsche Bundesbank Discussion Paper, No 27/2016, August 2016; C M Buch and L Goldberg (2016), Cross-border regulatory spillovers: how much? How important? Evidence from the International Banking Research Network, Deutsche Bundesbank and Federal Reserve Bank of New York, mimeo. The IBRN is a network consisting of central banks, the International Monetary Fund (IMF) and the Bank for International Settlements (BIS) that examines the activities of globally active banks. Applying a comparative empirical approach, bank-level data available at a national level only are analysed in country studies. The country results are subsequently compared and evaluated as part of a metastudy.

capital adequacy enables institutions to fulfil their core macroeconomic function and grant loans. Thus, there is also empirical evidence that lending tends to increase when capital ratios rise.<sup>26</sup> In addition, better capitalisation lowers banks' borrowing costs because of the lower default risk. It is therefore not possible to demonstrate empirically that a larger share of equity financing harms banks' profits, especially if the costs of financial crises are also taken into consideration.<sup>27</sup>

## List of references

Basel Committee on Banking Supervision (2010), Basel III: international framework for liquidity risk measurement, standards and monitoring, December 2010.

Basel Committee on Banking Supervision (2014), Basel III: the net stable funding ratio, October 2014.

Basel Committee on Banking Supervision (2015), Consultative document – interest rate risk in the banking book, June 2015.

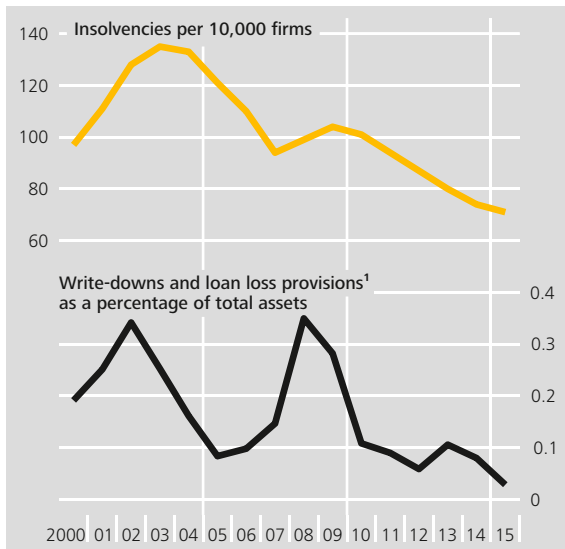
Basel Committee on Banking Supervision (2016), Standards – interest rate risk in the banking book, April 2016.

Brunnermeier, M K and L H Pedersen (2009), Market liquidity and funding liquidity, Review of Financial Studies, Vol 22, No 6, pages 2201 to 2238, June 2009.

<sup>26</sup> See L Gambacorta and H S Shin (2016) as well as C M Buch and E Pietro (2014).

<sup>27</sup> See J Dagher, G Dell'Ariccia and L Laeven (2016).

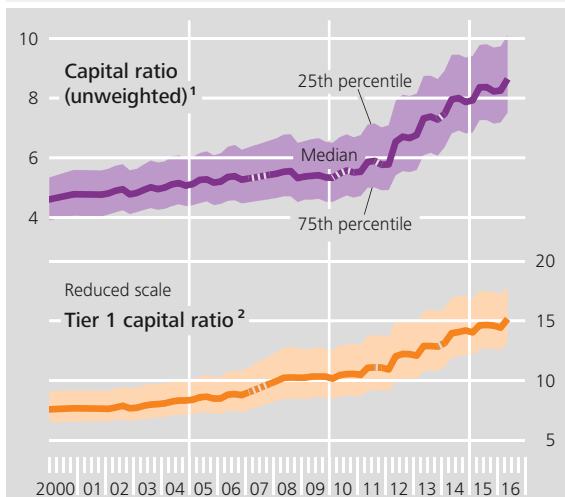
**Insolvency ratio compared with write-downs and loan loss provisions of German banks** Chart 3.12



Sources: Federal Statistical Office and Bundesbank calculations. <sup>1</sup> Write-downs and loan loss provisions have a negative impact on the operating result. Deutsche Bundesbank

**Capitalisation of German banks\*** Chart 3.13

As a percentage; annual values up to 2001, quarterly values from 2002



Source: Bundesbank calculations on the basis of individual institutions' and group reports. \* Linear interpolation in 2007. In 2007, 2011 and 2014, the valuations of tier 1 capital and risk-weighted assets changed as a result of Capital Requirement Directives CRD II, CRD III and CRD IV. <sup>1</sup> Tier 1 capital in relation to total assets; transitional period in 2010 pursuant to the Accounting Law Modernisation Act (Bilanzrechtsmodernisierungsgesetz). <sup>2</sup> Tier 1 capital in relation to risk-weighted assets. Deutsche Bundesbank

Buch, C M and E Prieto (2014), Do better capitalized banks lend less? Long-run panel evidence from Germany, *International Finance*, Vol 17, No 1, pages 1 to 23, April 2014.

Dagher, J, G Dell’Ariccia and L Laeven (2016), Benefits and costs of bank capital, *IMF Staff Discussion Note 16/04*, March 2016.

Deutsche Bundesbank (2012), *Monthly Report*, September 2012.

Deutsche Bundesbank (2015), *Monthly Report*, April 2015.

Deutsche Bundesbank (2016), *Monthly Report*, September 2016.

Farhi, E and J Tirole (2012), Collective moral hazard, maturity mismatch, and systemic bailouts, *American Economic Review*, Vol 102, No 1, February 2012.

Gambacorta, L and H S Shin (2016), Why bank capital matters for monetary policy, *BIS Working Papers No 558*, April 2016.

Hellwig, M (1998), Banks, markets, and the allocation of risks in an economy, *Journal of Institutional and Theoretical Economics*, Vol 154, No 1, pages 328 to 345, March 1998.

International Monetary Fund (2011), *Global Financial Stability Report*, April 2011.

Memmel, C (2014), Banks’ interest rate risk: the net interest income perspective versus the market value perspective, *Quantitative Finance*, Vol 14, No 6, pages 1059 to 1068, June 2014.



# Funded pension providers continuing to face challenges

*In a setting of persistently low interest rates, funded pension providers, who have promised guaranteed nominal returns, face challenges. This has prompted German life insurers to increasingly diversify their assets by region and sector. Although their investments now have longer maturities, the duration of these assets is still shorter than that of their obligations to policyholders. This duration gap has exposed life insurers to high interest rate risks.*

*Solvency II, a new risk-based and fair value-oriented framework for insurers which, amongst other things, sheds light on interest rate risk and requires that the appropriate amount of own funds be held against it, came into force at the beginning of this year. According to initial reports, the vast majority of life insurers have a sufficient Solvency II ratio. The bulk of these companies are applying transitional measures designed to avoid the turmoil that could be triggered by the abrupt transition to market-consistent valuation. Without any transitional measures, a significant capital shortfall would result.*

*The low interest rates are affecting not only life insurers but other funded pension providers as well. An EU-wide stress test exercise of institutions for occupational retirement provision (IORPs) has shown that defined benefits will no longer be covered by the insurers' own assets if they are valued at a market-consistent level. Against this background, it is even more important for companies to provide their investors with appropriate and unbiased information on pension obligations in their annual financial statements.*

## Interest rate sensitivity increasingly entering the spotlight

Owing to similarities in their business models, many insurers are exposed to the same macroeconomic risks. It is particularly life insurers' interest rate risk which is correlated. These firms have, for instance, a duration gap, ie a mismatch between very long-

*Many insurers are exposed to the same macroeconomic risks.*

term liabilities and shorter-term assets. Macroeconomic or financial market shocks could therefore have a very similar impact on many insurers and cause procyclical behaviour overall. Moreover, these shocks can spill over into other financial market sectors or the real economy if many insurers want to liquidate their assets simultaneously in order to meet regulatory capital requirements and thus stabilise their Solvency II ratio. This can drive down the prices of the affected assets.<sup>1</sup>

For the group of advanced economies, the International Monetary Fund (IMF), motivated by this finding, has established that life insurers are making an increased contribution to systemic risk, identifying insurers' greater sensitivity to interest rates as the cause.<sup>2</sup> Other empirical studies find that country-specific differences in companies' sensitivity to interest rates can be attributed to variations between the types of life insurance products typical of those countries.<sup>3</sup> Guarantee products, along with options and discretionary rights for policyholders, are far more important in Germany and the United States, say, than in the United Kingdom.<sup>4</sup> Countries where guarantee products and generous options and discretionary rights for policyholders are a major factor have seen life insurers' balance sheets become significantly more sensitive to interest rates during the period of low interest rates.<sup>5</sup>

Hence, it is not only individual (global) systemically important insurers but also an accumulation of insurers exposed to common risks which could pose a hazard to financial stability.<sup>6</sup> Alongside the existing regulatory framework, a macroprudential approach for correlated risks is needed to contain the "too-big-to-fail" problem. Various international bodies are currently debating what shape such an approach might take. One idea is that capital requirements for certain activities could be adapted to match their contribution to systemic risk.<sup>7</sup>

*A macroprudential approach for correlated risks needs to be added to the existing regulatory framework.*

Microprudential surveillance and macroprudential oversight are increasingly also looking at insurers' liquidity risk. For instance, the International Association of Insurance Supervisors (IAIS) is basing its analyses of insurers' risk to a growing extent on their respective product ranges, with products that expose insurers to considerable macroeconomic or

*Microprudential surveillance and macroprudential oversight are increasingly also looking at insurers' liquidity risk.*

<sup>1</sup> For more on systemic risks and the critical functions performed by insurers, see Deutsche Bundesbank (2014a), pp 67-75.

<sup>2</sup> See International Monetary Fund (2016a), chapter 3.

<sup>3</sup> In the context of the persistent low-interest-rate setting, Moody's (2015) compares the impact of various risk factors on life insurers' profitability for 21 industrial countries and emerging market economies.

<sup>4</sup> It is common in Germany to have a wide array of options and discretionary rights, such as the lump-sum option for pension insurance policies, the right to early termination or premium holidays for contracts.

<sup>5</sup> See D Hartley, A Paulson and R J Rosen (2016).

<sup>6</sup> The IMF refers to these two views of systemic risk as the "domino view" and the "tsunami view". See International Monetary Fund (2016a).

<sup>7</sup> For more on the debate on macroprudential instruments, see also European Systemic Risk Board (2015), especially Table 4 on p 28. For more on the structure of the global framework for insurers, such as the formulation of an international capital standard and further developments, see Federal Financial Supervisory Authority (2016b).

liquidity risk being given particular attention. The European Systemic Risk Board (ESRB), the body responsible for macroprudential oversight at the European level, likewise finds that insurers' liquidity needs to be monitored more closely.<sup>8</sup>

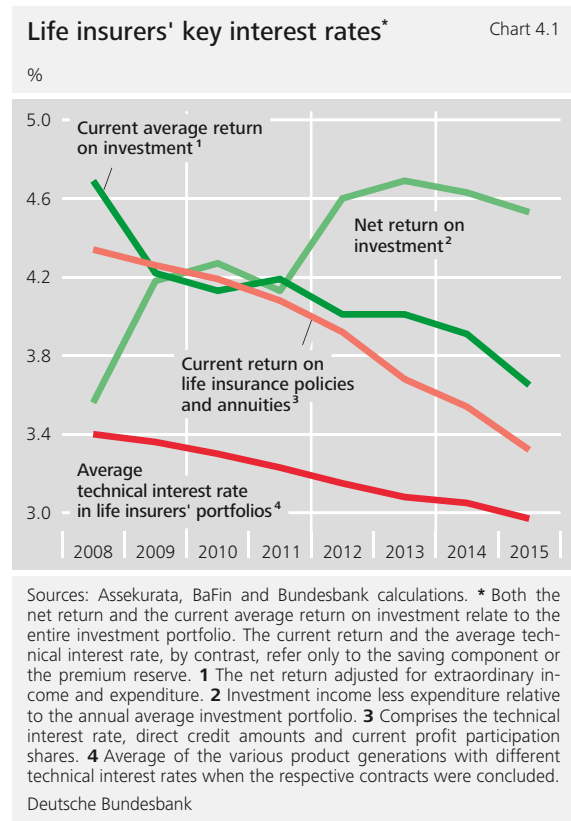
## ■ Interest rate risk and return on investment

The continuing decline in long-run interest rates is also having a lagged impact on German life insurers' current profit or loss and on their return on investment (see also the box entitled "German life insurers' return on investment strongly affected by the interest rate setting" on pages 52 and 53). Once older, high-yield assets mature, reinvestment is possible only at lower interest rates, which is why the average return on investment is likely to continue to trend downwards. The average current return on investment dropped in 2015 by 25 basis points to 3.65% (see Chart 4.1).<sup>9</sup>

The average technical interest rate in life insurers' portfolios, which serves as a measure of obligations to policyholders, continued its very slow annual percentage decline in 2015 to 2.97%.<sup>10</sup> For 2016, the life insurance industry has reduced the current nominal return on life and pension insurance policies to 3.11% on average.

### Asset reallocation

These interest rate developments may induce life insurers to search for yield and thereby take excessive risks in their investments.<sup>11</sup> A survey by the German Federal Financial Supervisory Authority (BaFin) of selected German insurance groups and large stand-alone undertakings, which covers the exposure of 43 life insurers to the 41 most important countries at notional value, sheds more light on insurers' in-



vestment behaviour.<sup>12</sup> Of the €692 billion in assets surveyed, which accounts for nearly 80% of the life insurance industry's total investments, an average of 54% was invested abroad by German life insurers in the fourth quarter of 2015.<sup>13</sup> This share is up by nine percentage points since the first quarter of 2013.

<sup>8</sup> See International Association of Insurance Supervisors (2016) and European Systemic Risk Board (2015) and (2016a). Options for the early termination of policies are one of the things the IAI is looking at. See also M Feodorina and T Förstemann (2015).

<sup>9</sup> For more information on the various return metrics used in insurance business, see Deutsche Bundesbank (2014b), p 53.

<sup>10</sup> This technical interest rate is the result of the insurance policies' originally agreed tariffs.

<sup>11</sup> See P Hieber, R Korn and M Scherer (2015) for a theoretical model of the relationship between higher guaranteed returns and the search for yield.

<sup>12</sup> The survey looks at investments held directly or indirectly in specialised funds. The advantage of evaluating the data based on notional values is that volume effects can be separated from temporary price effects.

<sup>13</sup> Since no data on total assets at notional values are available, all percentage shares listed below refer to the overall investment contained in the survey.

## German life insurers' return on investment strongly affected by the interest rate setting

In the past few years, German life insurance companies' return on investment – measured in terms of the current average return on investment – has been continuously sinking. Macroeconomic parameters which are capable of impacting on profitability include, in particular, the long-run real interest rate, the growth rate of real gross domestic product (GDP) and that of Germany's DAX stock index. These indicators reflect the macroeconomic environment in which German life insurers operate. Studies by the European Central Bank (ECB) and the European Insurance and Occupational Pensions Authority (EIOPA) have found the long-run interest rate to be the primary determinant of the return on investment.<sup>1</sup>

The profitability of German life insurers will be analysed below. This analysis will not only cover macroeconomic factors but also explore whether firm-specific variables can make any additional contribution to explaining the return on investment of the insurers under review. The firm-specific variables encompass the growth rate of premiums and the Solvency I coverage ratio.<sup>2</sup> In this manner, the impact of firms' growth and adequacy of own funds are studied. The panel dataset comprises observations of 72 life insurers over the period from 2005 to 2015.<sup>3</sup>

In the estimate below, the current average return on investment is the dependent variable. Owing to their business model, which is characterised by long-term policies with guaranteed returns, German life insurers' investment portfolios tend to be heavy on long-term fixed-coupon instruments. The current average return on investment

is therefore highly autocorrelated over time, which is why the model below, like the ECB and EIOPA analyses, uses the Arellano-Bond GMM estimator:<sup>4</sup>

$$y_{i,t} = \alpha + \rho y_{i,t-1} + x_{i,t}'\beta + z_{i,t}'\theta + c_i + \varepsilon_{i,t}$$

The current average return on investment is designated as  $y_{i,t}$  in the equation. The vector  $x_{i,t}$  contains the macroeconomic variables (growth rates of real GDP and the DAX and the long-run real interest rate<sup>5</sup>). The vector  $z_{i,t}$  comprises the firm-specific variables (growth rate of premiums and coverage ratio). The variables  $c_i$  and  $\varepsilon_{i,t}$  represent the firm-specific constant and the error term.<sup>6</sup>

<sup>1</sup> See European Central Bank, Financial Stability Review, November 2015, pp 83-90, and European Insurance and Occupational Pensions Authority, Financial Stability Report, May 2015.

<sup>2</sup> Premiums are defined as life insurers' gross premiums written. The Solvency I coverage ratio is the ratio of own funds to the regulatory own funds requirement. Over the observation period, the coverage ratio had to be greater than 100% to fulfil the regulatory own funds requirement.

<sup>3</sup> The dataset is composed of Bundesbank macroeconomic time series and the enterprise-specific variables used in the supervisory reports collected by the Federal Financial Supervisory Authority (BaFin).

<sup>4</sup> See M Arellano and S R Bond, Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, Review of Economic Studies, Vol 58 (2), No 194, pp 277-297, April 1991. The model was estimated in first differences.

<sup>5</sup> The real interest rate was calculated as the difference between the yield on Bunds with a residual maturity of ten years and annual coupon payments and the inflation rate (the Fisher equation).

<sup>6</sup> Dependent variables which are each lagged by one period and non-differenced are used as instruments. The validity of the instruments used could not be rejected at the 10% significance level by the Sargan test.

The adjacent table presents the results of the analysis.<sup>7</sup> Among the macroeconomic factors, the inflation rate and long-run real interest rate have the greatest economic impact on the return on investment.<sup>8</sup> It is found that a decrease in the long-run real interest rate by one percentage point causes German life insurers' current average return on investment to drop by around 0.11 percentage point. In addition, the growth rate of real GDP has a positive, statistically significant impact. Accordingly, a good economic situation, reflected in accelerated GDP growth, increases life insurers' earnings prospects. Equity market developments, however, do not have a statistically significant impact on the current average return on investment. This is probably partly due to the relatively small equities ratio of German life insurers. The enterprise-specific variables do not have any additional explanatory power, and their coefficients are not statistically significant. An alternative model which only includes statistically significant variables produces similar results.

On the whole, the results illustrate how dependent German life insurers' return on investment is on the level of interest rates and thus the risks created by the low-interest-rate environment.

### Determinants of German life insurers' return on investment

Arellano-Bond estimate for the observation period 2005 to 2015

Item	Estimation equation 1	Estimation equation 2
Current average return on investment (t-1)	0.6451*** (0.1387)	0.6671*** (0.1586)
Real interest rate	0.1060*** (0.0390)	0.1020** (0.0423)
Growth rate of real GDP	0.0151* (0.0081)	0.0148** (0.0058)
Inflation rate	0.1649*** (0.0486)	0.1657*** (0.0485)
Growth rate of the DAX	-0.0001 (0.0012)	.
Growth rate of gross premiums written	0.0005 (0.0013)	.
Coverage ratio	0.0009 (0.0016)	.
Number of observations	648	648
P-value of the Sargan test statistic	0.18	0.13
Number of instruments	35	17

Bundesbank calculations based on data provided by BaFin, Deutsche Börse AG and the Federal Statistical Office. \*\*\*, \*\*, \* = significant at the 1%, 5% and 10% level. Standard errors in parentheses.

Deutsche Bundesbank

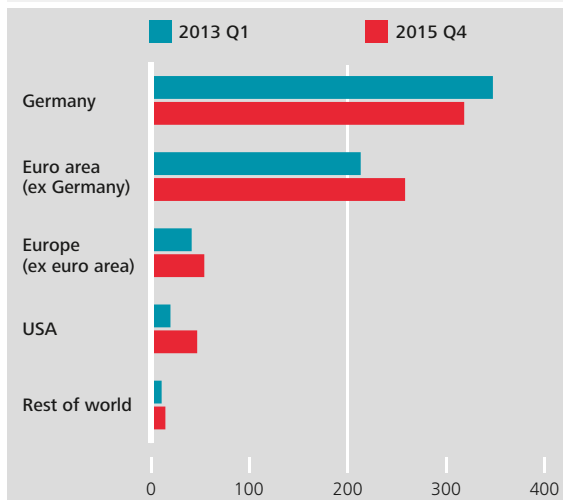
<sup>7</sup> Estimates using pooled OLS and fixed effects methods yield qualitatively comparable results.

<sup>8</sup> The statistical significance of a variable by itself does not provide evidence of its relevant effect. Decisive factors for assessing economic significance therefore include not only statistical significance but also the size of the coefficient of the relevant variable.

German life insurers' assets, by region\*

Chart 4.2

€ bn, notional values



Sources: BaFin and Bundesbank calculations. \* The BaFin assessment is based on a special survey of selected insurance groups and large companies which, at a sector level, encompasses the exposure of 43 life insurance companies to the 41 most important countries, thus covering nearly 80% of the life insurance sector's total assets. Includes investment held both directly and indirectly in specialised funds.

Deutsche Bundesbank

The diversification of the foreign portfolio across countries rose during this period.<sup>14</sup> At the same time, life insurers are increasingly pulling out of the German banking system and investing instead in foreign non-banks.

While these regional and sectoral reallocations are also intended to strengthen profitability, there is no evidence that life insurers have, on average, taken greater risks in doing so.<sup>15</sup> In fact, the bulk (64%) of the bond portfolio is still invested in AAA and AA bonds,<sup>16</sup> though systemic risks are not necessarily reflected in this rating-based perspective. The rating structure of assets improved slightly in 2015 relative to the preceding year. Life insurers have continued to increase the duration of high-quality investments, in particular.<sup>17</sup> They are thus adapting to Solvency II and earning maturity premiums.

Life insurers have been expanding their foreign investment, particularly in highly-rated euro-area countries and the United States (see Chart 4.2), while slightly reducing their exposure to Greece, Ireland, Italy and Portugal. Their investment in the United States has doubled, probably on account of the deeper markets and higher interest rates there. In the fourth quarter of 2015, US investments accounted for as much as 7% of the German life insurers' assets surveyed by BaFin.

Not only a geographical reallocation but also a sectoral shift in German life insurers' portfolios can be observed. Whereas exposures to banks (including Pfandbriefe) still accounted for 47% of the surveyed investments in the first quarter of 2013, by the fourth quarter of 2015 this figure had dropped to just 38%. This has led to a reduction in the (direct) interconnect- edness between the life insurance industry

*Not only a geographical reallocation but also a sectoral shift in German life insurers' portfolios can be observed.*

and the banking sector. It is largely domestic banks and the public Pfandbriefe they issue which have been affected by German life insurers' withdrawal from the banking sector. The likely drivers of this decline in investment are the reduction in the volume of outstanding public Pfandbriefe as well as the low yields. On the other hand, exposures to foreign banks have remained roughly unchanged. Traditionally, German life insurers' investment in foreign

<sup>14</sup> This is demonstrated by both the number of countries in the foreign portfolio and the Herfindahl-Hirschman index (HHI), a measure of concentration, which has declined since the first quarter of 2013. HHI, obtained by squaring each country's share of the foreign portfolio and summing up the resulting numbers, rises as the portfolio becomes more concentrated.

<sup>15</sup> Since the introduction of Solvency II, insurers have been required to hold own funds against risks on their investments. For that reason, too, insurers face a trade-off between the risks of and potential returns on their assets.

<sup>16</sup> See Assekurata (2016). Assekurata is a rating agency which is specialised in insurance companies.

<sup>17</sup> See Assekurata (2016). Duration reaches its peak in the sovereign portfolio, at 13.7.

banks has been predominantly in unsecured debt instruments which are likely to earn better returns but are also associated with higher risks because they might be converted to equity in a bank bail-in.<sup>18</sup>

The decline in exposure to German banks is being offset by an increase in exposure to foreign non-banks. Whereas in the fourth quarter of 2015 life insurers invested some 31% of the surveyed assets in the non-bank system, for reinsurers the figure is as much as roughly half.

German life insurers' exposure to sovereigns, meanwhile, is up only slightly. Around 95% of this exposure is to European sovereigns, which benefit from preferential regulatory treatment compared to private creditors in the Solvency II standard formula, since no own funds have to be held against spread and concentration risk. This can result in heightened vulnerability to macroeconomic risks.

### **Maturity transformation gives rise to interest rate risk**

The extent to which the low interest rates affect life insurers' resilience depends on the interest rate sensitivity of their assets and liabilities.

Most life insurance policies in Germany offer a fixed guaranteed nominal return over a very long maturity. 48% of the premium reserve is accounted for

*Most life insurance policies in Germany offer a fixed guaranteed nominal return over a very long maturity.*

by policies concluded 15 or more years ago. By offering such long maturities, insurers are catering for customers' demand for very long-term guaranteed returns that serve as old age pensions, which means that insurers are assuming households' interest rate risk. The maturities of their assets, by contrast, are often shorter, which means that life insurers are es-

entially engaging in maturity transformation. This contrasts with banks' practice of mostly issuing long-term loans and funding themselves through short-term deposits. Maturity transformation produces interest rate risk since, when interest rates fall, the present value of liabilities rises more quickly than that of assets. Insurers therefore, in some cases, use interest rate derivatives to hedge and transfer interest rate risk to counterparties. Initial assessments using trade repository data under the EU regulation on OTC derivatives, central counterparties and trade repositories (European Market Infrastructure Regulation, or EMIR) suggest that insurers are using interest rate derivatives to manage their interest rate risk.<sup>19</sup>

The duration gap, ie the difference in interest rate sensitivity between assets and liabilities, is a key metric for measuring interest rate risk. The wider the duration gap, the higher the risk in a period of falling interest rates. According to the European Insurance and Occupational Pensions Authority (EIOPA), German life insurers have, by international standards, the widest duration gap.<sup>20</sup> US or UK life insurers, for instance, usually have either a narrow duration gap or none whatsoever.<sup>21</sup>

One outcome of a wide duration gap is that, in a setting of falling interest rates, reinvestment returns might fall short of fixed annual return commitments. Risks to financial stability could arise, in particular, from an industry-wide duration gap if most or all insurers make similar adjustments to their asset portfolio in response to changes in the level of in-

<sup>18</sup> Whereas only 13% of exposure to domestic banks is attributable to unsecured claims, the figure for exposure to banks from large foreign countries stands at around 29%.

<sup>19</sup> See European Systemic Risk Board (2016b).

<sup>20</sup> See European Insurance and Occupational Pensions Authority (2014) and Moody's (2015), p 8.

<sup>21</sup> Although long-term guaranteed returns are equally prevalent in the United States and Germany, there are still differences in typical product features. The duration of German life insurers' liabilities is particularly long compared with other countries, including the United States. However, the duration of assets is similar in both countries. See International Monetary Fund (2015), p 58 and International Monetary Fund (2016a), p 17.



terest rates.<sup>22</sup> If interest rates fall, the objective of narrowing an existing duration gap can put additional downward pressure on long-term interest rates.<sup>23</sup> This would ultimately heighten the vulnerability of the system as a whole.

*Risks to financial stability could arise, in particular, if insurers make similar adjustments to their asset portfolio.*

An insurer's duration gap only partially captures interest rate risk, however. For one thing, insurance policies contain options, such as termination options, which, if exercised, change the duration. For another, variable-rate liabilities also exist. Insurers therefore have the means to adjust future profit participation shares downwards when interest rates fall.

### Using balance sheet data to measure the duration gap

The industry-wide duration gap for German life insurers can be measured using single-entity financial statements prepared under the Commercial Code (*Handelsgesetzbuch*), data on valuation reserves for their assets and, regarding the premium reserve, figures on the amount needed to safeguard the interests of continuing policyholders (*Sicherungsbedarf*).<sup>24</sup>

Liabilities and assets are mostly valued at the level of interest rates upon initial recognition. Valuation reserves on the asset side and hidden losses on the liability side are due largely to the fall in the interest rate level. This yields information on interest rate sensitivity and approximates the duration gap at the time of average initial recognition.

A calculation at the single-entity level for 80 German life insurers yields a mean duration gap of 6.0.<sup>25</sup> A wide dispersion in this measure implies considerable heterogeneity among German life insurers with

regard to maturity transformation and interest rate risk management. This indicates that, although German insurers are fundamentally exposed to the same interest rate risk, they differ widely in terms of their vulnerability.

### Substantial interest rate hike could have adverse impact

Whereas a wide duration gap implies long-run risks when interest rates fall, closing that gap could increase risk if interest rates were to rise substantially. This is because German law as it stands implicitly dictates that surrender values are pre-determined, ie independent of the market interest rate.

The longer the maturity of fixed-income assets, the more sensitive their fair values become to an increase in interest rates.

If interest rates were to rise above enterprise-specific critical levels, the fair value of investments would then drop to a level so low that the surrender values on aggregate would

*If interest rates rise above enterprise-specific critical levels, it is rational for policyholders to lapse their policies.*

<sup>22</sup> See International Monetary Fund (2016a), chapter 3.

<sup>23</sup> More long-dated bonds need to be added in order to narrow an existing duration gap. This can push down long-term interest rates, thereby causing an existing duration gap to expand. See D Domanski, H S Shin and V Sushko (2015).

<sup>24</sup> The amount needed to safeguard the interests of continuing policyholders approximates the hidden losses on the liability side. It is the difference between the premium reserve including the additional interest provision and the present value of an insurer's liabilities discounted for a 15-year period at the 10-year zero-coupon euro swap rate. It was introduced by the Life Insurance Reform Act.

<sup>25</sup> As an interest rate sensitivity metric, duration depends on the context. For a sample of nine large German life insurers, EIOPA has estimated a duration gap of 10.7. Their estimate is based on payment flows reported by the insurers, whereas the approach applied in this chapter is based on balance sheet data in line with the Commercial Code and fair value-oriented off-balance-sheet adjustments such as the amount needed to safeguard the interests of continuing policyholders and valuation reserves. The two approaches are therefore not comparable. See A Möhlmann (2016).



be underfunded. Looking beyond the benefits of having insurance cover against biometric risks, the loss of tax advantages and the cancellation fees, it would, in this case, be rational for policyholders to lapse their life insurance policies.<sup>26</sup>

Enterprise-specific critical interest rate levels have fallen from around 5.9% in 2007 to approximately 3.3% in 2015 as a median level for the larger German life insurance companies (see Chart 4.3).<sup>27</sup> Part of the reason for this decline is that life insurers have extended the maturity of their fixed-income assets, meaning that the fair values now respond more strongly to changes in interest rates. The Life Insurance Reform Act (*Lebensversicherungsreformgesetz*), which entered into force in August 2014 and reins in the outflow of funds from insurance companies and strengthens their buffers, has provided less relief by contrast.<sup>28</sup>

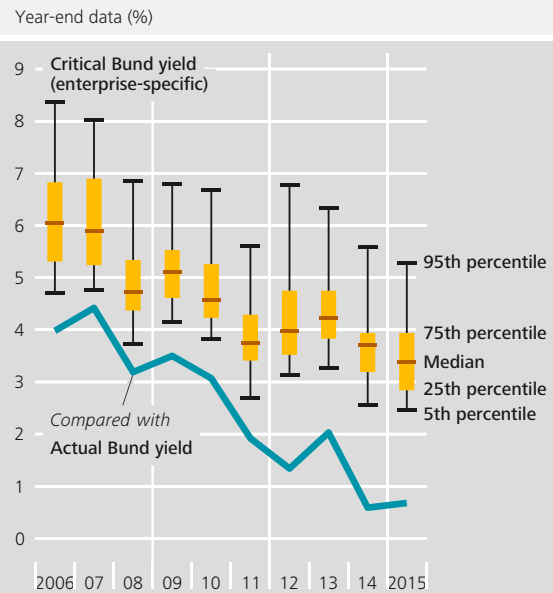
From a financial stability perspective, the continued persistence of the low-interest-rate environment is presently the main source of threat. However, this is no reason to lose sight of the threat of a significant increase in interest rates, especially since it could be mitigated if surrender values were sensitive to interest rates.<sup>29</sup>

## Macroprudential dimensions of Solvency II

The question of how well equipped life insurers are to deal with the challenges posed by the low-interest-rate environment depends on their resilience. Solvency II, a new risk-based and fair value-oriented microprudential framework, came into force at the beginning of this year. The new regime is designed

*Solvency II, a new risk-based and fair value-oriented microprudential framework, has come into force.*

**Critical interest rate level for life insurers given an upsurge in policy lapses\*** Chart 4.3



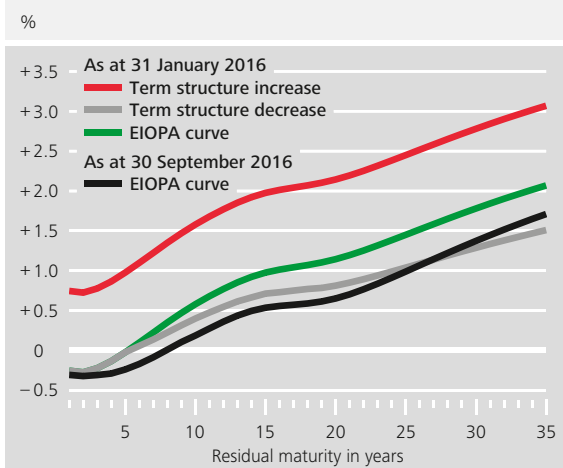
\* Yield on Bunds with a residual maturity of ten years, above which an upsurge in policy lapses would impair life insurers' stability. The analysis covered the approximately 60 largest German life insurance companies with a premium reserve of more than €1 billion each.  
 Deutsche Bundesbank

to boost insurers' solvency, preserve the industry's resilience and thus contribute to financial stability overall. The Solvency I coverage ratio has now been superseded by the solvency capital requirement (SCR) and the Solvency II ratio. The SCR should at least be high enough to prevent an insolvency from occurring more often than once every 200 years.<sup>30</sup>

The first step in calculating the SCR is for the insurer to calculate the basic own funds. The second step is

<sup>26</sup> For more details, see M Feodorina and T Förstemann (2015) and Deutsche Bundesbank (2015b), p 52.  
<sup>27</sup> Between 1972 and 2016, the highest year-on-year increase in the yield on Bunds with a residual maturity of ten years was 2.6 percentage points. Over a two-year period, the largest figure was 3.75 percentage points.  
<sup>28</sup> For more on the relief provided by this Act, see Deutsche Bundesbank (2015b), pp 46-47.  
<sup>29</sup> For more details, see Deutsche Bundesbank (2015b), pp 51-53.  
<sup>30</sup> This corresponds to a one-year probability of default and a value at risk (VaR) of 0.5%. For more on the extent to which Solvency II can be regarded as a calibration of a 1-in-200-years event, see A Braun, H Schmeiser and F Schreiber (2015).

**Term structure curves in the interest rate risk module of the Solvency II standard formula\*** Chart 4.4



Source: EIOPA. \* Solvency II permits the use of a standard formula for calculating the solvency capital requirement (SCR). This is done by calculating own funds as the difference between the present value of assets and that of the technical provisions, discounted using the interest rates of the EIOPA term structure curve (for Germany, without volatility adjustment). In order to capture risks, the own funds are then given in a stress event (increase/decrease in the term structure) with the aid of the term structures shown, pursuant to Articles 166 and 167 of Commission Delegated Regulation (EU) 2015/35.

Deutsche Bundesbank

to give the own funds under stressed conditions. The resulting arithmetic own funds shortfall corresponds to the SCR. The ratio of own funds to the SCR is the SolvencyII ratio, which should never fall below 1 or 100%. The own funds requirements should, therefore, at the very least be high enough to just about offset the arithmetic own funds shortfall. SolvencyII thus delivers information on solvency not only at projected interest rates or fair values, but also at interest rates or fair values in stressed scenarios.

In the standard formula, risks are modelled with the aid of a modular approach. In a first step, SCRs are calculated for each individual module. The market risk module contains six sub-modules: for interest rate risk, equity risk, property risk, spread risk, concentration risk and currency risk. These are then aggregated; a correlation matrix takes into account inter-risk diversification effects.<sup>31</sup> From a macroprudential perspective, interest rate risk is of particular

interest. It is particularly relevant to German life insurers and is determined to a great degree by the duration gap. A large number of life insurance undertakings are jointly exposed to this macroeconomic risk.

Certain increases and decreases in the EIOPA term structure need to be taken into account in the interest rate risk module.<sup>32</sup> The larger of the resulting changes in own funds then yields the SCR for this module. However, if the interest rate is already zero or lower, no further adjustments are made in the EIOPA scenario simulating a fall in the term structure of interest rates, and the original interest rate from the EIOPA term structure is used (see Chart 4.4).

Thus, for January 2016, the EIOPA term structure (green curve) shows negative interest rates for residual maturities of one to five years. This means that no further adjustments are needed for this maturity segment in the standard formula's "decrease in the term structure of interest rates" scenario (grey curve). For these maturity segments, then, interest rates are the same as those in the EIOPA term structure. The current situation of ever-lower and negative interest rates (black curve) for residual maturities of up to eight years was not covered by the stressed scenario of the SolvencyII standard formula as at January 2016.

*The current situation of ever-lower and negative interest rates was not covered by the SolvencyII standard formula.*

<sup>31</sup> See Article 164 of Commission Delegated Regulation (EU) 2015/35.

<sup>32</sup> EIOPA publishes the basic risk-free interest rate term structure, along with term structures for a scenario of rising interest rates and one of falling interest rates, on its website (<https://eiopa.europa.eu/regulation-supervision/insurance/solvency-ii-technical-information/risk-free-interest-rate-term-structures>). Companies can use these term structures and scenarios from the standard formula. Alternatively, they can also apply their own internal models, though these must be approved by supervisors.

## Correlations in the market risk module

The use of a correlation matrix in the market risk module is based on the fundamental idea that not all individual risks will materialise simultaneously, meaning that, in a diversified portfolio, risks can be balanced to a degree. The correlation coefficients used are chosen such that, even in phases of stress, the correlation between the individual types of asset is not underestimated. In periods of stress, correlations are typically higher than in periods of calm.<sup>33</sup> A correlation matrix which fails to take this fact into account could therefore underestimate the capital requirements from a macroprudential point of view. In an extreme case, firms using the standard formula could have a shortage of own funds in a period of stress. Therefore, EIOPA's correlation matrix took particular account of marginal distributions and, in some cases, used samples that were confined to crisis periods.<sup>34</sup> EIOPA mainly used data for the United Kingdom to calibrate the matrix.<sup>35</sup>

The Bundesbank has calculated an alternative correlation matrix based on indices for the European and German markets.<sup>36</sup> On the whole, the correlation matrix used in the standard formula appears to be relatively robust even when using an alternative data set. What the alternative calibration also shows, though, is that, especially for currency risk, relatively low correlation coefficients were set. A diversified foreign currency portfolio can be less correlated with other asset classes than individual currencies.<sup>37</sup> This might explain the lower correlation coefficients in the standard formula.

*Insurers should review the adequacy of the correlation matrix for their specific portfolio.*

Despite the Solvency II standard formula's relatively robust correlation matrix, insurers which use the standard formula should also regularly review the adequacy of the correlation

matrix for their specific portfolio, eg as part of their own risk and solvency assessment (ORSA).

## Risks surrounding long-term liabilities

In principle, the Solvency II capital requirements are based on a market-consistent valuation of liabilities. Individual elements of Solvency II, however, deviate from full fair value orientation. In some cases, they cushion the impact of interest rate fluctuations on the Solvency II ratio and shift the full effect of persistently low interest rates to a future point in time. One key element here is the ultimate forward rate (UFR).<sup>38</sup>

Solvency II requires future liabilities to be discounted to a present value at market rates (risk-free interest rate term structure). However, for liabilities with a maturity of over 20 years, Solvency II stipulates the use of discount rates calculated on the basis of the UFR.<sup>39</sup> This is due to the perception that market rates in long maturity segments are not being gauged with sufficient accuracy on account of a lack of market depth, or that they are, in some cases, simply not available.

<sup>33</sup> See M Loretan and W B English (2000).

<sup>34</sup> See Committee of European Insurance and Occupational Pensions Supervisors (2010c).

<sup>35</sup> See Committee of European Insurance and Occupational Pensions Supervisors (2010a) and (2010b).

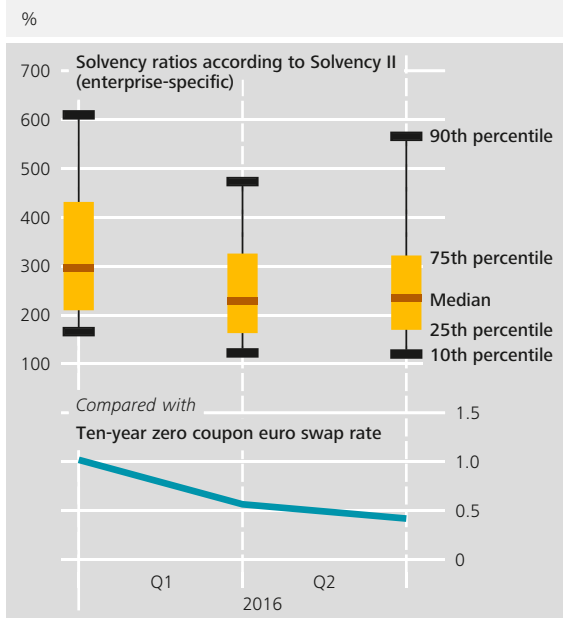
<sup>36</sup> Pairwise rolling correlations for the annual rates of change of the indices under review are calculated in order to compute the coefficients. For each category, the value for the 95th percentile of the calculated correlation coefficients is used to create the correlation matrix. The concentration category is omitted here as it is not an asset class. For this category, the values of the correlation matrix of the Solvency II standard formula are maintained.

<sup>37</sup> See CRO Forum (2009).

<sup>38</sup> Other elements include the transitional measures relating to technical provisions and the unlimited measures relating to the long-term guarantee assessment (volatility adjustment, matching adjustment).

<sup>39</sup> The UFR itself is not a discount rate. For the resulting term structure, see Chart 4.4. For more details on how it is calculated, see European Insurance and Occupational Pensions Authority (2016b).

**Solvency ratios of German life insurers according to Solvency II\*** Chart 4.5



Sources: BaFin and Bundesbank calculations. \* The chart shows the solvency ratios of the 72 life insurance companies for which quarterly reports are available. The first report was published on 1 January 2016.  
 Deutsche Bundesbank

The UFR in Solvency II can be conceptualised as the sum of the expected real interest rate and the expected inflation rate. It is currently set at 4.2% (given an expected real interest rate of 2.2% and an expected inflation rate of 2%). Expected real interest rates are ideally predicated on the future outlook, elements of which include saving and investment as well as demographic change. By contrast, EIOPA approximates the expected real interest rate using historical averages.

Owing to these uncertainties, the UFR should be reviewed at regular intervals. This year, given the decline in expected long-term real interest rates, EIOPA has proposed reducing the UFR to 3.7%.<sup>40</sup> Taken in isolation, this would cause some individual insurers' Solvency II ratios to fall perceptibly.

An UFR that is set too high gives insurers potentially unsustainable capital relief. Market participants are

unlikely to apply the UFR when internally valuing long-term liabilities, for instance when they transfer their insurance portfolios.<sup>41</sup>

EIOPA held a public consultation to discuss reducing the UFR.<sup>42</sup> The discussion is still ongoing, which is why a decision is pending. Within the framework of the EIOPA methodology, it appears logical to lower the UFR to 3.7%; an incremental reduction would be a good way to achieve this objective. For the sake of transparency, it would be advisable to disclose the UFR sensitivity of the Solvency II ratios.

*Within the framework of the EIOPA methodology, it appears logical to lower the UFR to 3.7%.*

### Initial Solvency II reports showing sufficient Solvency II ratio

At the beginning of 2016, the Solvency II ratio of German life insurers stood at an aggregated 286%, well above 100%. Ratios vary noticeably from one insurer to the next (see Chart 4.5). All insurers met the capital requirements.

*The drop in interest rates is the main reason for the decline in the Solvency II ratio.*

For the first quarter of 2016, the aggregate ratio fell to 210% before holding steady in the second quarter of 2016.<sup>43</sup> Three

<sup>40</sup> See European Insurance and Occupational Pensions Authority (2016b). The EIOPA consultation takes several different options into consideration in order to spread out the impact of a reduction in the UFR over several years. For more on the deliberations about more realistic discount rates, see also De Nederlandsche Bank (2016).

<sup>41</sup> See European Systemic Risk Board (2015).

<sup>42</sup> More information can be obtained from EIOPA's website at <https://eiopa.europa.eu/Pages/Consultations/EIOPA-CP-16-003-Consultation-Paper-on-the-methodology-to-derive-the-UFR-and-its-implementation-.aspx>

<sup>43</sup> Data for 86 life insurance companies are available for the beginning of 2016. Owing to exemptions, however, only 72 life insurers report quarterly data.

insurers failed to meet the capital requirements in the first quarter, followed by two insurers in the second.<sup>44</sup> The drop in interest rates since the beginning of the year is the main reason for the decline in the Solvency II ratio. On the whole, market risk made the strongest contribution to capital requirements (78% of the basic capital requirement).<sup>45</sup> The lion's share of this is attributable to interest rate risk.

What this initial stocktake since the entry into force of the new supervisory regime already makes clear is that Solvency II ratios are highly susceptible to fluctuation, for instance if interest rates and other capital market indicators are volatile. Calculating Solvency II ratios at quarterly cut-off dates also amplifies these fluctuations.

In order to ease their transition to a market-consistent valuation, insurers, upon application, are permitted to apply transitional measures for 16 years that will be phased out gradually.<sup>46</sup> These are a viable component of Solvency II that will help smooth any turmoil caused by an abrupt transition to market-consistent valuation.

Indeed, over 70% of German life insurers are applying these transitional measures. And it is precisely those insurers that would otherwise have a low Solvency II ratio which are using this instrument as, according to BaFin data, in the first quarter of 2016, 26 insurers had to make use of such transitionals in order to report sufficient own funds.<sup>47</sup> Without any transitionals, at the end of the first quarter of 2016 these insurers would have had a capital shortfall of €12.3 billion, or just under 13% of all life insurers' own funds (following a figure of €3.5 billion among 16 life insurers at the end of 2015, or just over 3% of own funds).

Starting in May 2017, all insurers will be required to publish an annual solvency and financial condition report (SFCR). The light this disclosure will shed on the use of transitionals can be expected to put insur-

ers under pressure to comply with the requirements at an early stage. Solvency metrics (especially the SCR) are difficult to compare across Europe. Differences in the approval and application of transitional measures are a major reason for this. Market observers, then, are likely to place more stock in the strict version of the solvency metrics, which disregards transitional measures, and less in those which factor in transitional measures. There are other factors which make the measures difficult to compare. For instance, some companies apply an internal model instead of the standard formula or make use of either volatility or matching adjustments.

*Solvency metrics are difficult to compare.*

### IMF has investigated German life insurers' resilience

As part of this year's financial sector assessment program (FSAP) for Germany, the IMF subjected life insurers to a simplified top-down stress test.<sup>48</sup> For 75 firms, it investigated the impact of adverse developments in the capital markets, which tends to imply higher stress than the standard formula, on the key Solvency II metric.<sup>49</sup> The IMF assumed a combination of lower risk-free interest rates, with a particularly severe impact on technical provisions, and a decline in risky assets' fair values.

<sup>44</sup> These insurers have the option of extending the deadline until the end of 2017 pursuant to section 348 of the Insurance Supervision Act (Versicherungsaufsichtsgesetz); only as from 2018 are these institutions obligated to meet the capital requirements. To do so, they have to take suitable measures to either raise eligible own funds or reduce the risk profile.

<sup>45</sup> The basic capital requirement is the capital requirement aggregated across risk categories.

<sup>46</sup> For a detailed description of and background to the transitional measures, see Federal Financial Supervisory Authority (2016a).

<sup>47</sup> See Federal Financial Supervisory Authority (2016c).

<sup>48</sup> See International Monetary Fund (2016b), pp 30-40.

<sup>49</sup> Measured in terms of technical provisions, the companies analysed by the FSAP accounted for around 93% of the market.

If the Solvency II transitional measures are applied, a majority of German life insurers (62 companies) are able to meet the solvency requirements in the underlying stress scenario. Without transitional measures, by contrast, 34 companies would already have an own funds shortfall in the baseline scenario, climbing to 58 companies in the stress scenario. The own funds shortfalls at the affected companies would create a capital shortfall of around €12 billion in the baseline scenario and €39 billion in the stress scenario. This would correspond to 7% and 23%, respectively, of the own funds of the life insurers under review.

The results in the baseline scenario without transitional measures illustrate the challenges which the persistent low-interest-rate environment has been presenting to German life insurers. The outcome of the IMF stress test is largely consistent with earlier Bundesbank studies that looked at the resilience of German life insurers.<sup>50</sup>

### Departure from fixed guaranteed returns

Lawmakers, supervisors and insurers themselves are responding to the challenges exposed by these findings. Reducing the maximum technical interest rate to 0.9% (from 1.25%) with effect from 1 January 2017 is a logical step, even though the relief this move will afford to companies will only be slow to arrive. The Life Insurance Reform Act, which entered into force in 2014, has also strengthened firms' resilience, although the measures have failed to entirely offset the impact of the renewed fall in interest rates.

To a certain extent, life insurers are moving away from products that pay guaranteed returns over the lifetime of the policy. Several undertakings have discontinued their traditional

*Life insurers are moving away from products that pay guaranteed returns over the lifetime of the policy.*

line of business, while others have stopped taking in new business altogether and are in run-off. The elimination of distribution costs could be one of the potential benefits of these moves. Another possible impact could be market consolidation. Capital increases and a reduction in profit participation shares are also among the measures taken to improve life insurers' resilience.

## Funded pension provision facing challenges and potential reforms

The persistent low-interest-rate environment is posing a challenge to funded pension plans wherever there is an implicit or explicit promise of a nominal return and, at the same time, a duration gap has been built up. This is affecting funded pension plans in all three pillars of pension provision in Germany (see Chart 4.6).<sup>51</sup>

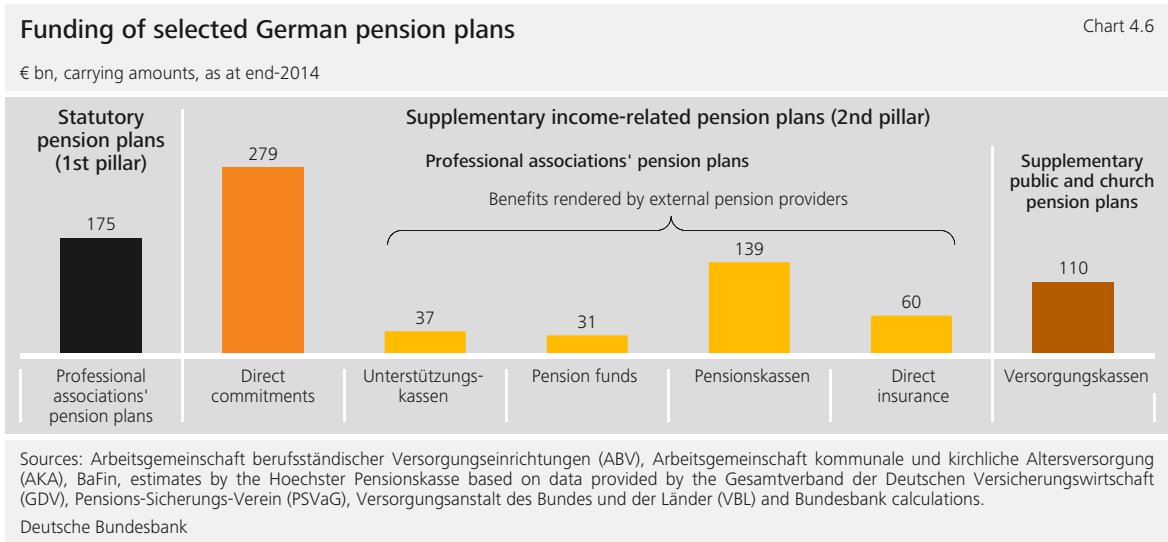
*The persistent low-interest-rate environment is affecting funded pension plans in all three pillars of pension provision in Germany.*

Professional associations' pension plans, which belong to the category of statutory pension plans (first pillar), are among the funded systems. As at the end of 2014, professional associations' pension plans included nearly one million eligible members and held some €175 billion in assets, which equates to about 3.4% of German households' financial assets. Members usually have no entitlements under the statutory (public) pension insurance scheme, which means that their old-age income probably depends relative-

<sup>50</sup> See Deutsche Bundesbank (2015b), pp 47-51.

<sup>51</sup> Pensions in Germany rest on a system of three pillars: statutory pension plans (the first pillar), supplementary income-related pension plans (the second pillar) and private pension plans (the third pillar), the lattermost pillar being covered by, for instance, life insurers.





ly heavily on the professional associations' pension plans.

As at the end of 2014, occupational pension plans and supplementary public and church pension plans had some €656 billion in funds, which equates to nearly 13% of German households' financial assets. Their only function, as income-related pension insurance (second pillar), is to supplement statutory pension insurance. This curbs the potential impact on persons with vested pension entitlements in the theoretical event of cuts in benefits. In addition, vested pension entitlements are protected by means of a multi-level system. For instance, an employer's secondary liability under the Occupational Pensions Act (*Betriebsrentengesetz*) means that it is liable if an institution for occupational retirement provision (IORP) is unable to render the promised benefits in full unaided.<sup>52</sup>

In future, employers might be held increasingly accountable for delivering on promised occupational pension benefits.<sup>53</sup> An EU-wide stress test conducted by EIOPA in 2015

***Employers might be held increasingly accountable for promised occupational pension benefits.***

found that, given market-consistent valuation, only 85% of promised benefits could be covered by the surveyed German IORPs' own assets, even in the baseline scenario. This gap widens in the stress scenarios, as one would expect.<sup>54</sup>

The occupational pension system can act as a potential transmission channel for capital market risks to the corporate sector in this regard. From there, these risks could then spill over further to corporate investors, such as banks. Investors thus need to have access to the right information in order to correctly understand and price these risks. It is therefore important for risks from occupational pension insurance to be fully and transparently reflected in management accounting.

The same holds true for direct commitments, which have traditionally been significant in Germany. Under direct commitments, companies set aside pension provisions, so that, at a later point in time, they can render the promised employee retirement ben-

<sup>52</sup> For an explanation of the occupational pension system, see J Clemens and T Förstemann (2015).

<sup>53</sup> See Financial Stability Committee (2016), p 24.

<sup>54</sup> See European Insurance and Occupational Pensions Authority (2016a).



efits themselves. Employee retirement benefits are protected from corporate insolvency by the Pension Guarantee Association (*Pensions-Sicherungs-Verein*). Whereas pension provisions accounted for according to the International Financial Reporting Standards (IFRS) are already carried at the higher fair value of pension obligations in the low-interest-rate environment, those of German non-financials reported under the Commercial Code showed hidden losses of between roughly €56 billion and €72 billion at the end of 2015.<sup>55</sup> That corresponds to around 29% to 37% of profit or loss after tax.<sup>56</sup> Owing to a change in German law, it will take even longer for provisions calculated according to Commercial Code accounting standards to gravitate towards market interest rates, which could potentially impair the informative value of annual financial statements. However, possible risks to financial stability are averted by a moratorium on dividend payments.

Politically, the occupational pension insurance system, primarily the concept of employer liability, is continuing to be called into question.<sup>57</sup> One particular topic of discussion is the idea of exempting employers from liability risk, at least going forward, through defined contribution or defined ambition

*The employer liability system is being called into question.*

pension schemes. Employers play a major role in the occupational pension insurance system due to their influence on investment policy. If employers were no longer liable for the investment success, this would probably give them less of an incentive to ensure a low-risk investment strategy. However, from the perspective of financial stability, relieving employers of liability does, in and of itself, have its benefits as it would curtail the potential spillover of capital market risks to the corporate sector.

## ■ List of references

Assekurata (2016), Marktausblick zur Lebensversicherung 2016/17, June 2016.

Braun, A, H Schmeiser and F Schreiber (2015), SolvencyII's market risk standard formula: how credible is the proclaimed ruin probability? *Journal of Insurance Issues*, Vol 38, No 1, pages 1 to 30, spring 2015.

Clemens, J and T Förstemann (2015), Das System der betrieblichen Altersversorgung in Deutschland, *Wirtschaftsdienst*, Vol 95, No 9, pages 627 to 635, September 2015.

Committee of European Insurance and Occupational Pensions Supervisors (2010a), CEIOPS' advice for Level 2 implementing measures on SolvencyII: SCR standard formula Article 111b calibration of market risk module, January 2010.

Committee of European Insurance and Occupational Pensions Supervisors (2010b), CEIOPS' advice for Level 2 implementing measures on SolvencyII: SCR standard formula Article 111(d) correlations, January 2010.

Committee of European Insurance and Occupational Pensions Supervisors (2010c), QIS5 calibration paper, April 2010.

CRO Forum (2009), Calibration recommendation for the correlations in the SolvencyII standard formula, December 2009.

---

<sup>55</sup> See Financial Stability Committee (2016), p 43 and Deutsche Bundesbank (2015a).

<sup>56</sup> See Deutsche Bundesbank (2015c).

<sup>57</sup> See P Hanau and M Arteaga (2016) and Federal Ministry of Labour and Social Affairs and Federal Ministry of Finance (2016).

De Nederlandsche Bank (2016), DNB committed to adoption of more realistic UFR for insurers, DNBulletin, May 2016.

Deutsche Bundesbank (2014a), Analyses of the importance of the insurance industry for financial stability, Monthly Report, July 2014.

Deutsche Bundesbank (2014b), Financial Stability Review, November 2014.

Deutsche Bundesbank (2015a), Statement by the Deutsche Bundesbank of 18 August 2015 on the Bundestag's decision regarding the German Commercial Code's discount rate for pension provisions (BT Drucksache 18/5256), August 2015.

Deutsche Bundesbank (2015b), Financial Stability Review, November 2015.

Deutsche Bundesbank (2015c), German enterprises' profitability and financing in 2014, Monthly Report, December 2015.

Domanski, D, H S Shin and V Sushko (2015), The hunt for duration: not waving but drowning?, BIS Working Papers No 519, October 2015.

European Insurance and Occupational Pensions Authority (2014), Insurance stress test, November 2014.

European Insurance and Occupational Pensions Authority (2016a), IORPs stress test report 2015, January 2016.

European Insurance and Occupational Pensions Authority (2016b), Consultation paper on the methodology to derive the UFR and its implementation, April 2016.

European Systemic Risk Board (2015), Report on systemic risks in the EU insurance sector, December 2015.

European Systemic Risk Board (2016a), Macroprudential policy beyond banking: an ESRB strategy paper, July 2016.

European Systemic Risk Board (2016b), Shedding light on dark markets: first insights from the new EU-wide OTC derivatives dataset, ESRB Occasional Paper No 11/2016, September 2016.

Federal Financial Supervisory Authority (2016a), Solvency II-Übergangsmaßnahmen zur Rückstellungsbewertung: Eine erste Bestandsaufnahme, BaFin-Journal, March 2016.

Federal Financial Supervisory Authority (2016b), Annual Report 2015, May 2016.

Federal Financial Supervisory Authority (2016c), Erste Erkenntnisse aus den Sparten unter Solvency II, August 2016.

Federal Ministry of Labour and Social Affairs and Federal Ministry of Finance (2016), Entwurf eines Gesetzes zur Stärkung der betrieblichen Altersversorgung und zur Änderung anderer Gesetze (Betriebsrentenstärkungsgesetz), November 2016.

Feodoria M and T Förstemann (2015), Lethal lapses – how a positive interest rate shock might stress German life insurers, Deutsche Bundesbank Discussion Paper No 12/2015, June 2015.

Financial Stability Committee (2016), Dritter Bericht an den Deutschen Bundestag zur Finanzstabilität in Deutschland, June 2016.

Hanau, P and M Arteaga (2016), Rechtsgutachten zu dem "Sozialpartnermodell Betriebsrente" des Bundesministeriums für Arbeit und Soziales, March 2016.

Hartley, D, A Paulson and R J Rosen (2016), Measuring interest rate risk in the life insurance sector: the U.S. and the U.K., Federal Reserve Bank of Chicago Working Paper 2016-02, January 2016.

Hieber, P, R Korn and M Scherer (2015), Analyzing the effect of low interest rates on the surplus participation of life insurance policies with different annual interest rate guarantees, European Actuarial Journal, Vol 5, No 1, July 2015.

International Association of Insurance Supervisors (2016), Systemic risk from insurance product features (previously referred to as non-traditional non-insurance activities and products), June 2016.

International Monetary Fund (2015), Financial Sector Assessment Program United States – Stress testing (Technical Note), June 2015.

International Monetary Fund (2016a), Global Financial Stability Report, April 2016.

International Monetary Fund (2016b), Financial Sector Assessment Program Germany – Stress testing the banking and insurance sectors (Technical Note), June 2016.

Loretan, M and W B English (2000), Evaluating correlation breakdowns during periods of market volatility, Board of Governors of the Federal Reserve System International Finance Discussion Papers No 658, February 2000.

Möhlmann, A (2016), Interest rate risk of life insurers – evidence from accounting data, Deutsche Bundesbank, mimeo.

Moody's (2015), Low interest rates are credit negative for insurers globally, but risks vary by country, Global Insurance Themes, March 2015.

# Technology-enabled financial innovations: a source of opportunities and risks

*Technology-enabled financial innovations (fintechs) represent a segment of the financial system that is gaining significance in Germany on account of its rapid growth. This is projected to intensify competition in some parts of the financial system. Gauging how fintechs might impact on the structure of the financial system from today's perspective is highly challenging, given the early stage of innovation, the insufficient data pool and the endogenous response to the changing environment on the part of established financial intermediaries. From a macroprudential angle, monitoring fintechs early on would appear to be conducive to identifying potential changes in incentive patterns, shifts in risk and contagion risk before fintechs grow to systemically important dimensions. A set of criteria also needs to be drawn up should it be necessary to move the existing regulatory framework forward in a way that gives due consideration to both the opportunities and risks associated with fintechs.*

## Fintechs – an innovative element in the financial system

The digitalisation trend is having an impact on the financial sector, partly due to the emergence of technology-enabled financial innovations,<sup>1</sup> which have the potential to transform the way in which core functions of the financial system are performed.

*Technology-enabled financial innovations have the potential to transform the way in which core functions of the financial system are performed.*

### A dynamic addition to the financial sector

There is no generally agreed definition of fintech.<sup>2</sup> A portmanteau of the terms “financial services” and “technology”, fintech is used to describe technology-enabled financial innovations that bring forth new financial instruments, services or intermediaries. Fintech products can be consumer (business to consumer: B2C) or business (business to business: B2B) solutions, back-office applications or different ways of performing core functions of traditional financial intermediaries (such as lending, payments or asset management).

In the narrower sense of the term, fintech is often used to describe the businesses providing such technology-enabled financial innovations. These players carve out, automate and rearrange parts of the value-added chain of traditional financial intermediaries. The fintech segment is home to numerous start-ups. But there are also established technology firms (“big techs”) or telecommunications businesses, not to mention the traditional financial intermediaries themselves, which provide digital financial services. In the broader sense, fintech can also cover the technologies (such as distributed ledger technology<sup>3</sup>)

that facilitate innovative financial services<sup>4</sup> or their provision.

In the absence of a uniform definition and with innovation advancing at a fast pace, a distinct taxonomy of technology-enabled financial innovations is difficult to compile. This problem is often resolved by assigning innovations to the economic function they serve.<sup>5</sup>

A straightforward taxonomy can be used, then, to assign selected innovations to their main fields of application within the financial sector (see Chart 5.1).<sup>6</sup> Individual innovations can well be used in more than one field of application. Financial innovations in the payments space that have attracted a great deal of attention include smartphone payment apps in both the consumer-to-business (C2B) and peer-to-peer (P2P) fields, payment initiation services in e-commerce and virtual currencies (mainly bitcoin). With regard to securities settlement, meanwhile, efforts are currently focused on harnessing distributed ledger technology to optimise post-trading operations. Cloud computing or big data applications can be used to support the provision of financial services. In addition, major innovations in the area of open

<sup>1</sup> Financial innovation is the term used to describe the process of creating and diffusing new financial products, services, processes, technologies, markets and institutions in the financial sector. See D T Philippas and C Siriopoulos (2012), J Lerner and P Tufano (2011) and P Tufano (2003).

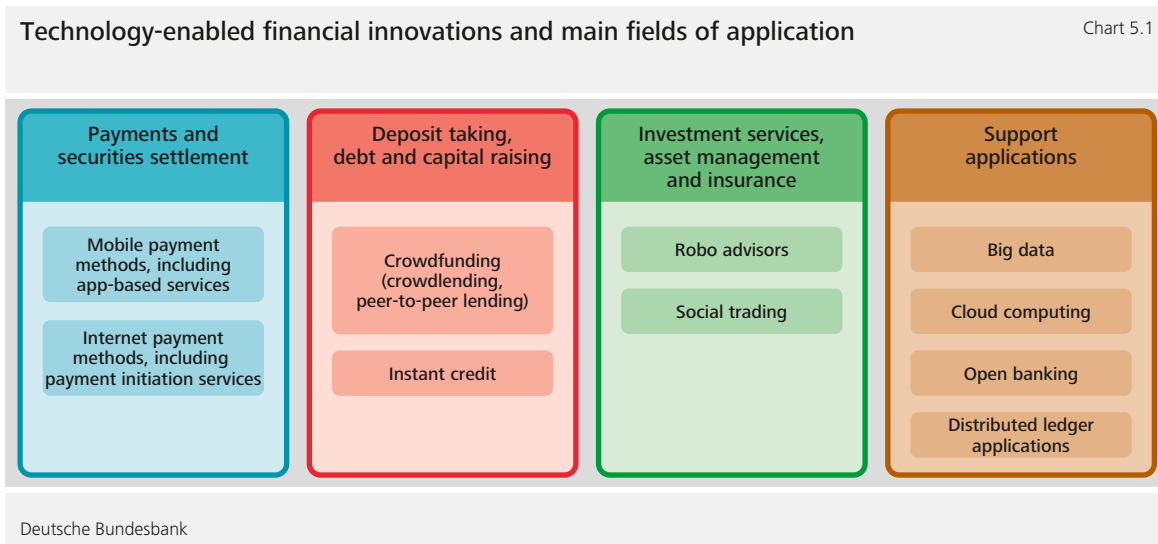
<sup>2</sup> See also [https://www.bafin.de/EN/Aufsicht/FinTech/fintech\\_artikel\\_en.html](https://www.bafin.de/EN/Aufsicht/FinTech/fintech_artikel_en.html)

<sup>3</sup> 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. An example of this is the blockchain technology used for digital currencies, amongst others.

<sup>4</sup> The term “financial services” is broadly defined here and is unrelated to the definition set out in section 1 (1a) of the Banking Act.

<sup>5</sup> See D T Philippas and C Siriopoulos (2012), J Lerner and P Tufano (2011), P Tufano (2003), R C Merton (1995), R C Merton (1992) and D B Crane, K A Froot, S P Mason, A Perold, R C Merton, Z Bodie, E R Sirri and P Tufano (1995), pp 3 ff.

<sup>6</sup> Besides the literature cited in the previous footnote, see also World Economic Forum (2015).



banking are forging a link between bank services and platform-based services.<sup>7</sup>

### Supply and demand factors driving fintech growth

The emergence and diffusion of technology-enabled financial innovations are being driven, on the one hand, by supply-side factors that spur the development of innovative financial services and, on the other, by demand-side developments that encourage market participants to adopt those innovations.

One of the foremost supply-side factors is the greater availability of new communication technologies that allow people to connect with each other whenever and wherever they want. These new technologies make it easier for users to access the information they need to make decisions, besides driving down costs and shortening response times. On the demand side, meanwhile, users familiar with new communication technologies have come to expect digital financial services to offer the same benefits (in terms of mobility, flexibility, speed, suitability and usability etc) as the other digital services they already use.

## Fintechs and their implications for financial system stability

The fintech segment is still in its infancy. Market estimates suggest that it is growing very briskly indeed, albeit from a very low base. Up until now, that has prevented the segment from having a material impact on the financial system.

*The fintech segment is still in its infancy.*

### Though small, fintechs need macroprudential oversight

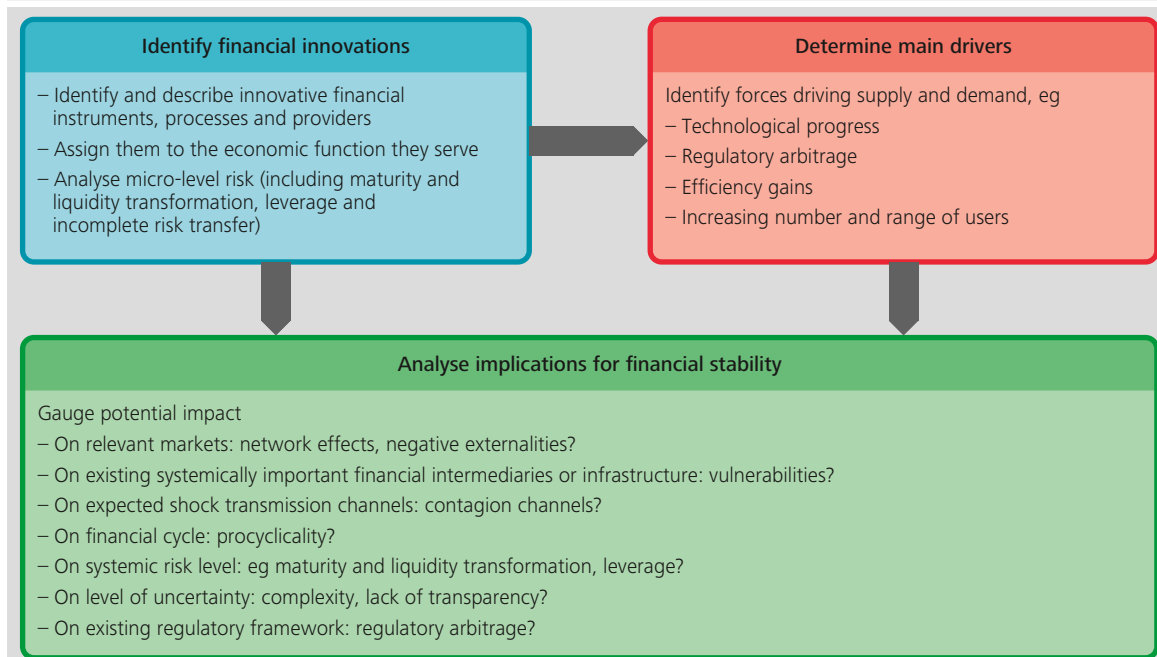
That notwithstanding, it would appear wise to extend the coverage of macroprudential oversight to include the fintech segment early on (see Chart 5.2). Surveillance should focus on incentive problems such as information asymmetries or principal-agent problems, possible externalities, shifts in risk and the transformation of potential contagion channels.<sup>8</sup> Technology-enabled financial innovations in the ar-

<sup>7</sup> This link is being forged inter alia via application programming interfaces (APIs) and software as a service (SaaS) models.

<sup>8</sup> See N Gennaioli, A Shleifer and R Vishny (2012).

## Monitoring financial innovations

Chart 5.2



Deutsche Bundesbank

eas of credit intermediation and asset management, to name but two areas, have experienced strong growth, so they play an important role in this regard. This covers capital-raising platforms (crowdfunding),<sup>9</sup> notably platform-based lending (crowdlending), as well as automated investment advice, investment or contract broking or automated portfolio management services (robo advisory services, or robo advisors for short; frequently also referred to as automated advice and management or automated advisory services).<sup>10</sup>

### Potential opportunities and risks for financial stability

The new players and applications can have a positive, but also a negative impact on the financial system (see Chart 5.3):<sup>11</sup> fintechs can benefit the financial system if they improve innovation, efficiency and

transparency, lower costs, complete markets and bring about better risk diversification. This is because new entrants to the market stoke competition within the financial system. If technological innovation lowers the economic market entry and exit barriers for potential new rivals, this can raise the contestability of those markets.<sup>12</sup> Cases of this phenomenon can be found *inter alia* in the emergence of crowd-lending in loan provision and of robo advisors in

<sup>9</sup> Crowdfunding is used here as a generic term for all types of platform-based capital raising and includes equity-based (crowdinvesting) and loan-based (crowdlending, peer-to-peer lending) capital raising as well as special subcategories such as donation-based and rewards-based crowdfunding.

<sup>10</sup> See also the box entitled "Regulation of crowdlending and robo advisory services in Germany" on page 74. Social trading models are not covered by this article.

<sup>11</sup> Frequent data and endogeneity problems mean that there is only a slim body of empirical literature on the way financial innovations affect financial stability. For a higher level of financial innovation, evidence of positive growth effects, but also higher idiosyncratic bank fragility, can be found in T Beck, T Chen, C Lin and F M Song (2014).

<sup>12</sup> See W J Baumol, J C Panzar and R D Willig (1982).



the investment advice space. In these instances, incumbent market players are also pushed to become more innovative. Efficiency gains and a reduction in search and transaction costs are notable benefits of the increased automation rates associated with fintechs. This also opens up scope for established intermediaries such as banks to drive down their costs.

*New players and applications can have a positive impact on the financial system.*

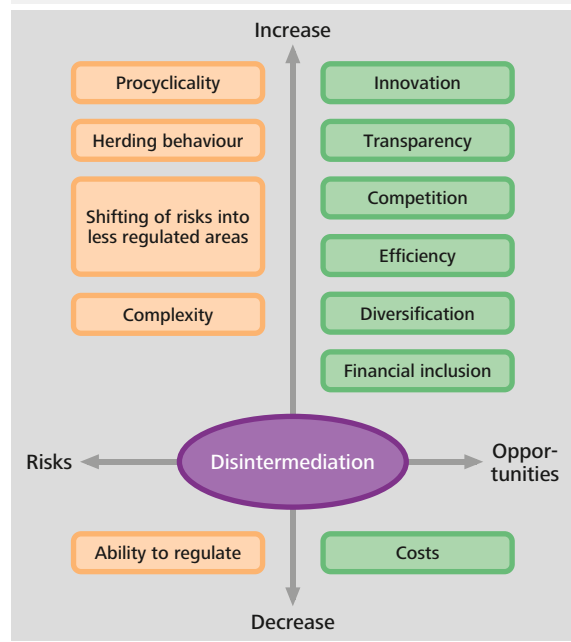
The emergence of new technological standards and the resulting positive network effects can also spur efficiency gains. New telecommunications-based (eg mobile phone and internet) access channels to financial services and a greater prevalence of data-driven technologies can boost the transparency of the financial system and thus reduce existing information asymmetries. Moreover, innovations can breed new innovations due to the existence of “innovation spirals” – that is, new products, processes, providers and learning effects can act as catalysts for innovation transfers and other adaptations; similarly, economies of scale and scope can transform solutions that were unprofitable in their infancy into feasible applications.<sup>13</sup>

From a systemic perspective, fintechs are also a potential source of risk to financial stability, however. A higher degree of automation brought about by robo advisors, such as in the taking of investment decisions, can exacerbate procyclicality if it encourages the taking of similar risk positions or similar behaviour

*From a systemic perspective, fintechs are also a potential source of risk to financial stability.*

(herding behaviour). The economic functions of fintechs also give rise to risks: where fintechs go beyond functioning solely as brokers and interfaces to traditional intermediaries, risks typically associated with bank-like transactions, such as leverage, liquid-

**Opportunities and risks of fintech-induced disintermediation** Chart 5.3



Deutsche Bundesbank

ity and maturity transformation, as well as credit intermediation, are chief among those which can spark systemic risk. Attention should also be focused on the incomplete transfer of risk when credit intermediation chains are formed, the risk of exacerbating incentive problems, or information asymmetries when individual parts are carved out of value-added chains. On top of this, the key role played by new technology may elevate operational risk to systemic dimensions. Further issues are the incentive problems and risks associated with business models designed for fast-paced growth which have not yet run through an entire credit cycle (moral hazard, incentives to misprice risk).

Disintermediating incumbent intermediaries or activities can play a part in diversifying risk or alleviating frictions if it eliminates existing incentive problems

<sup>13</sup> See R C Merton (1992).

and information asymmetries. But it can also amplify problems because a market environment made more competitive by the existence of fintechs may add still further pressure to banks' already beleaguered profitability. Thus, for instance, disintermediation by fintechs carving out profitable parts of traditional providers' value-added chains could squeeze bank profitability. This can be problematic from a systemic angle if it erodes the resilience of the financial system, creates incentives to take on more risk, or hinders banks from building up stronger capital buffers. Thus far, it has been difficult to gauge just how far disintermediation might go. We are already seeing cases of fintechs and incumbent financial intermediaries starting to cooperate, of fintechs being bought up, and of established financial intermediaries developing new technologies themselves.

### Trade-off in the microprudential regulation of fintechs

Just as it is impossible to clearly distinguish and uniformly define fintechs, so, too, would it be wrong to subject them all to the same microprudential regulations. In Germany, fintech firms run different business franchises, so they are subject to different microprudential and consumer protection standards. If the services performed by a fintech enterprise require authorisation, the relevant prudential standards must be met in full.<sup>14</sup> The interplay between the supervision of institutions and products is another factor to bear in mind. Looking to the future, fintechs may also require more robust macroprudential supervision if it becomes clear that they might present a threat to financial stability.

*It would be wrong to subject all fintechs to the same microprudential regulations.*

Microprudential supervisors are already increasingly faced with practical questions relating to the fintech segment.<sup>15</sup> In essence, much of what fintechs

offer is in fact traditional financial services. What is more, numerous fintech enterprises in Germany work closely with licensed credit institutions, financial service providers and payment institutions in an arrangement where the fintech enterprises provide the technology while the institutions take responsibility for the activities requiring authorisation (a practice dubbed "white label banking" – for example, banking or financial services governed by the Banking Act (*Kreditwesengesetz*), or payment services under the Payment Services Oversight Act (*Zahlungsdiensteaufsichtsgesetz*)).<sup>16</sup> Although fintechs, then, often do not conduct any business requiring authorisation themselves, the quantity and nature of the fintech-related enquiries addressed to supervisors indicate just how vibrant this segment has now become. In this regard, the regulatory obligations which fledgling start-ups need to satisfy in the financial services industry often appear to be a source of uncertainty. The Bundesbank and the Federal Financial Supervisory Authority (BaFin) have responded by stepping up their dialogue with the industry in an effort to meet the increased need for information.

Germany's microprudential regulators face a trade-off concerning the question of how to regulate fintech enterprises. On the one hand, the policy that the same business is subject to the same risk and should therefore also be treated with the same regulation is the nearest regulators can get to a regulatory and supervisory regime covering every single risk

<sup>14</sup> If fintechs do not fall within the scope of prudential supervision – eg because they only provide IT solutions – their business activity does not require authorisation. A prudential classification can be found at [http://www.bundesbank.de/Redaktion/DE/Downloads/Aufgaben/Bankenaufsicht/die\\_deutsche\\_bundesbank\\_leistet\\_hilfestellung.pdf?\\_\\_blob=publicationFile](http://www.bundesbank.de/Redaktion/DE/Downloads/Aufgaben/Bankenaufsicht/die_deutsche_bundesbank_leistet_hilfestellung.pdf?__blob=publicationFile)

<sup>15</sup> Bundesbank Regional Offices based in regions with a thriving (financial) start-up culture, especially, have been seeing an increased number of enquiries regarding the authorisation requirement for business models and other forms of dialogue with fintech enterprises in recent years.

<sup>16</sup> A number of fintech enterprises, having started out by cooperating with banks, have now submitted requests for authorisation as a full-service bank pursuant to the Banking Act, a small number of which have already been granted.

and economic function (see the box entitled “Regulation of crowdlending and robo advisory services in Germany” on page 74). On the other, there is the matter of being aware of the challenges presented by new technologies. This might give rise to an additional need for regulation, including at the macroprudential level. This trade-off can be seen, for instance, in the way the value-added chain in the financial services industry is increasingly being distributed across a large number of smaller players in conjunction with platform-based services. The existing regulations might no longer be appropriate for the new forms of capital raising associated with this development and might in fact obstruct innovation.<sup>17</sup>

Furthermore, given the potential division of services, the entire credit intermediation chain should continue to be regulated in terms of risk adequacy. Thus,

*The entire credit intermediation chain should continue to be regulated in terms of risk adequacy.*

mounting heterogeneity in the financial services industry, or the division of products and processes, might conceivably open up gaps or “grey areas”

in the microprudential regulations. Legislators and supervisors therefore need to proceed flexibly to ensure that the provisions are suitably adapted to reflect recent developments.<sup>18</sup> Here, their task is to examine in detail whether a fintech’s activities are little more than a technical improvement that is already completely covered in a meaningful fashion by the existing supervisory rules.

## Selected fintechs from a financial stability perspective

Financial stability aspects are especially pertinent for fintechs operating in the fields of crowdlending, owing to their involvement in the credit intermedia-

tion process, and robo advisory services, where they could act to amplify herding behaviour.

### Crowdlending taking root and requiring better oversight

Crowdlending is a form of lending where one lender or several lenders provide funding via an online platform. Depending on their percentage share of the loan, these – mostly private – lenders receive agreed payments of interest and principal, but they are also exposed to default risk.

At present, there are no German crowdlending platforms which themselves grant loans. Instead, they operate as online brokers bringing together borrowers and lenders for a fee. Broadly speaking, two forms of credit broking have emerged. The first is the direct broking of subordinated loans between borrowers and lenders; the second, the referral of borrowers and lenders to a credit institution cooperating with the platform (known as a fronting bank<sup>19</sup>). This fronting bank then performs the task of lending to the borrower, a task which, pursuant to section 1 (1) sentence 2 number 2 of the Banking Act, generally requires authorisation.<sup>20</sup> The bank then transfers the claim to the lenders, either by as-

*At present, there are no German crowdlending platforms which themselves grant loans.*

<sup>17</sup> See M Casper (2015) on the trade-off between closing regulatory gaps and avoiding future evasive action while at the same time attempting to tap innovative sources of funding.

<sup>18</sup> One example of this was introduced with the Retail Investor Protection Act (Kleinanlegerschutzgesetz). The last half-sentence of section 2a (1) of the Capital Investment Act (Vermögensanlagegesetz) states that if crowdlending exceeds certain threshold values, the offeror of the capital investment can no longer take advantage of the relief from certain information requirements that is otherwise available for crowdlending.

<sup>19</sup> See also Deutsche Bundesbank (2014), p 22 for a definition of fronting banks in as far as they relate to credit funds.

<sup>20</sup> Insurers and mutual funds, too, are permitted to grant loans commercially in Germany, albeit on a limited scale.

## Regulation of crowdlending and robo advisory services in Germany

Germany's regulatory approach to platform-based lending (crowdlending) generally covers every element of the credit intermediation process. However, as crowdlending platforms run a wide range of different business models, a blanket statement about whether individual players require official authorisation for their activities cannot be made. Instead, each player needs to be subjected to a case-by-case assessment. As a rule, fronting banks (lending banks which cooperate with crowdlending platforms) are subject to the provisions of the Banking Act (*Kreditwesengesetz*). Depending on the nature of cooperation, the fronting bank alone can be responsible for complying with the relevant prudential provisions. Where processes are outsourced to a crowdlending platform, neither the proper performance of these business activities and services nor the business organisation within the meaning of section 25a (1) of the Banking Act may be compromised as a result. In particular, the institution must ensure ongoing appropriate and effective risk management such that it includes the outsourced activities and processes.<sup>1</sup> Depending on its business model, the platform itself, on the other hand, often needs no authorisation pursuant to the Banking Act or the Payment Services Oversight Act (*Zahlungsdiensteaufsichtsgesetz*) if its business activities comprise nothing more than loan brokerage and payment services. This means that pure-play crowdlending platforms are not supervised by the Bundesbank and the Federal Financial Supervisory Authority (BaFin) in this respect. In most cases, however, they need to be authorised by the competent trade supervision authority pursuant to either section 34c or section 34f of the Industrial Code (*Gewerbeordnung*). In accordance with section 31 (5) of

the Securities Trading Act (*Wertpapierhandelsgesetz*), recipients of such an authorisation are required *inter alia* to assess whether the brokered investments are appropriate for the customer. Lastly, there are supervisory provisions governing the information to be made available to investors pursuant to the Capital Investment Act (*Vermögensanlagengesetz*). Thus, under certain conditions, a key information document can be prepared instead of the usual prospectus.<sup>2</sup>

As for automated investment advice, investment or contract broking and automated portfolio management (robo advisory services), a blanket statement about the authorisation requirements imposed on providers of these services in Germany cannot be made either. The regulatory requirements very much depend on how each online platform is set up. But this again is an area where the "same regulation for the same business" principle holds true, with the result that automated portfolio management, for example – just like investment advice or investment or contract broking – must be authorised by BaFin pursuant to section 32 (1) of the Banking Act. Without this authorisation, robo advisory services are generally prohibited in these lines of business. The Securities Trading Act sets out further obligations which might also need to be adhered to.

---

<sup>1</sup> See section 25b of the Banking Act as well as AT 9 of the Minimum Requirements for Risk Management (MaRisk).

<sup>2</sup> The conditions for and scope of exemption from the obligation to prepare a prospectus pursuant to section 2a (1) of the Capital Investment Act and the rules governing the preparation of a key information document and warning notice for capital investments are discussed in M Casper (2015), *Das Kleinanlegerschutzgesetz – zwischen berechtigtem und übertriebenem Paternalismus*, Journal of Banking Law and Banking, Vol 27, No 5, pp 265-282, October 2015.

signing the loan directly or by indirect means. In the indirect channel, the bank first sells the loan to a special purpose vehicle (SPV), which then originates unsecured debt instruments whose payment flows together match those of the underlying credit claim (instruments known as borrower payment contingent notes). These notes are subscribed to on a *pro rata* basis by the lenders assembled on the crowd-lending site. The notes rank *pari passu* with one another, which means that they are not tranching and thus do not constitute securitisation.<sup>21</sup>

Cooperation between crowdlending platforms and banks is intensifying as fronting banks increasingly outsource processes associated with loan origination – even essential ones – to crowdlending platforms. As a case in point, platforms calculate a loan’s expected probability of default and use that as a basis for setting the lending rate. The services offered by platforms are thus becoming increasingly similar to those performed by banks. Spurred by this and other developments, banks have started creating crowdlending platforms of their own, and there are instances of platform operators incorporating banks into their groups, thus strengthening the ties between banks and platforms. As a result, banks are likewise enhancing and refining their lending processes as a way of adapting to the new environment.<sup>22</sup>

From a macroprudential perspective, the growing crowdlending market requires improved surveillance. Owing to the insufficient data pool, very little

***From a macroprudential perspective, the growing crowd-lending market requires improved surveillance.***

information is available on the loans brokered in this market, such as loan volumes, riskiness and investors. Moreover, any trans-

formation in credit intermediation chains could cause the risks associated with the brokered loans to accumulate in the financial system. For this and other reasons, the au-

thorities need to monitor whether contractual terms and the regulatory environment are setting the right incentives for the actors involved in credit intermediation. Attention here could focus on the behaviour of fronting banks which, rather than taking on credit risk themselves, pass it on to the investors, thus following an “originate to distribute” model. This gives banks an incentive to set credit standards that are looser than those for loans that remain on their own balance sheet.<sup>23</sup>

### **Robo advisors as a potential threat to financial stability**

The Bundesbank and BaFin define robo advisors as automated internet-based services in the context of investment advice, investment or contract broking and portfolio management.<sup>24</sup> These operators of online platforms offering automated advisory services provide their customers with the opportunity to receive a diversified portfolio proposal based on personal information. The composition of that portfolio and any changes made to it are usually based on algorithms derived from portfolio theory models.<sup>25</sup>

A portfolio proposal created by a robo advisor is based on customer information similar to that underpinning traditional investment advice. First, investors are asked to provide their particulars (such as age, profession or monthly income), investment-related data on the desired investment volume and horizon, and information on their personal investment objectives (eg expected risk-return preferences). Robo advisors normally use online questionnaires to ob-

<sup>21</sup> See Article 4 (61) of the Capital Requirements Regulation (CRR).

<sup>22</sup> See J H Boyd and M Gertler (1994) on how banks adapt to shocks and new regulatory provisions.

<sup>23</sup> See V M Bord and J A C Santos (2015).

<sup>24</sup> See also [https://www.bafin.de/EN/Aufsicht/FinTech/Anlageberatung/anlageberatung\\_node\\_en.html](https://www.bafin.de/EN/Aufsicht/FinTech/Anlageberatung/anlageberatung_node_en.html). A uniform international definition has yet to be established.

<sup>25</sup> See J W Lam (2016).

tain this information. Second, the portfolio proposal builds on the logic of the underlying algorithm which ultimately selects the investment products and proposes how the portfolio might be composed.<sup>26</sup>

The degree of standardisation can vary strongly among providers of robo advice,<sup>27</sup> and this might also impact on the suitability of the investment proposal for the individual needs of customers. Investment itself is predominantly in exchange-traded funds (ETFs). This, and the fact that automated investment advice does away with personal interaction, means that robo advisors boast a potential cost advantage over traditional portfolio advisors.

Rising levels of automation associated with robo advisory services might be a source of financial stability risks. If robo advisors use similar algorithms, they might trigger an increased incidence of unidirectional portfolio shifts.<sup>28</sup> Herding behaviour can drive

*Rising levels of automation might be a source of financial stability risks.*

changes in asset prices that are not justified by the fundamentals. In this scenario, spells of financial market turmoil in particular would see mounting pressure to offload securities or redeem fund units, pushing up liquidity risk in these market segments. Interaction between robo advisors and ETFs might even amplify this risk.<sup>29</sup> Additionally, if this scenario were to become a widespread phenomenon, operational risk (eg errors or functional disruptions in the algorithms) could likewise have systemic implications.

## ■ Need for macroprudential action

Both the positive and negative changes that might be associated with the growth of the fintech segment need to be monitored from a macroprudential perspective. On the one hand, fintechs contribute to

financial sector heterogeneity, which might make the financial system as a whole more resilient to shocks. On the other, incentive patterns and contagion risk could change, while existing risks might shift or new ones may emerge.

Gauging how fintechs might impact on the structure of the financial system is challenging, however, given the early stage of innovation, the insufficient data pool and the endogenous response to the changing environment on the

part of established financial intermediaries. This is compounded by significant differences in the international regulatory framework for the fintech segment. It is therefore

fundamentally important to get a clearer picture of fintechs' business activities to better understand whether and in what way they might pose a threat to financial stability. This includes compiling informative and internationally comparable data on volumes and risk metrics. What is more, international bodies need to work towards establishing a common understanding of technology-enabled financial innovations and their regulatory framework in the near future to pave the way for the common and appropriate regulation of any newly identified risks.

*It is important to get a clearer picture of fintechs' business activities to better understand whether and in what way they might pose a threat to financial stability.*

<sup>26</sup> See Joint Committee of the European Supervisory Authorities (2015), pp 12 ff.

<sup>27</sup> See [https://www.bafin.de/EN/Aufsicht/FinTech/Anlageberatung/anlageberatung\\_node\\_en.html](https://www.bafin.de/EN/Aufsicht/FinTech/Anlageberatung/anlageberatung_node_en.html)

<sup>28</sup> See Joint Committee of the European Supervisory Authorities (2015), pp 27 ff. Frictions caused by the interplay between risk-averse households and risk-neutral asset managers are also discussed in S Morris and H S Shin (2014) and M Feroli, A K Kashyap, K Schoenholtz and H S Shin (2014).

<sup>29</sup> The impact of ETFs on asset volatility is discussed in I Ben-David, F Franzoni and R Moussawi (2014). Further information on ETF liquidity risk can be found in Deutsche Bundesbank (2013), pp 42-43.



## ■ List of references

- Baumol, W J, J C Panzar and R D Willig (1982), Contestable markets and the theory of industry structure, Saunders College Publishing/Harcourt Brace, June 1982.
- Beck, T, T Chen, C Lin and F M Song (2014), Financial innovation: the bright and the dark sides, January 2014.
- Ben-David, I, F Franzoni and R Moussawi (2014), Do ETFs increase volatility?, NBER Working Paper No 20071, April 2014.
- Bord, V M and J A C Santos (2015), Does securitization of corporate loans lead to riskier lending?, Journal of Money, Credit and Banking, Vol 47, No 2-3, pages 415 to 444, March 2015.
- Boyd, J H and M Gertler (1994), Are banks dead? Or are the reports greatly exaggerated?, Quarterly Review, Federal Reserve Bank of Minneapolis, Vol 18, No 3, pages 2 to 23, October 1994.
- Casper, M (2015), Das Kleinanlegerschutzgesetz – zwischen berechtigtem und übertriebenem Paternalismus, Journal of Banking Law and Banking, Vol 27, No 5, pages 265 to 282, October 2015.
- Crane, D B, K A Froot, S P Mason, A Perold, R C Merton, Z Bodie, E R Sirri and P Tufano (1995), The global financial system: a functional perspective, Harvard Business School Press, September 1995.
- Deutsche Bundesbank (2013), Financial Stability Review, November 2013.
- Deutsche Bundesbank (2014), Financial Stability Review, November 2014.
- Feroli, M, A K Kashyap, K Schoenholtz and H S Shin (2014), Market tantrums and monetary policy, Chicago Booth Research Paper No 14-09, February 2014.
- Gennaioli, N, A Shleifer and R Vishny (2012), Neglected risks, financial innovation, and financial fragility, Journal of Financial Economics, Vol 104, pages 452 to 468, June 2012.
- Joint Committee of the European Supervisory Authorities (2015), Joint Committee discussion paper on automation in financial advice, December 2015.
- Lam, J W (2016), Robo-advisors: a portfolio management perspective, Yale College, April 2016.
- Lerner, J and P Tufano (2011), The consequences of financial innovation: a counterfactual research agenda, NBER Working Paper No 16780, February 2011.
- Merton, R C (1992), Financial innovation and economic performance, Journal of Applied Corporate Finance, Vol 4, No 4, pages 12 to 22, January 1992.
- Merton, R C (1995), A functional perspective of financial intermediation, Financial Management, Vol 24, No 2, pages 23 to 41, Summer 1995.
- Morris, S and H S Shin (2014), Risk-taking channel of monetary policy: a global game approach, Working Paper, Princeton University, January 2014.
- Philippas, D T and C Siriopoulos (2012), Is the progress of financial innovations a continuous spiral process?, Investment Management and Financial Innovations, Vol 9, No 1, 2012.
- Tufano, P (2003), Financial innovation, in G Constantinides, M Harris and R Stulz, Handbook of the Economics of Finance, Vol 1A, Amsterdam, pages 307 to 335, 2003.
- World Economic Forum (2015), The future of financial services, Final Report, June 2015.





# Increased importance of central counterparties

*The global financial crisis exposed the weaknesses of the then prevailing method of bilateral clearing for over-the-counter (OTC) derivatives. Subsequently, in 2009, the G20 heads of state and government agreed that clearing through central counterparties (CCPs) should be mandatory for standardised derivatives. The implementation of this agreement is expected to stabilise the financial system. However, suitable regulation of these financial market infrastructures is required in order to properly address the increased importance, brought about by this reform, of CCPs for the functioning of the financial system as a whole.*

*A key focus of current work therefore lies in strengthening the resilience of CCPs and developing dedicated recovery and resolution regimes. In addition, improvements are being made to the data pool that is vital for monitoring CCPs. Given the systemic importance of CCPs, supervisory authorities have also conducted an initial Europe-wide CCP stress test.*

*Beyond this, thought should also be given to the further development and completion of the macroprudential framework for CCPs. This includes developing a quantitative methodology for identifying systemically important CCPs. In addition, it is necessary to continuously monitor risks to the financial system emanating from CCPs (owing to their interconnectedness with other financial market participants or to their often high market concentration). What is ultimately required is to develop suitable macroprudential instruments to counteract potential systemic risks stemming from CCPs.*

## Significance of central clearing for financial stability

In order to reduce direct and indirect channels of contagion between banks, the G20 leaders agreed in 2009 that clearing through central counterparties (CCPs) should be mandatory for standardised over-the-counter derivatives contracts.

CCPs offset opposing financial transactions (netting) to determine the net risk from these transactions and thus reduce overall risk in the financial system. Furthermore, in return for the provision of collateral and the payment of a fee, CCPs provide a guarantee to their counterparties that financial transactions will be settled at the end of the given term. They take on

*CCPs take on the direct counterparty credit risk of the trading partners.*

the role of contracting party between the buyer and seller in a financial transaction. By doing so, they take on the direct counterparty credit risk of the trading partners and can – assuming the CCP has a well-functioning risk management framework – mitigate indirect contagion effects that can arise in the event of a major market participant defaulting. This can reduce the systemic risks of derivative transactions, which are generally more complex and have longer terms than spot transactions.<sup>1</sup>

A characteristic feature of the functioning of a CCP is that its positions are always matched on account of its role as both buyer and seller for every transaction. If a clearing member defaults, however, the CCP itself must take on the obligations arising from the transactions cleared for that member and ensure that any resulting losses are covered.

In addition, CCPs may sustain losses in other ways, such as from the investment of clearing members' collateral (investment risk) or as a result of cyber attacks<sup>2</sup> or other operational risks. In principle, the CCP

is liable for these losses with its own equity. If a CCP is unable to completely cover the losses that occur, it cannot fulfil its assigned function as a "breakwater" against the spread of systemic risks.

To guard against risks arising from clearing members defaulting, CCPs operate a multi-stage default management procedure that is sometimes referred to as the default waterfall. CCPs first of all demand an initial margin from clearing members for each transaction they are asked to clear. This is paid in the form of cash collateral or securities collateral. The initial margin is determined on the basis of risk, which is largely measured by the market price fluctuations (price volatility) of the cleared products. Higher volatility inherently entails a higher risk of loss, so the initial margin is raised to cover this greater risk. Concentration risk is also taken into account, amongst other factors.<sup>3</sup>

*To guard against risks arising from clearing members defaulting, CCPs operate a multi-stage default management procedure.*

In addition, CCPs continually measure the value of open positions and perform a cash settlement between the clearing members at least once daily over the full term of the transaction. This variation margin, as it is known, offsets the gains and losses that arise between clearing members during the day as a

<sup>1</sup> Central clearing is offered for equities, bonds and commodities, as well as for the derivatives based on these assets and credit derivatives. Many repos and reverse repos are also cleared centrally, whereas FX trades are, for the most part, cleared bilaterally. Central clearing requires financial instruments to exhibit a certain degree of standardisation, which means that its prevalence varies from one financial market to another.

<sup>2</sup> See the box entitled "Cyber risks and financial stability" on p 27-28.

<sup>3</sup> See Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2012), p 52, section 3.6.6, which describes the key factors that should feed into the calculation of initial margins: "The method selected by the CCP to estimate its potential future exposure should be capable of measuring and incorporating the effects of price volatility and other relevant product factors and portfolio effects over a close-out period that reflects the market size and dynamics for each product cleared by the CCP."

result of price changes. If a clearing member defaults and its collateral is insufficient to cover the resulting losses, CCPs must draw on dedicated own financial resources to participate in the losses. This possibility of having to participate in losses is intended to provide the CCP with a monetary incentive to ensure that its risk management is sound. Finally, all clearing members must contribute to a default fund, which is drawn on to cover any remaining losses. This potential mutualisation of losses provides all participants with incentives to push for the CCP to run a well-functioning risk management system. As a last resort, the CCP's own capital can be drawn on for losses that are not covered by the pre-funded CCP waterfall.

In principle, it is conceivable that the pre-funded resources of the CCP waterfall could be insufficient to cover losses that would arise, for example, if several clearing members defaulted simultaneously. If a CCP experiences financial distress as a result, this can have systemic effects on account of the CCP's interconnectedness with the financial system and the contagion risks that this entails.

*If a CCP experiences financial distress, this can have systemic effects.*

A focus of current work by the Financial Stability Board (FSB) thus lies on strengthening CCPs' resilience and recoverability. The international Principles for Financial Market Infrastructures (PFMI)<sup>4</sup> form the point of departure for this work. These were jointly devised in 2012 by the Committee on Payments and Market Infrastructures (CPMI) located at the Bank for International Settlements (BIS) and the International Organization of Securities Commissions (IOSCO). At the behest of the FSB, the CPMI and IOSCO are currently drafting further guidance on individual elements of the PFMI and developing standards for supervisory stress tests for CCPs. As part of this process, they are taking into account the experience

gained to date in the application of the principles by CCPs. In addition, the FSB is drawing up further guidance on its principles relating to the resolution of CCPs that are unlikely to be returned to viability through recovery measures.<sup>5</sup>

A dedicated resolution regime for CCPs – and thus a deviation from ordinary insolvency law – is at least required for CCPs whose default would cause systemic consequences. This, in turn, raises the question of how the systemic importance of a CCP might be determined.

#### **Degree of CCPs' systemic importance difficult to determine**

The PFMI make the general assumption that CCPs are systemically important for their respective country of domicile because they perform critical services for the functioning of the financial markets. However, national supervisory authorities can designate a CCP as not systemically important, but are then expected to provide a comprehensive and clear rationale for this decision. Furthermore, the PFMI stipulate higher requirements for CCPs that carry out activities with a more complex risk profile, such as clearing certain derivatives, or CCPs that are systemically important in multiple jurisdictions. These CCPs must ensure at all times that the pre-funded waterfall described above is sufficient to absorb the losses caused by the simultaneous default of their two largest clearing members, whereas the remaining CCPs need only be able to absorb the losses caused by the default of their largest clearing member.

The systemic importance of CCPs depends on their individual size, interconnectedness and substitutability. In contrast to the situation for banks, however,

<sup>4</sup> See Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2012).

<sup>5</sup> See Financial Stability Board (2016).

there is, as yet, no convincing method taking into account both quantitative and qualitative factors to differentiate between systemically important CCPs and those that are not systemically important or be-

*The systemic importance of CCPs depends on their individual size, interconnectedness and substitutability.*

tween CCPs that are globally systemically important and those that are nationally systemically important (see the box entitled “Quantitative methodology for identifying systemically important central counterparties” on pages 83 and 84 for a possible approach to identifying CCPs of systemic importance to the German financial system).<sup>6</sup>

### Central clearing entails high market concentration

One of the aims of the regulatory reforms initiated since the financial crisis is to expand the use of central clearing on the OTC derivatives markets. It is to be expected that the reforms will hugely alter the existing market structures and will further increase the systemic importance of derivatives CCPs.

*One of the aims of the regulatory reforms is to expand the use of central clearing on the OTC derivatives markets.*

The OTC derivatives markets are characterised by a tiered network structure with a core of dealer banks. The dealer banks typically engage in a high level of trading activity, but tend not to position themselves in the market, as they earn their profits primarily by capitalising on spreads. Market risks entered into for customers are hedged, for example, with opposite positions on exchanges or with other dealer banks. For these traders, central clearing is a cost-efficient option if as many of their customers and other traders as possible are connected to the same CCP as

they are, as this increases netting possibilities.<sup>7</sup> The net position to be collateralised is then significantly smaller than the original gross position. Other netting possibilities arise when positions in different products can be offset against each other on the basis of statistical correlations.<sup>8</sup> Large CCPs with a high number of clearing members and thus a larger netting potential therefore present advantages to dealer banks. For this reason there is an observable tendency towards an oligopolistic structure in the CCP market; indeed, CCPs are sometimes categorised as natural monopolies.<sup>9</sup> This tendency is also reflected in the concentration indicators for the European CCP market, such as the Herfindahl-Hirschman Index (HHI).<sup>10</sup>

*The OTC derivatives markets are characterised by a tiered network structure with a core of dealer banks.*

Chart 6.1 shows the HHI of the four segments of exchange-traded derivatives, OTC derivatives, spot products and repos, along with the respective annual turnover cleared by CCPs in 2015 according to the Central Counterparty Clearing Statistics (CCCS)<sup>11</sup> of the European Central Bank (ECB).<sup>12</sup>

<sup>6</sup> The PFMI stipulate factors to be considered in such an assessment only for determining whether a CCP is systemically important in multiple jurisdictions. See Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2012), p 43, section 3.4.19: “Determinations of whether a CCP is systemically important in multiple jurisdictions should include consideration of, among other factors, (a) the location of the CCP’s participants, (b) the aggregate volume and value of transactions that originate in each jurisdiction in which it operates, (c) the proportion of its total volume and value of transactions that originate in each jurisdiction in which it operates, (d) the range of currencies in which the instruments it clears are cleared or settled, (e) any links it has with FMIs located in other jurisdictions, and (f) the extent to which it clears instruments that are subject to mandatory clearing obligations in multiple jurisdictions.”

<sup>7</sup> See D Duffie and H Zhu (2011).

<sup>8</sup> See R Cont and T Kokholm (2014).

<sup>9</sup> See C Pirrong (2011), p 15.

<sup>10</sup> The HHI is the sum of the squared market shares of market participants. See Deutsche Bundesbank (2006), pp 35-53.

## Quantitative methodology for identifying systemically important central counterparties

The following text presents a quantitative methodology that can be used to identify domestic and foreign central counterparties (CCPs) of systemic importance to the German financial system. The systemic importance of a CCP is not confined solely to its country of domicile, but also extends to other countries in which the financial system is closely linked to the CCP via its clearing members. It is generally not possible to use prudential data about CCPs to identify foreign CCPs which are systemically important to the domestic financial system as only the competent authorities in the CCPs' country of domicile have regular access to these data. This means that the German supervisory authorities do not have direct access to prudential data on foreign CCPs. The methodology presented here is therefore based on prudential reporting data for loans of €1 million or more pursuant to section 14 of the Banking Act (*Kreditwesengesetz*). According to this Act, loans granted by German banks to non-residents, which exceed the reporting threshold of €1 million within a quarter, must also be reported with their respective balances on the reporting date at the end of the quarter. The European Banking Authority's (EBA) assessment methodology for identifying other systemically important institutions (O-SIIs), which uses an indicator-based scoring model, serves as a template for determining systemic importance.<sup>1</sup> As CCPs differ in function and role from banks, the O-SII methodology is adapted to take account of the special features of central clearing.

The O-SII methodology uses the three categories of "size", "interconnectedness" and "complexity" to model systemic importance. Each cate-

gory contains a normalised individual indicator, which is based on prudential reporting data. For these individual indicators, a score is calculated for each institution by determining the ratio of the individual indicator value for the institution in question to the aggregate of the indicator values summed across all institutions. The arithmetic average of the scores of the individual indicators is then calculated.

When applying the O-SII methodology to identify systemically important CCPs on the basis of data pertaining to loans of €1 million or more, a distinction could be made between the following three categories, which may indicate systemic risks and would be equally weighted when incorporated into the scoring model: the size of German credit institutions' exposures to a CCP, the level of interconnectedness with the German financial system and the complexity of the underlying transactions.

For the category of "size", the indicator used is the sum of the loans of €1 million or more of German financial institutions and their subsidiaries per borrowing CCP. The meaning of the term "credit" as defined in section 19 of the Banking Act also covers deposited securities and cash collateral, derivatives (at fair value), repos and reverse repos, and thus core business areas of CCPs. The indicator for the category of "interconnectedness" is the number of German finan-

---

<sup>1</sup> See European Banking Authority, Guidelines on the criteria to determine the conditions of application of Article 131 (3) of Directive 2013/36/EU (CRD) in relation to the assessment of other systemically important institutions (O-SIIs), EBA/GL/2014/10, December 2014.

cial institutions which have cleared transactions via the CCP in the respective quarter and have exceeded the reporting threshold. As an indicator for the category of “complexity”, the reported credit position relating to derivatives is used, as these are considered to be complex financial products. The final score for assessing systemic importance is calculated as the arithmetic average across the categories.

When calculated over a number of quarters, the scoring model provides a stable assessment of the systemic importance of CCPs. Based on data from the years 2014 to 2016, 11 CCPs can be considered systemically important to the German financial system. These include seven European CCPs, three American CCPs and one Asian CCP.

The methodology presented in this text can also be used to develop a macroprudential risk mon-

itoring system for CCPs as well as to observe changes in the use of CCPs by market participants. For example, risks stemming from CCPs owing to their degree of interconnectedness or their high market concentration are of interest. Despite the considerable progress that has been made, especially with regard to the reporting of derivative transactions to trade repositories and the extensive publication of aggregated data by CCPs, previous studies quickly reached their limits in terms of microdata availability, however. Given the frequent cross-border significance of CCPs, it would seem worthwhile to forge ahead with these studies beyond the national level – this could be done at the European level within the framework of the European Systemic Risk Board (ESRB) or at the international level within the context of the Financial Stability Board (FSB).

The market concentration in the OTC derivatives segment is the most striking. The total nominal clearing volume for this segment amounted to nearly €500 trillion in 2015, with an HHI of just slightly under the upper limit of 10,000. The reason the HHI is so high is because a UK CCP accounts for the lion’s share of OTC derivatives clearing in Europe. According to the ECB’s CCCS data, this CCP has a market share of close to 99%. However, it should be borne in mind that non-European CCPs also compete in this market segment, yet their clearing volumes are not captured by the ECB’s statistics.

The clearing of exchange-traded derivatives also exhibits a high market concentration, with an HHI of 5,525. The annual turnover of this segment stood at €316 trillion in 2015. The HHI of the clearing segment for spot products is roughly the same (HHI = 5,340), but its annual clearing volume is much lower, at €90 trillion. The lowest HHI can be seen in the

repo clearing segment (HHI = 2,997), with a turnover in excess of €200 trillion in 2015.

The observable tendency towards large CCPs and high market concentrations in the clearing of financial products via CCPs requires a nuanced assessment. A single global CCP that cleared all products for all markets would provide the greatest netting potential and would have the lowest collateral requirements.<sup>13</sup> However, it would also entail enormous concentra-

*The tendency towards large CCPs and high market concentrations in the clearing of financial products via CCPs requires a nuanced assessment.*

<sup>11</sup> Source: European Central Bank, Statistical Data Warehouse, Securities Clearing, last accessed on 7 November 2016.

<sup>12</sup> To determine the HHI, the nominal values of the cleared products in the CCCS were converted into market shares.

<sup>13</sup> See D Duffie and H Zhu (2011).



tion risks (the too-big-to-fail problem). Ultimately, a clearing landscape with several competing CCPs that ensures the substitutability of clearing services is therefore likely to strike the best balance between the conflicting aims of efficiency and stability.<sup>14</sup>

### Competition between CCPs harbours risks

The central clearing market structures outlined above exhibit an understandable monopolistic tendency, but also show that competition does exist between CCPs, for instance in the repo clearing segment. From

*Collateral requirements, in particular, constitute a key competitive lever.*

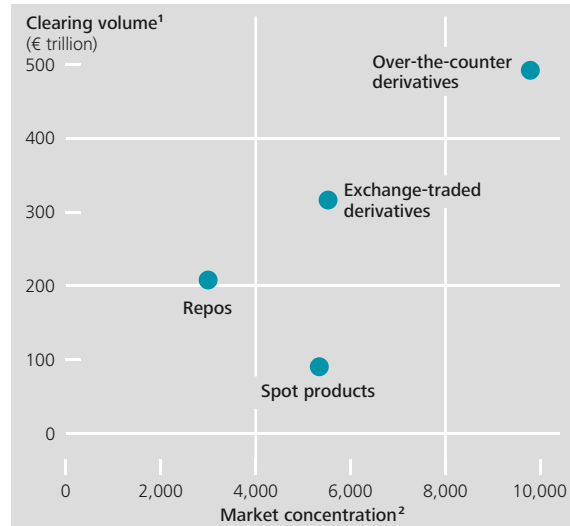
the point of view of the clearing members, key competitive levers include, in particular, the quality of risk management, the amount

of collateral to be pledged and the clearing fees. Collateral requirements entail capital costs for clearing members, providing them with a monetary incentive to choose a CCP with lower collateral requirements.<sup>15</sup>

CCPs could potentially compete with each other on clearing fees, margin requirements and netting possibilities across product classes. While minimum regulatory standards are, for example, set out in the European Market Infrastructure Regulation (EMIR),<sup>16</sup> CCPs do have some leeway in the precise design of their risk management models. Accordingly, CCPs sometimes assess risks differently, which means that the costs of central clearing for clearing members may vary from one CCP to another. Due to the pressure of competition, an incentive may arise for CCPs to calibrate risk models as cost-effectively as possible under the given rules and to require less collateral from clearing members.<sup>17</sup> This is especially true in periods of low volatility, ie in a market environment in which market price risks appear low.

Market concentration among European CCPs in central clearing of various financial product classes

Chart 6.1



Sources: ECB and Bundesbank calculations. **1** Turnover of centrally cleared financial products in 2015 (nominal values). **2** Measured by the Herfindahl-Hirschman Index (HHI). Market concentration is considered heightened as of an HHI greater than 1,800. Deutsche Bundesbank

A clear drop in collateral requirements in times of low volatility could induce clearing members to engage in a higher volume of financial transactions using the collateral at their disposal, thus increasing their leverage. However, market volatility could also spike again. CCPs would then potentially have to significantly increase their collateral requirements in order to ensure that risks were sufficiently collateralised. If a CCP's market share reaches a significant size, this could have repercussions for entire market segments and force market participants to close out trading positions or sell assets if they do not have sufficient collateral to meet the CCP's tougher requirements. These fire sales could have an ampli-

<sup>14</sup> See European Systemic Risk Board (2016), p 21.

<sup>15</sup> See J P Krahenen and L Pelizzon (2016)

<sup>16</sup> See Regulation (EU) No 648/2012 of the European Parliament and of the Council on OTC derivatives, central counterparties and trade repositories.

<sup>17</sup> See N Abruzzo and Y-H Park (2016).

fying effect (procyclicality) by leading to additional price volatility and a renewed increase in the CCP's collateral requirements.

## Implications for macroprudential policy

### Collateral requirements as a potential macroprudential instrument

In principle, CCPs' collateral systems have the potential to act procyclically, ie to amplify periods of stress on the financial markets. This is why EMIR requires CCPs to set up their risk models in such a way that procyclical effects are avoided as far as possible. To this end, three options have been defined for CCPs' risk management.<sup>18</sup>

*CCPs' collateral systems have the potential to act procyclically.*

However, the scope for interpreting these options is not inconsiderable<sup>19</sup> and they may present CCP risk

managers with conflicting goals. For example, in order to avoid procyclical effects, it can make sense from a financial stability perspective to raise collateral requirements at an early stage in times of low volatility. However, doing so in practice can be difficult because of the possible competitive disadvantages this would entail.<sup>20</sup>

Strengthening EMIR's procyclicality-limiting requirements for risk management and complementing these with macroprudential requirements

*EMIR requirements should be complemented by macroprudential requirements.*

therefore seems worth considering.<sup>21</sup> The latter could, for example, include binding supervisory minimum floors for collateral requirements.

These would prevent an extensive decrease in re-

quirements in calm market phases. Another conceivable option would be to require clearing members to pledge more collateral than demanded by the CCP, thus creating an additional buffer. If (microprudential) collateral requirements were to increase suddenly, this macroprudential buffer could then be released, counteracting rising liquidity needs in the financial system.

The European Systemic Risk Board (ESRB) is currently exploring possible arrangements for the use of collateral requirements for macroprudential purposes. In this context, discussions are also under way on whether a macroprudential harnessing of the collateral requirements used in the central and bilateral clearing of financial transactions would be suitable for preventing the emergence of excessive leverage in individual sectors or the financial system as a whole and exerting a corresponding dampening influence on the financial cycle.

### Stress test confirms general robustness of CCPs

Supervisory stress tests are another important pillar of the macroprudential framework. In April 2016, the European Securities and Markets Authority (ESMA) published the results of its first Europe-wide CCP stress test.<sup>22</sup> ESMA conducted this test with the

<sup>18</sup> See Article 28 (1) of Commission Delegated Regulation (EU) No 153/2013 of 19 December 2012 supplementing Regulation (EU) No 648/2012 of the European Parliament and of the Council with regard to regulatory technical standards on requirements for central counterparties:

"a) applying a margin buffer at least equal to 25% of the calculated margins which it allows to be temporarily exhausted in periods where calculated margin requirements are rising significantly; b) assigning at least 25% weight to stressed observations in the lookback period [...]; c) ensuring that its margin requirements are not lower than those that would be calculated using volatility estimated over a 10 year historical lookback period."

<sup>19</sup> See European Systemic Risk Board (2015a), p 11.

<sup>20</sup> See J P Krahnert and L Pelizzon (2016), p 7.

<sup>21</sup> See European Systemic Risk Board (2015a), p 23.

<sup>22</sup> See European Securities and Markets Authority (2016).

support of national supervisory authorities, the ESRB and the ECB and placed particular emphasis on CCPs' counterparty credit risk. It was assumed that up to 30 banks were simultaneously unable to meet their commitments to CCPs. In addition, various extreme disruptions to the financial markets were played out.

Overall, ESMA confirmed that CCPs in the EU have a high degree of stability and are financially well-equipped. Even after taking into account second-round effects, no systemic risks were identified at European CCPs.

However, the ESMA stress test did not look purely at the pre-funded financial resources of CCPs, but also took into account contractually agreed additional contributions that clearing members can be required to make to CCPs. That said, in a generally crisis-ridden environment, banks cannot necessarily be expected to be able to make such contributions readily. Banks do not act solely as clearing members, but also engage in other activities that can lead to higher liquidity needs in a crisis scenario. In the extreme market scenarios underlying the stress test assumption, clearing members could, for example, incur additional losses from bilateral transactions with the banks that defaulted as clearing members (ie transactions not cleared via CCPs). The financial crisis also showed that interbank markets can quickly dry up when banks hoard liquidity instead of making it available to other market participants. In such market periods it is doubtful whether all clearing members would really have sufficient liquidity to make additional contributions to a CCP, let alone to several CCPs simultaneously.

Future stress tests should address the aforementioned weaknesses and focus more on the financial system as a whole.

*Future stress tests should focus more on the financial system as a whole.*

One way to do this would be to augment the stress tests for banks, insurers and

CCPs, which have thus far been carried out separately, by developing uniform and comprehensive scenarios that concern all market participants equally and take better account of feedback loops on the entire market setting.

At the global level, the CPMI and IOSCO have started work on internationally harmonised guidelines for supervisory stress testing. A public consultation on these proposals is scheduled to be held in mid-2017. Moreover, a global stress test for key derivatives CCPs is also envisaged.

### **Improved data pool vital**

The information presented above has underscored the need to further develop the analytical basis for effectively monitoring CCPs and the potential risks they pose to financial stability. This first of all entails setting up a data pool that can be used for macroprudential purposes and drawn on for cross-sectional analyses (concerning the interconnectedness of CCPs, for example) as well as cyclical analyses (looking at the implications of CCPs' collateral practices, say). Some initial successes can already be seen in this context. For example, since the start of 2016, CCPs have been required to meet the international public quantitative disclosure standards for CCPs drawn up by the CPMI and IOSCO.<sup>23</sup> Furthermore, data from trade repositories can be put to increasingly good use.

### **Development of dedicated recovery and resolution regimes for CCPs needed**

Recovery and resolution regimes are sometimes considered to be a macroprudential instrument in the wider sense. Clearing services provided by CCPs can

---

<sup>23</sup> See Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2015).

be of such crucial importance to the functioning of financial markets that their continuity has to be ensured even if the CCP is in danger of defaulting. It therefore follows that systemically important CCPs

*Insolvency proceedings do not take into account the negative externalities of a CCP default.*

in danger of defaulting should not automatically be subject to ordinary insolvency proceedings. The primary aim of such proceedings is to satisfy the claims of insolvency creditors. Such proceedings do not take into account the negative externalities that the default of a CCP may have on the financial system. Dedicated recovery and resolution regimes for CCPs should therefore be developed to avoid negative impacts on financial stability in the event of a CCP defaulting.

Many CCPs in the EU have already improved their recoverability as a result of their own risk management activities. This has occurred in particular through the agreement that clearing members should make additional contributions

*Many CCPs in the EU have already improved their recoverability. However, there is no legal basis requiring all CCPs to maintain recovery instruments.*

to the default funds. However, there is no legal basis to date requiring all CCPs to maintain recovery instruments. The CPMI and IOSCO set out detailed standards for recovery plans back in 2014.<sup>24</sup> In this context, a study by the CPMI and IOSCO on the financial risk management and recovery practices at ten global derivatives CCPs has revealed considerable divergences in the implementation of these standards by individual CCPs.<sup>25</sup>

The resolution of CCPs that are unlikely to return to viability through recovery measures likewise serves to maintain the continuity of the CCPs' critical clearing services in order to avoid negative effects on

financial stability. However, the resolution is carried out by resolution authorities with special powers. Detailed resolution principles are being drafted at the international level. The FSB has already developed principles<sup>26</sup> that are currently being fleshed out in more detail.<sup>27</sup> Specific requirements are scheduled for adoption in mid-2017. For the purpose of implementing these international requirements, the European Commission has announced a legislative initiative for a European recovery and resolution regime for CCPs.

In order to be able to absorb the losses incurred by a CCP in danger of defaulting, the available financial resources must, if needed, be as extensive, secure and liquid as possible. If the losses are attributable to the default of a clearing member, these resources may include

*One could consider generally increasing the own funds available to CCPs.*

funds earmarked, but not yet used, for the CCP's risk management (CCP default waterfall). That said, the available resources are not limited to those in the pre-funded waterfall but can, for example, include contractually agreed additional contributions from the clearing members to the default funds or, indeed, retained variation margins. From a macroprudential point of view, it should be borne in mind that the counterparty credit risks that were previously concentrated at the CCP could be partially shifted back to the clearing members if the CCP were in danger of defaulting. Therefore, an analysis would need to be carried out on a case-by-case basis as to whether, because of the resulting contagion effects emanating from the clearing members for example, such a shift would be justifiable with regard to the

<sup>24</sup> See Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2014).

<sup>25</sup> See Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2016).

<sup>26</sup> See Financial Stability Board (2014).

<sup>27</sup> See Financial Stability Board (2016).

stability of the entire system. One could also consider generally increasing the own funds available to CCPs *ex ante* so that these could be called on in periods of stress. In this vein, the ESRB has proposed that CCPs' contributions of own resources to the default waterfall be set according to the volume of transactions they clear rather than according to static criteria, as is currently the case.<sup>28</sup>

In light of the feedback effects between the recovery or resolution of CCPs and the rest of the financial system, it seems advisable for macroprudential supervisors to be suitably involved in the drafting of recovery and resolution plans. This would help ensure that the impact of the individual measures on financial stability is adequately assessed.

*It seems advisable for macroprudential supervisors to be suitably involved.*

## ■ List of references

Abruzzo, N and Y-H Park (2016), An empirical analysis of futures margin changes: determinants and policy implications, *Journal of Financial Services Research*, Vol 49, No 1, pages 65 to 100, February 2016.

Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2012), *Principles for financial market infrastructures*, April 2012.

Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2014), *Recovery of financial market infrastructures*, October 2014.

Committee on Payments and Market Infrastructures and International Organization of Securities Com-

missions (2015), *Public quantitative disclosure standards for central counterparties*, February 2015.

Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2016), *Implementation monitoring of PFMI: level 3 assessment – report on the financial risk management and recovery practices of 10 derivatives CCPs*, August 2016.

Cont, R and T Kokholm (2014), *Central clearing of OTC derivatives: bilateral vs multilateral netting*, *Statistics and Risk Modeling*, Vol 31, No 1, pages 3 to 22, March 2014.

Deutsche Bundesbank (2006), *Monthly Report*, June 2006.

Duffie, D and H Zhu (2011), *Does a central clearing counterparty reduce counterparty risk? Review of Asset Pricing Studies*, Vol 1, No 1, pages 74 to 95, December 2011.

European Securities and Markets Authority (2016), *EU-wide CCP stress test 2015*, April 2016.

European Systemic Risk Board (2015a), *ESRB report on the efficiency of margining requirements to limit pro-cyclicality and the need to define additional intervention capacity in this area*, July 2015.

European Systemic Risk Board (2015b), *ESRB report on issues to be considered in the EMIR revision other than the efficiency of margining requirements*, July 2015.

European Systemic Risk Board (2016), *ESRB report to the European Commission on the systemic risk*

---

<sup>28</sup> See European Systemic Risk Board (2015b), p 4 f.

implications of CCP interoperability arrangements, January 2016.

Financial Stability Board (2014), Key attributes of effective resolution regimes for financial institutions, II-Annex 1: resolution of financial market infrastructures (FMIs) and FMI participants, October 2014.

Financial Stability Board (2016), Essential aspects of CCP resolution planning, Discussion Note, August 2016.

Krahnert, J P and L Pelizzon (2016), "Predatory" margins and the regulation and supervision of central counterparty clearing houses (CCPs), SAFE White Paper No 41, September 2016.

Pirrong, C (2011), The economics of central clearing: theory and practice, ISDA Discussion Paper Series, No 1, May 2011.

## ■ Glossary

<b>B2B</b>	Business to Business
<b>B2C</b>	Business to Consumer
<b>BaFin</b>	Federal Financial Supervisory Authority
<b>BIS</b>	Bank for International Settlements
<b>BLS</b>	Bank Lending Survey
<b>C2B</b>	Consumer to Business
<b>CCCS</b>	Central Counterparty Clearing Statistics
<b>CCP</b>	Central Counterparty
<b>CPMI</b>	Committee on Payments and Market Infrastructures
<b>CRD IV</b>	Capital Requirements Directive IV
<b>CRR</b>	Capital Requirements Regulation
<b>EBA</b>	European Banking Authority
<b>ECB</b>	European Central Bank
<b>EIOPA</b>	European Insurance and Occupational Pensions Authority
<b>EMIR</b>	European Market Infrastructure Regulation
<b>ESMA</b>	European Securities and Markets Authority
<b>ESRB</b>	European Systemic Risk Board
<b>ETF</b>	Exchange-Traded Fund
<b>EU</b>	European Union
<b>FSAP</b>	Financial Sector Assessment Program
<b>FSB</b>	Financial Stability Board
<b>GDP</b>	Gross Domestic Product
<b>HHI</b>	Herfindahl-Hirschman Index
<b>IAIS</b>	International Association of Insurance Supervisors
<b>IBRN</b>	International Banking Research Network
<b>IFRS</b>	International Financial Reporting Standards
<b>IMF</b>	International Monetary Fund
<b>IORPs</b>	Institutions for Occupational Retirement Provision
<b>IOSCO</b>	International Organization of Securities Commissions
<b>LCR</b>	Liquidity Coverage Ratio
<b>NSFR</b>	Net Stable Funding Ratio
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>OFR</b>	Office for Financial Research
<b>ORSA</b>	Own Risk and Solvency Assessment
<b>O-SIIs</b>	Other Systemically Important Institutions
<b>OTC</b>	Over-the-Counter
<b>P2P</b>	Peer to Peer
<b>P/B ratio</b>	Price-Book ratio
<b>P/E ratio</b>	Price-Earnings ratio



<b>PFMI</b>	Principles for Financial Market Infrastructures
<b>SCR</b>	Solvency Capital Requirement
<b>SLB</b>	Systemic Liquidity Buffer
<b>SLS</b>	Systemic Liquidity Shortfall
<b>SPV</b>	Special Purpose Vehicle
<b>SSM</b>	Single Supervisory Mechanism
<b>UFR</b>	Ultimate Forward Rate

## 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 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

October 2016	Significance and impact of high-frequency trading in the German capital market
September 2016	The performance of German credit institutions in 2015
August 2016	Monetary policy and banking business
July 2016	Evolution of the Bank Lending Survey since the onset of the financial crisis Approaches to resolving sovereign debt crises in the euro area Bank recovery and resolution – the new TLAC and MREL minimum requirements
May 2016	Monetary policy and banking business
April 2016	Stock market valuations – theoretical basics and enhancing the metrics
February 2016	Monetary policy and banking business

January 2016      The supervision of less significant institutions in the Single Supervisory Mechanism  
December 2015    Deposit protection in Germany

## ■ Discussion papers

42/2016	Spillover effects of credit default risk in the euro area and the effects on the euro: a GVAR approach	Timo Bettendorf
41/2016	Financial shocks and inflation dynamics	Angela Abbate, Sandra Eickmeier, Esteban Prieto
39/2016	Learning about banks' net worth and the slow recovery after the financial crisis	Josef Hollmayr, Michael Kühl
38/2016	The effects of government bond purchases on leverage constraints of banks and non-financial firms	Michael Kühl
37/2016	Potential implications of a NSFR on German banks' credit supply and profitability	Matthias Schmitt, Christian Schmaltz
34/2016	Cross-border transmission of emergency liquidity	Thomas Kick, Michael Koetter, Manuela Storz
30/2016	How does P2P lending fit into the consumer credit market?	Calebe de Roure, Loriana Pelizzon, Paolo Tasca
29/2016	Capturing information contagion in a stress-testing framework	Kartik Anand, Céline Gauthier, Prasanna Gai, Moez Souissi
27/2016	International banking and cross-border effects of regulation: lessons from Germany	Jana Ohls, Marcus Pramor, Lena Tonzer
25/2016	Flying under the radar: the effects of short-sale disclosure rules on investor behavior and stock prices	Stephan Jank, Christoph Roling, Esad Smajlbegovic
24/2016	The payout behaviour of German savings banks	Matthias Köhler
23/2016	Transmission of global financial shocks to EMU member states: the role of monetary policy and national factors	Maria Gelman, Axel Jochem, Stefan Reitz
22/2016	Banks' interest rate risk and search for yield: a theoretical rationale and some empirical evidence	Christoph Memmel, Atılım Seymen, Max Teichert
20/2016	The effect of bank shocks on firm-level and aggregate investment	João Amador, Arne J Nagengast
18/2016	Black Monday, globalization and trading behavior of stock investors	Jeong-Ryeol Kurz-Kim
17/2016	Asset encumbrance, bank funding and financial fragility	Toni Ahnert, Kartik Anand, Prasanna Gai, James Chapman
16/2016	Interbank intermediation	Marcel Bluhm, Co-Pierre Georg, Jan-Pieter Krahenen
15/2016	High-frequency trading in the Bund futures market	Kathi Schlepper
14/2016	How central is central counterparty clearing? - A deep dive into a European repo market during the crisis	André Ebner, Falko Fecht, Alexander Schulz

13/2016	The joint dynamics of sovereign ratings and government bond yields	Makram El-Shagi, Gregor von Schweinitz
11/2016	Traditional banks, shadow banks and the US credit boom – credit origination versus financing	Robert Unger
09/2016	Credit risk interconnectedness: what does the market really know?	Puriya Abbassi, Christian Brownlees, Christina Hans, Natalia Podlich
08/2016	Cyclical investment behavior across financial institutions	Yannick Timmer
03/2016	Heterogeneity in euro-area monetary policy transmission: results from a large multi-country BVAR model	Martin Mandler, Michael Scharnagl, Ute Volz
48/2015	Monetary policy and the asset risk-taking channel	Angela Abbate, Dominik Thaler
46/2015	Credit risk stress testing and copulas – is the Gaussian copula better than its reputation?	Philipp Koziol, Carmen Schell, Meik Eckhardt
45/2015	Testing for Granger causality in large mixed-frequency VARs	Thomas B Götz, Alain Hecq, Stephan Smeekes
44/2015	Fundamentals matter: idiosyncratic shocks and interbank relations	Peter Bednarek, Valeriya Dinger, Natalja von Westernhagen
42/2015	Monetary-fiscal policy interaction and fiscal inflation: a tale of three countries	Martin Kliem, Alexander Kriwoluzky, Samad Sarferaz
41/2015	Do speculative traders anticipate or follow USD/EUR exchange rate movements? New evidence on the efficiency of the EUR currency futures market	Oliver Hossfeld, Andreas Röthig
40/2015	Arbitraging the Basel securitization framework: evidence from German ABS investment	Matthias Efing
39/2015	Cyclicality of SME lending and government involvement in banks	Patrick Behr, Daniel Foos, Lars Norden

