

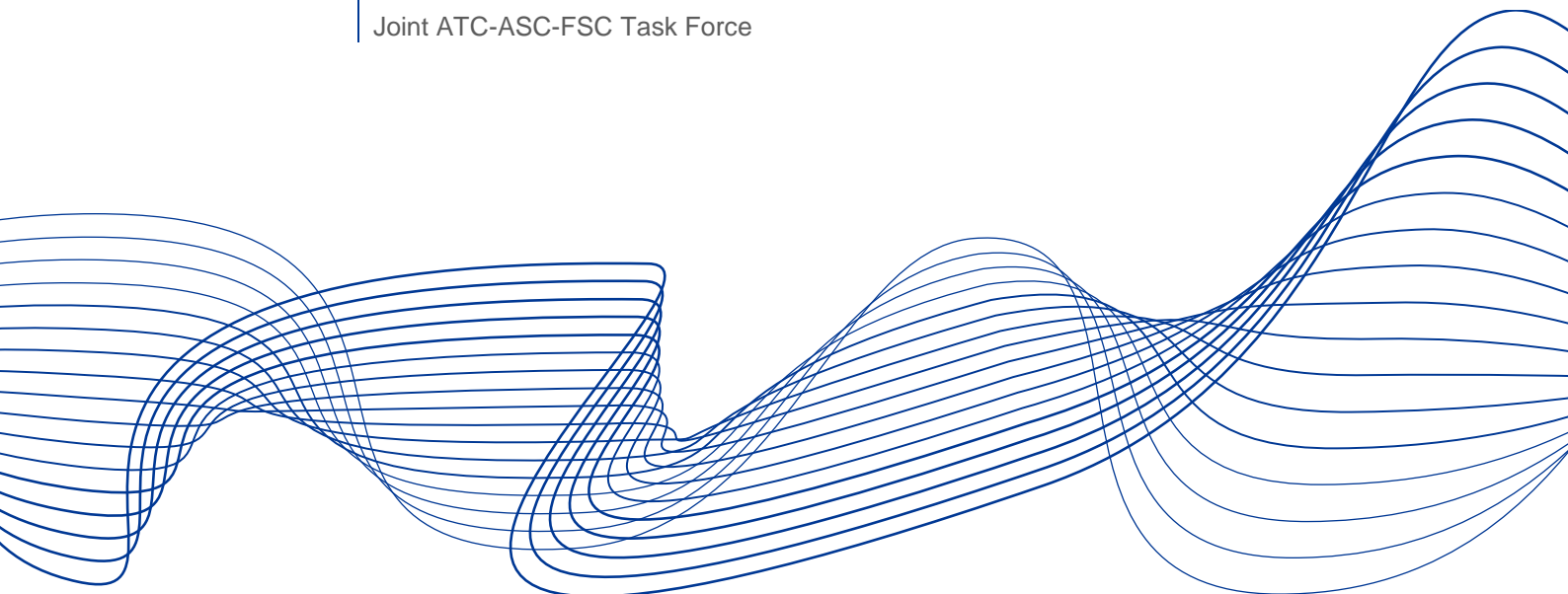
Technical documentation

Section B

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The impact of low interest rates and ongoing structural changes on the banking system: assessment of vulnerabilities, systemic risks and implications for financial stability

Joint ATC-ASC-FSC Task Force



ESRB

European Systemic Risk Board

European System of Financial Supervision

“In the business world, the rear-view mirror is always clearer than the windshield.”

Warren Buffet

“[...] the need to increase profitability and potentially adapt business models is a challenge facing all banks in the euro area. All of them feel the strong winds from low economic growth and low interest rates. And all of them have to find ways of dealing with these circumstances.”

Danièle Nouy¹

¹ Speech by Danièle Nouy, Chair of the ECB's Supervisory Board, Deutsche Bank – Bank Capital Forum, London, 23 February 2016.



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Executive Summary

The level of interest rates is of major importance to financial market participants, including banks. In a context where interest rates remain low for a long period of time (in one scenario over a ten-year horizon), the impact on the EU banking sector could be quite significant. In particular, the following vulnerabilities have been identified, and have the potential to trigger structural changes.

Resilience. The resilience of the EU banking sector may weaken under the “low for long” scenario if the negative impact on bank profitability of reduced net interest income outweighs the potential positive impact on credit risk due, for example, to reduced impairments. A low interest rate environment implies lower net interest margins because it is difficult to set negative deposit rates for bank customers (which could be required to maintain net interest margins, recovering the cost of equity in a period of low asset returns). At the same time, other components of bank profitability may benefit from low interest rates in the short term given, for example, increased trading activity due to rising asset prices and a reduction in impaired loans. On balance, over the longer term, negative effects are expected to outweigh positive effects if subdued real economic growth persists. Nevertheless, this outcome is highly uncertain. Pressures on bank profitability could lead to increased risk-taking and lower asset quality to compensate for the reduced interest income. In terms of capital, using retained earnings to boost nominal capital may not be enough to meet new regulatory requirements (capital buffers and MREL/TLAC being the most prominent of these) and banks may be forced to deleverage if investors’ appetites for banks’ equity are not sufficiently large. This could be the case if investors’ expectations of banks’ return on equity are adjusting too slowly to the new equilibrium. A negative feedback loop among low profitability, depressed new lending and real economic growth could persist in the “low for long” scenario.

Credit cycle. Low interest rates should be conducive to an increase in loan volumes by fostering loan creation, as long as credit demand is not suppressed by expectations of low growth. However, lower credit standards may be incentivised, reducing asset quality in the long run. The relative uncertainty over which scenario will prevail (“low for long” or “back to normal”) may encourage banks to indulge in an excessive relaxation of credit standards and/or widespread forbearance. In that case excessive forbearance and relaxed credit expansion would have a negative effect on the quality of banks’ asset growth. It is also possible that there would be shifts within banks’ loan portfolios towards more profitable or less capital-costly loans. Additionally, banks’ probable increased risk tolerance (search for yield) could expose them to significant losses in the future, which may be triggered, amongst other factors, by a return to higher interest rates due to higher credit risk rather than a solid economic recovery.

Funding. Costs of market funding would continue to remain low in an environment of low interest rates, which could then encourage banks to issue more debt than equity (negatively impacting on bank resilience). Stronger reliance on deposit funding should improve the stability of bank funding, except for the fact that banks’ reluctance to pass on negative rates to customers would further depress net interest margins. Funding issues are more likely to arise under the “back to normal” scenario, e.g. when investors reconsider the currently low premiums they charge for holding hybrid bank debt (additional Tier 1) and other debt instruments once MREL/TLAC implications have been fully priced in.

Maturity and liquidity transformation. The net effect on the degree of maturity transformation is unclear ex ante. Low interest rates may cause a decline in maturity transformation in the long term, since banks would be able to issue liabilities with longer maturities in the market. That would also reflect the fact that the depositors’ base of banks would not be significantly affected. But search-for-yield might also be conducive to banks terming out their assets, e.g. by increasing their share in



mortgages and sovereign bonds. This could increase the risk of fire sales and the pro-cyclical behaviour of banks. This effect, if it materialised, would probably be even stronger for the non-bank financial sector and would be mutually reinforcing.

Interconnectedness. The shift of depositors to similar products offered by insurers or asset managers and a potential crowding-out of sound investments in the provision of credit, should widespread forbearance and relaxed credit standards prevail, could diminish the role of EU banks in the financial system. In addition, provided banks increase their reliance on market funding, they will become, in broad terms, more interconnected with financial markets. Similarly, on the regulatory side, the Capital Markets Union may further diminish the role of the banking channel in the provision of credit to the real economy, while increasing the fee income of banks.

Market structure and concentration. Low profitability and limited opportunities to raise equity in primary markets may trigger mergers and acquisitions within the EU. That could either be seen as a welcome development in banking system consolidation or could exacerbate the “too big to fail” problem and decrease competition within the EU banking system. In the event (not very likely under current conditions) that consolidation of the EU banking system were to take place with cross-border operations, tensions in relations between home and host supervisory authorities could be exacerbated, a situation the EBA and the SSM would have to address.

Current regulatory initiatives, to be finalised during 2016, may address some of the vulnerabilities observed (and may also put pressure on banks’ profitability). Theoretically, solvency ratios, including capital buffers, will limit risk-taking by banks, since increases in the risk weights of assets must be covered by a corresponding increase in equity. Liquidity ratios should also limit the shift towards riskier assets, since banks will be obliged to maintain a minimum stock of liquid assets (Liquidity Coverage Ratio) and to rely on stable funding sources (Net Stable Funding Ratio). To what extent the new regulation will be able to address the possible vulnerabilities associated with a “low for long” interest rate scenario, or whether additional macroprudential measures will be needed, is yet to be analysed. Furthermore, the expected implementation of IFRS 9 may have a non-negligible effect on impairment charges for EU banks in the medium term.

The assessment presented so far applies to a scenario where low interest rates remain low for a prolonged period of time along with subdued growth. Under the alternative scenario where there is a return to normal rates after a short period of time (2-3 years), some of the vulnerabilities and structural changes outlined above may not occur or may be inverted (for example, net interest margins may recover, loan affordability might be hampered and asset quality could decrease). Simultaneously, risks embedded in this rise in interest rates may appear:

- Banks with fixed-rate loans could see potential threats to profitability once interest rates rise, having issued fixed-rate loans at lower rates. This is relevant since, if liabilities have shorter maturities than assets and/or a higher share of variable-rate instruments, their repricing occurs at a faster speed than the repricing of assets (in particular longer-term, real-estate related loans).
- Higher market volatility and a lower appetite for banks’ debt could substantially increase the cost of market funding for banks at a moment where the cost of deposits is also expected to increase.

Against this background, a thorough and comprehensive assessment of the identified risks and vulnerabilities under both scenarios suggests that macroprudential policy actions should be explored for risks concerning resilience for both the “low for long” and the “back to normal”



scenarios. In the first case (resilience in the “low for long” scenario), the risk has three different facets: (i) low profitability reduces banks' ability to accumulate capital organically via retained earnings and to supply credit², (ii) low profitability may raise viability concerns for weakly capitalised banks and provides incentives for “gambling for resurrection”, and (iii) the persistent weakness of banks' balance sheets impedes the resolution of problem assets and could lead to a further deterioration in asset quality (e.g. an increase in NPLs, deterioration of credit standards and misallocation of capital). In the case of a risk to bank resilience under the “back to normal” scenario, a distinction needs to be drawn between countries where fixed-rate loans dominate (in which case the risk would stem from negative movements in net interest income) and countries with a majority share of variable-rate loans (where tensions would originate from borrowers' higher debt servicing costs).

The macroprudential authorities should monitor the remaining identified risks closely and carefully since, even if their materialisation would not have a widespread negative impact on the EU banking system, there could be areas and segments which are especially vulnerable to these.

² Under the “low for long” scenario the decrease in net interest margin mainly affects banks where variable-rate loans are predominant, whereas under the “back to normal” scenario the banks most affected are those where fixed-rate loans dominate.



Introduction

The level of interest rates is an important variable for participants in financial markets, including banks and other credit institutions³. When interest rates stay at low levels for a prolonged period of time the behaviour of market participants, in general, and banks, in particular, is strongly affected and may give rise to a series of vulnerabilities specific to such an environment (including, among others, low profitability or increased risk appetite). If these vulnerabilities remain unaddressed systemic risk might increase in the whole economy. Once the underlying factors leading to a low interest rate environment have been identified and clearly understood, macroprudential policy may play a role in curtailing the adverse effects of some of these vulnerabilities.

Given the decisive role of banks in the EU's financial sector, it is the purpose of this report to describe the main impact and potential vulnerabilities arising from an environment where interest rates remain low. This is an exercise in imagining how low interest rates may change the EU banking system in the long run, rather than an attempt to capture evidence of the more immediate impact of low interest rates on banks. In terms of scope, the level of interest rates is considered exogenous and is not discussed from a monetary policy perspective. Indeed, it could be argued that the trend towards lower interest rates started in recent decades, and is not limited to the monetary policy decisions that central banks around the world have made since 2008.

Two scenarios are used throughout the assessment: in the first, interest rates remain at a low level for a prolonged period of time (at least ten years), while in the second there is a gradual return to higher levels, which could be considered “normal”. In both cases, the analysis of the long-term effects of low interest rates is mostly qualitative, given that any quantitative prediction for a long-term horizon (more than five years) would be rather uncertain⁴. Therefore, some of the vulnerabilities mentioned in the report may not materialise or may be compensated for by other factors – regulation being the most prominent of these. Indeed, regulation should, theoretically, act as a catalyst for reducing risks in the banking system, by correcting them at source.

The report commences with a discussion of the risk and vulnerabilities in a low interest rate environment. The impact on banks of potential vulnerabilities from a low interest rate environment has been divided into six areas, which are further described in the sections that follow. These six areas are: resilience (profitability and solvency), credit cycle, funding, liquidity and maturity transformation, interconnectedness, and market structure and concentration. While the first three areas may bring visible effects even in the short term, the effects of the last three are expected to arise only in the very long term. The report then continues with an assessment and prioritisation for each of the identified risks. The report contains six annexes. The first seeks to illustrate graphically the effect of low interest rates on banks over time, noting the different areas of banking activities that are affected. A summary table of the risk assessment is shown in the second annex. The third annex contains charts that support the analysis of vulnerabilities. A proposal for clustering EU national banking systems, based on indicators from the Analysis of National Banking Systems (ANBS), is outlined in the fourth annex. The fifth annex describes a simple simulation exercise of the evolution of net interest income for fixed-rate loans under the “back to normal” scenario. Finally, in the sixth annex, the report shows the results of some empirical analyses of the impact of low interest rates on the profitability of banks.

³ For ease of reference, the term “banks” will be used throughout this report to mean “banks and other credit institutions”.

⁴ Under these circumstances, predictions cannot be made without making untenable assumptions or, if made, the prediction itself is subject to a huge confidence interval and is thus of little use.



A. Identification of risks and vulnerabilities



Section 1

Resilience of banks: profitability and solvency

Resilience is a key component of a sound financial system in the sense that it allows banks to withstand negative shocks and to be able to provide financial services even under adverse conditions. One of the main components of resilience is solvency, which is understood as focusing on the capital set aside by banks to withstand unexpected losses. Another important component is profitability, since profits generated by the activities of the banks may signal how effective and sustainable the activities of banks are in the long term. At a microprudential level, profits may also be used to build buffers to compensate for unexpected losses. The lack of such profits may compromise the solvency and, even, the existence of a bank, leading to its potential resolution. When these developments take on a system-wide perspective, they determine how the EU's banking system will look in the long term.

1.1 Impact of low interest rates on profitability

The determinants of bank profitability are usually split into three broad groups: (i) bank-specific factors, (ii) macroeconomic factors and (iii) structural factors. The level of interest rates should be included in the second group, alongside inflation and growth, among other variables (ECB (2015)). Bank profitability is usually measured using a ratio of nominal profits to a stock variable from the balance sheet. Hence, when discussing the expected behaviour of bank profitability under a low interest rate scenario, it is also important to understand what has happened to the banks' nominal profits.

Under a scenario where interest rates remain low for a long period of time following subdued growth, this environment might, *ceteris paribus*, negatively affect the profitability and the nominal profits of banks, due to a combination of factors of different sign. Of these factors, the following are highlighted:

1. Lower net interest margins. An environment of low interest rates negatively impacts banks' net interest margin (NIM), *ceteris paribus*. When rates decrease, interest revenues are typically hit more than expenses, as a proportion of banks' liabilities (in particular retail sight deposits) is quite insensitive to interest rate changes (Chart 1⁵). The speed at which interest revenues and expenses react to rate changes is itself a function of banks' asset and funding structures. Once the low level of interest rates has been fully internalised by banks, the net interest margin will remain low (see Annex 6 or Claessens et al. (2016) for the most recent results). Whether profitability improves or deteriorates further will depend on volume growth and credit (and other) risks materialising in a low-growth environment.
2. Higher interest revenues due to asset growth. While unit margins may decrease, as outlined above, the expected increase in the volume of loans, derived from a low interest rate environment, may increase the total interest revenues of banks. Together with fair value gains and the decrease in interest expenses, this has contributed to the trend for net interest income in recent quarters (Chart 2). In the long run the trend might be unstable, as asset growth will ultimately depend on the normalisation of real economy conditions and, as a consequence, credit demand. Banks might also increase the loan rates offered to customers as a response

⁵ Net interest margins have decreased in both the US and the EU over the last twenty years, following the downward trend of interest rates. For a discussion on the different levels of margins on both sides of the Atlantic, please refer to ECB (2015), Schildbach and Wenzel (2013), and Weigand (2015).



to low market rates as they target a nominal amount of interest revenues⁶. That would sustain interest margins but depress loan growth. The ultimate impact of low rates on balance sheet growth and on banks' profitability is therefore at best unclear ex ante: assets cannot grow indefinitely so the decrease in margins is expected to prevail over the increase in volumes, especially in a scenario where low interest rates coexist with low growth.

3. Attempts to increase net fee income. In an attempt to diversify the sources of revenues following the decrease in net interest revenues, banks may focus more on fee-related activities⁷. This special focus would signal a change in the business model of banks, although it might not be able to fully compensate for the decrease in revenues from interest, since net interest income is, so far, the main source of income for EU banks (Chart 3). Additionally, if economic growth remains subdued, fee income might also be adversely affected by sluggish demand for fee-related bank services. Furthermore, there are other factors which would negatively impact the growth of fee and commission income, including digitalisation, transparency, reduced complexity of products, and derivatives becoming more costly due to clearing obligations and related collateral requirements.
4. Impact on impairment charges⁸. An immediate effect of low interest rates is an improvement in loan affordability, which in turn results in a lower rate of non-performing loans and a lower recognition of impairment charges in the income statement of banks. However, in the long term, since credit standards might be further relaxed in the search for new loans and under a scenario of low interest rates and low growth, asset quality might decline and therefore the reduction of impairment charges could reverse at some point.

In general, a low interest rate/low profitability environment should incentivise banks to compensate for declining interest income with higher trading income and fee-generating business. Trading activity usually rises with high asset price volatility. Whether asset price volatility would be structurally low or high under the "low for long" scenario is not obvious, however, especially given structural trends that are reducing market liquidity. The risk is, of course, that in certain cases, when banks are not profitable enough in their core businesses, they may try to "gamble for resurrection" and engage in excessively risky trading activities.

Even if some of the above factors have a positive effect on banks' profits for a given period, the overall impact in the long term will be negative if (i) the increase in loan volume is not able to compensate for the decrease in the net interest margin per loan; (ii) increased competition limits the growth of net fee income; (iii) recurrent capital gains are not recognised, and (iv) the expected reduction in impairment charges is not sustained in the long run if growth remains subdued (as is the assumption under the "low for long" scenario). In line with this, the recent Transparency Exercise by the EBA (EBA (2015c)) reveals that, for data as of 30 June 2015, net interest income remains under pressure due to low interest rates, while income from trading and from fees and commissions has slightly increased its weight in banks' profit and loss accounts. Charges for impairments and provisions (the latter mostly related to conduct risk) still account for a significant proportion of banks' net operating profit in many banking systems, negatively affecting their

⁶ There is some evidence of this effect for Switzerland (see Bech Malkhozov 2016), but not for Denmark (see Bruegel (2014), Rasmussen (2013) and Nielsen and Aalund (2014)). While for the euro area there is no evidence of increasing loan rates up to now, over a longer-term horizon, there is not enough existing evidence to discard this possibility.

⁷ Like, amongst others, providing advice in the issuance of securities, clearing and settlement, custody, asset management or fiduciary transactions.

⁸ The predicted adoption of IFRS 9 would most probably cause the impairment charges to rise (see Deutsche Bank (2015)), even if this seems counterintuitive in an environment of low interest rates. In 2018, the new accounting standard IFRS 9 will enter into force. One of the main new features of the standard is that it uses the concept of expected loss for the recognition of impairment, instead of the incurred loss used so far in accounting.



profitability. These have, however, been falling in recent quarters, prompting an aggregate improvement in banks' overall profitability.

It should be noted, however, that while interest rate levels might impact the trend for bank profitability in the EU, other relevant factors, especially an improvement in economic conditions, will also be key to determining EU banks' profitability in the coming years⁹. The risk is that a negative feedback loop involving low profitability, depressed new lending and real economic growth could persist under the "low for long" scenario. However, if it were possible for growth to recover, the above profitability issues could be avoided. This is particularly relevant to the future trend for impairment charges, which depend mostly on which scenario finally materialises¹⁰.

1.2 Impact of low interest rates and structural changes on solvency

There will be two different drivers for additional capital needs in the coming years. The first refers to the new requirements stemming from regulation, including the full implementation of the CRD/CRR, the TLAC/MREL¹¹ and the leverage ratio. The second is an expansion of credit materialised, which would increase the size of banks' balance sheets and, via an increase in risk-weighted assets, could affect the amount of nominal equity banks must hold¹².

To meet these additional capital requirements or to offset any other shock, banks may no longer rely as much on retained earnings as they did in the past, given lower profitability, and may need to issue fresh capital in the markets. The analysis in Annex 6 sees this as unlikely, unless the profitability of EU banks falls sharply¹³. If banks remain unable to meet their cost of equity from internal returns they may struggle to attract investors to meet their capital needs (see Claessens et al. (2016)).

In the above case there are two opposing forces which could increase or decrease risk appetite for a bank's equity. On the one hand, low profitability and low expectations of any future improvement could reduce investor appetite¹⁴. Alternatively, investor appetite may be greater due to depressed yields in other segments of the financial markets and, to the extent that regulation and supervision are able to reduce risks in the banking system, investors might demand lower ratios for the return on equity. Which of the two factors dominates and how they interact with the expected credit expansion is not at all clear at this stage.

A risk of further deleveraging may emerge over a longer horizon, as banks would be unable to sustain the expansion of their balance sheets given their capital needs, and would be forced to deleverage. Whether this risk materialises is of course uncertain, but it should certainly be borne in mind when considering the effects of low interest rates on banks. Furthermore, a combination of deleveraging (understood as a reduction of the ratio of total assets to equity) and low asset profitability (measured by the return on assets) would hamper the return to levels of return on equity

⁹ See the results of the analysis carried out in Annex 6.

¹⁰ Under a scenario of low interest rates for a prolonged period of time alongside low growth ("secular stagnation"), impairment charges are expected to rise in the long term. A scenario such as "back to normal", where the level of interest rates is basically linked to the financial cycle (and is not the result of structural factors) would see a decline in impairment charges when the real economy recovers.

¹¹ For further reference to the MREL/TLAC, please see BBVA (2014) and EBA (2015a).

¹² If the capital ratio is defined as Equity / Risk-weighted Assets and is kept constant above a fixed value x , then any increase in the denominator of the ratio would call for an increase in the numerator of the ratio, in order to maintain a capital ratio of x .

¹³ For a ROE of 5%, very close to current levels, and under several strong assumptions (no profit distribution, growth of RWA at the same rate as growth of credit and a capital ratio of 12.5% for all banks), the capital deficit generated organically would be lower than EUR 100 billion and fully compensated for by a capital surplus in other banks or jurisdictions. See Annex 6 for further details.

¹⁴ One could argue that this was what occurred in the falls in the share prices of banks in January 2016.



seen in recent years. In the current environment, previous levels of return on equity cannot be used as a benchmark for future trends in the banking system.

Box 1

Interaction of the low interest rate environment with regulatory initiatives

Banks in the EU are currently adopting several pieces of regulation correcting some of the imbalances which led to the financial crisis of 2007-2008. The following paragraphs briefly describe the interaction between the different regulatory initiatives and the low interest rate environment.

Solvency. Solvency ratios aim at ensuring that banks have sufficient capital (own funds) to cover unexpected losses stemming from risks. In addition, beyond Pillar 1 and Pillar 2 requirements, there are a number of buffers which are added to the minimum capital requirements. These buffers are the capital conservation buffer, the institution-specific counter-cyclical capital buffer, the G-SII buffer, the O-SII buffer and the systemic risk buffer. The build-up of these buffers is expected to increase the total capital held by banks. During a prolonged period of low interest rates, where bank profitability is low and the cost of raising equity is still high (compared to RoE), reaching a higher level for CET1 ratios may prove to be challenging.

Liquidity. The Liquidity Coverage Ratio (LCR) was introduced to ensure that banks have sufficient high-quality liquid assets (HQLA) to survive a major stressed scenario lasting 30 calendar days. To comply with the ratio, banks must hold HQLA, which are specifically those assets which yield a lower return, and this might put downward pressure on profitability. At the same time, the valuation of HQLA is likely to increase in a low interest rate environment, making compliance with this ratio easier.

The Net Stable Funding Ratio (NSFR) seeks to compare the stable funding sources of a bank (namely, deposits), with the asset side of a bank's balance sheet. Here, the NSFR may act as an anchor for deposits, which banks are very keen to maintain for the computation of the ratio. Several factors should be considered when discussing the interaction of the NSFR with low interest rates:

- Low interest rates tend to reduce the cost of issuing long-term debt – this implies a lower cost of stable funding and facilitates compliance with the NSFR. By issuing larger volumes of these types of securities, banks increase their NSFR while limiting the cost of lengthening the maturity of their liabilities.
- Items requiring stable funding are weighted on the basis of their liquidity and quality. For example, level 1 HQLA receive a factor of 5% while non-HQLA with a maturity longer than one year receive a factor of 85%. There is, therefore, once again an incentive to hold HQLA, which might affect banks' profitability.
- At the same time, banks' search for yield may trigger a shift between HQLA and non-HQLA, reducing their ability to comply with the NSFR.

Leverage. The leverage ratio is a non-risk based ratio introduced to limit the excessive use of liabilities, rather than equity, to finance bank assets. The ratio is neutral for risk weights, since these are not used in the calculation. In other words, assets with very low and with very high risk weights count the same for the leverage ratio.

Concentration. The large exposures regime imposes limits on the concentration of exposures to a single counterparty. In broad terms, a bank shall, after taking into account the effect of credit risk mitigation techniques, not have exposures to a customer or group of connected customers exceeding 25% of its eligible capital.



Bail-in liabilities. The Financial Stability Board (FSB) has recently published the standard for the Total Loss Absorbing Capacity (TLAC), aimed at large international banking groups. The TLAC (as well as the MREL for all EU banks) standards define the minimum requirements for the instruments and liabilities that should be readily available for bail-in during resolution. The implementation of these standards in 2019 will impact banks' activities, specifically their lending and borrowing rates¹⁵. Banks, anticipating the implementation of TLAC, are now issuing more subordinated debt, which is eligible for TLAC. The current low interest rate environment allows this debt to be issued at a lower cost than some years ago, which means that the low interest rate environment is helping banks to comply with future TLAC requirements. However, EU banks still face a shortfall with regard to TLAC requirements – complying with these requirements in the future may negatively impact the net interest income and therefore the profitability of banks.

¹⁵ According to the FSB, the introduction of the TLAC would imply an increase in lending rates for the average borrower ranging from 2.2 to 3.2 basis points.



Section 2

Impact of low interest rates on the credit cycle

2.1 Provision of credit to the real economy

Interest rates are, by definition, the core variable when loans are granted; their levels and expectations of changes play a decisive role in the provision of credit by banks. In line with these assumptions and assuming there is an increase in investment, a low interest rate environment will significantly contribute to raising the demand for loans, which is actually the intended effect of expansionary monetary policy.

In addition, low interest rates over a prolonged period of time improve credit affordability by reducing the repayment burden faced by corporates and households, and therefore the incidence of borrower distress. However, the level of interest rates is one of the key factors used to assess customers' debt repayment capacity. This may lead to overly optimistic conclusions regarding this capacity and customers' creditworthiness, potentially even increasing access to credit for lower income customer categories. This overly positive assessment of borrower soundness may relate to an overvaluation of collateral or to the provision of credit with very high LTV/LTDI/SDI ratios, amongst others. In other words, credit standards may be further relaxed due to an overly positive assessment of the soundness of the borrower, based on an improvement in loan affordability, as well as increased pressure to expand loan volumes to offset the fall in net interest margins. Data from the ECB's Bank Lending Survey are already signalling a narrowing of credit margins and an easing of credit standards¹⁶, although at this stage the evidence does not conclusively prove whether this trend is excessive or not (Charts 4, 5 and 6)¹⁷.

Under current circumstances, the total national and bank credit-to-GDP gaps remain negative for the majority of EU Member States as a consequence of the collapse in credit growth during the crisis years. Once credit growth picks up significantly in the future, the counter-cyclical capital buffer may help to avoid periods of excessive credit growth. However, the counter-cyclical capital buffer cannot address two potential risks derived from a long period of low interest rates and low growth: (i) the excessive relaxation of credit standards¹⁸ and (ii) a shift in the credit portfolio towards more profitable and less capital-intensive segments (like consumer loans or mortgages, as opposed to loans to SMEs¹⁹), abandoning other loans that are needed to provide credit to the real economy.

A return of interest rates to higher levels will therefore worsen loan affordability for borrowers with lower or more volatile incomes, which could negatively impact banks' asset quality. Furthermore, the current high indebtedness of sovereigns, households and corporates could create a debt trap that could limit the positive demand side effect of low interest rates and could exacerbate the negative impact on customers' repayment burdens of a potential rise in interest rates.

¹⁶ Credit standards are still relatively tight when compared with the previous observations of the Bank Lending Survey, which started in 2003.

¹⁷ Indeed, banks' responses to the survey show that credit standards are still tight when compared to the midpoint of the range of credit standards since 2003.

¹⁸ Maddaloni and Peydró (2011) argue that, based on data on lending standards from the euro area and the USA, there is robust evidence that lending standards to firms and households are softened when short-term interest rates (monetary policy rates) have been too low for too long, especially for mortgage loans. When comparing the impact of short-term and long-term interest rates, they find that the softening impact of low short-term rates is statistically and economically more significant than the effect of long-term rates.

¹⁹ According to data from the EBA stress tests of 2014, the risk weight density in the exposure class "corporates – SME" is about twice as high as the risk weight density in the exposure class "Retail – Secured by real estate".



In principle, the expansion of loans should reach the real economy, understood as comprising households and non-financial corporations²⁰. Nonetheless, empirical evidence (Chart 8 and EBA (2015c)) shows that EU banks have recently increased their exposures to government bonds, thereby potentially contributing to the fall in sovereign yields. Additionally, the increased volume of loans to households (mostly as mortgages (Chart 7 and EBA (2015c)) could lead to increases in house price growth (mainly in large cities in certain countries).

2.2 Loan renegotiation and forbearance

Forbearance basically implies the amendment of the terms of conditions of a given loan, usually in favour of a borrower, when that borrower is facing financial difficulties²¹. Renegotiation applies when the borrower is not facing financial difficulties (Central Bank of Ireland (2013) and European Commission (2015)). In practice, even though the definitions are clear, the distinction between the two concepts is decidedly blurred.

There are several factors which contribute to a decision by banks and/or borrowers in favour of renegotiation/forbearance for existing loans. First, quite apart from the level of interest rates, intense competition between banks gives the borrower some bargaining power when renegotiating the terms of a loan,²² while the fall in the value of the loan collateral means banks have little incentive to liquidate the loan and sell the collateral in the market at a low price²³. In addition to these factors, an environment of low interest rates increases incentives for forbearance since:

- (a) derived from the yield curve in a low interest rate environment, the opportunity cost of receiving a payment at some point in the future rather than today is quite low; and
- (b) it is more costly for a bank to recognise impairment charges against a borrower in financial difficulty in the profit and loss statement than to support that borrower by improving loan conditions²⁴.

From a micro perspective, loan renegotiation and, to a certain extent, forbearance does not create any evident risk for the bank or for the borrower, as it mostly involves a private contract between two knowledgeable counterparties. This is fully true for the renegotiation of existing loans, although while forbearance may offer relief to troubled borrowers in the short term, in the long term, if widespread and extending over time, there may be negative effects (Andritzky (2014)). The negative effects of widespread forbearance can be grouped into three main categories:

1. Widespread forbearance may hide pockets of vulnerabilities until they cannot be contained any longer. At that point loans will need to be reclassified as non-performing, impacting on the profitability (and in extreme cases even the solvency) of the bank.
2. By providing a more optimistic view of the financial soundness of borrowers and banks, widespread forbearance might contribute to the mispricing of risks within the financial system.

²⁰ The empirical evidence from Japan shows that the focus of lending activity might be more on retail than on corporate given that, in general, (i) corporates are more sensitive to changes in economic activity and (ii) a rebound in corporate lending might lag behind economic recovery due to an overhang of unused capacities. However, Jiménez et al. (2014) found, using Spanish data, that a lower overnight interest rate spurs lower-capitalised banks to expand and prolong credit to riskier firms and to lend to riskier new applicants, granting them loans that are larger and longer term.

²¹ The term "forbearance" is understood to comprise loan evergreening (the continuous renewal of a short-term loan before it becomes due).

²² An environment of low interest rates, where the borrower is not immediately benefiting from them while low growth is challenging his/her ability to honour his/her debts, may provide strong incentives for the renegotiation of the terms and conditions of the existing loan.

²³ This is especially relevant in contexts of a rapid and excessive growth in real estate prices.

²⁴ An additional factor to consider is the potential incentive which the adoption of IFRS 9 may give for forbearance. According to IFRS 9, modifications to loans that reduce the present value of contractual cash flows will typically result in a modification loss and a consequent reduction in the loss allowance will be required.



3. Productive investment may be crowded-out from bank funding to the advantage of forbore loans, giving rise to a situation where the real economy (or at least a part of it) is subject to a credit crunch because the bank funding needed has already been allocated, with existing loans being forbore. In most cases these loans should simply be declared non-performing, which would decrease their balance sheet value through provisions, or written off or disposed of.

This last effect of widespread forbearance is one of the key factors explaining developments in Japan over the last two decades under a similar environment of low interest rates (see, among others, Bank of England (2014), Caballero et al. (2008), and Peek and Rosengren (2005)). At a European level, Homar et al. (2015) find, based on data from the recent ECB Comprehensive Assessment, that weak macroeconomic conditions, lax bank supervision and individual bank weaknesses are the key factors driving forbearance. An environment of low interest rates may weaken the position of banks, especially in terms of their sources of income, and is also expected to reflect subdued macroeconomic conditions. Therefore, even if loan affordability should make this less likely on the part of borrowers, excessive and widespread forbearance should be addressed to move the European Union away from a “Japanese” scenario. In this sense, the EBA ITS on the matter and the ECB Comprehensive Assessment could constitute relevant tools to address the issue and avoid the risks of widespread forbearance (a “Japanese” scenario).

2.3 Increased risk appetite

A prolonged period of low interest rates and its notably negative impact on banks’ net interest income, and a fall in the cost of market funding affects banks’ business strategies concerning higher risk tolerance. This is driven by several factors:

- (i) Banks generally follow “absolute return” strategies, i.e. the maximisation of a profitability ratio (return on assets or return on equity) or of the growth rate of net profits. This behaviour, in a context where nominal profits are at risk as outlined in the previous section, may push banks to pursue search-for-yield strategies, to revert to riskier and more profitable products (including “gambling for resurrection” in trading activities), to rely more on fee-generating activities, and to increase leverage (e.g. if a RoE target exists). The ultimate consequence of this is an increase in the riskiness of exposures and investment in new, potentially illiquid financial instruments.
- (ii) A low interest rate environment incentivises carry trades which may result in potentially high volatility and turmoil involving both asset prices and exchange rate misalignments.
- (iii) In a low interest rate environment incentives may become distorted, mispricing of risk may occur and the degree of substitutability of different financial instruments may vary, possibly resulting in the misallocation of resources.
- (iv) Increasing asset prices as a result of quantitative easing may lead, on the one hand, to profit frontloading but, on the other, to limited reinvestment opportunities.

If short-term interest rates are low relative to long-term rates, banks and other financial institutions may overinvest in assets of longer duration. Longer-maturity assets, granted at fixed rates, may render net interest margins less reactive to a rebound in interest rates than in the past.



Empirical evidence suggests that, at least at this stage, it is difficult to find evidence of increased risk taking in banks' balance sheets (see Charts 9, 10 and 11²⁵ in respect of asset duration, rating, term premia and stable funding). Anecdotal evidence suggests that banks are scaling down their hedging of new positions against a rise in interest rates. Banks' current strategies would be riskier in an increasing interest rates scenario but are fairly defensive in a prolonged period of low interest rates. In addition, empirical evidence suggests that increased risk-taking has been observed mainly in banks with solid trading expertise, sound profits and higher capital (Abbassi et al. (2015), Martynova et al. (2015), Camara et al. (2013), IMF (2009), and Boot and Ratnovski (2012)). One of the reasons for this counterintuitive behaviour might be that losses from trading activities can be absorbed by the capital and profits of these institutions, or simply that they are more difficult to hide since forbearance is not possible.

There are several factors which could, coupled with low interest rates, certainly generate negative effects in the future:

- (i) The lack of a consistent Pillar 1 charge for interest rate risk in the banking book.
- (ii) Compressed credit spreads. Search for yield and low risk aversion contribute to reduced credit spreads, decreasing the ability of investors to identify the underlying risk profiles of investments.
- (iii) The length of the low interest rate period. Shortly after an interest rate fall, banks record revaluation profits and capital reserves from their fair value portfolios, which could offset the negative impact of future falls in interest rate income. However, this buffer is no longer available after a prolonged period of low interest rates.
- (iv) Illiquidity in some markets as a result of subdued market-making activities. This illiquidity, referring usually to corporate bonds, can negatively impact closing positions in the event of an abrupt market reversal. It should, however, be noted that in the case of fire sales the liquidity tends to evaporate regardless of current market depth.

Box 2

Low for long: the case of Japan

Following the so-called “lost decade” (1991-2000), Japan remained in a situation of low inflation and anaemic growth until 2007, due to an ageing population and stagnant productivity growth²⁶. Since 1995, Japanese interest rates have remained close to zero. The challenges faced by Japan are seen by several commentators²⁷ as sharing similarities with the prevailing situation in the euro area given its low inflation, weak demographics and record low interest rates; banks in several SSM countries are also burdened with non-performing loans, as in Japan. In this box, the following questions are reviewed: i) Were interest rates “too low” in Japan?; ii) How did the banks react to weak macroeconomic conditions and; iii) How did low interest rates affect risk-taking in the banking sector?

²⁵ Chart 11 should be interpreted with caution, as estimates of term premia are often model-dependent.

²⁶ Growth of total factor productivity dropped from 1% to 0% over the period 1990-1995 and remained there until 2002, slightly recovering thereafter.

²⁷ See Financial Times “Japan should scare the eurozone”, <http://www.ft.com/cms/s/0/d447376a-4389-11e2-a48c-00144feabdc0.html#axzz4EwhMESoL>. Paul Krugman also compares EU countries such as Sweden with Japan due to deflation, see discussion in the press at <http://www.bloomberg.com/news/articles/2014-04-23/krugman-target-of-swedish-indignation-as-japan-comment-rebuffed>.



Were interest rates “too low”?

Nominal and real interest rates dropped to very low levels during the “lost decade” and remained at those levels after 2002, when banks started cleaning up their balance sheets. Short-term nominal interest rates had reached zero by 1995 and have remained broadly at the zero lower bound since then; 10-year interest rates also stabilised at low levels (see Chart 12). The slope of the term structure remained flat at around 1.2-1.5%.²⁸

A golden rule-type benchmark suggests that interest rates were in line with the economy until 2002, when the government took decisive action to clean up banks’ balance sheets. In particular, the level of (real) long-term interest rates²⁹ was broadly consistent with trend growth (computed as the sum of population growth and a long-term average of total factor productivity (TFP) growth) until 2002. Compared to such a benchmark, however, long-term rates could have been deemed to be “too low” after 2002 (see Chart 12).

After 2002 the non-financial private sector provided an increased amount of savings although private investment did not pick up, despite extremely low real rates. A chronic mismatch between unutilised savings and a lack of domestic investment opportunities suggests that, in spite of the benchmark provided by the “golden rule”, the natural (equilibrium) rate of interest remained below the actual (real) interest rate and was still too high to balance demand and supply for savings. It cannot be excluded that the euro area may well be facing a similar situation of excess savings, justifying very low real rates (chart 13)³⁰.

Banks were slow in dealing with NPLs, then invested mainly in government securities

The lost-decade syndrome ended in 2002, when banks were forced to fully recognise non-performing loans which, however, left them with sizeable capital shortages.³¹ A plausible estimate of capital gaps from non-performing loans³² shows that the Japanese banking system was consistently short of capital over a period of 15 years, until 2006. The cleaning up of NPLs from banks’ balance sheets between 2002 and 2003 led to the emergence of a capital gap of about 2.5% of GDP (JPY 13 trillion), which at least dispelled uncertainty about its actual size. However, this gap was not absorbed until 2006 – basically no capital was injected into the banking system after 2003.

In order to recapitalise themselves, Japanese banks consistently deleveraged during the “lost decade” while they were weighed down by NPLs, and leverage only gradually stabilised after 2002, although it did not pick up again (see Chart 14). After they had dealt with non-performing loans, Japanese banks did not engage in risk-taking behaviour, notwithstanding the very low interest rates which could have fuelled carry-trade operations for many asset classes. In particular, banks substituted loans with government bonds³³, and the rising government deficit was financed by an increased flow of private sector savings, intermediated by banks. Public debt grew without causing sovereign stress because debt ownership remained mainly domestic (90% held by Japanese investors)³⁴.

²⁸ Expansionary monetary policy in the form of aggressive QE pushed it to 0.6% first in 2014 and this year to zero.

²⁹ Long-term real rates are computed by subtracting a long-term average of observed inflation from 10-year nominal interest rates.

³⁰ Demographic trends also show similarities as net population growth recently turned negative in Europe.

³¹ See Hoshi and Kashyap (2010).

³² Capital gaps are computed by Hoshi and Kashyap as the difference between the product of NPL times the LGD and existing provisions.

³³ See Aoki and Sudo (2013).

³⁴ See Hoshi and Ito (2012).



Overall, low leverage limited risk-taking and the normalisation of non-performing loans made the banking system very safe. Indeed, Japanese banks are perceived as very safe, as shown by the Z-score, a measure of risk related to a bank's probability of default³⁵: banks in Japan became safer than their European and US counterparts after the crisis which began in 2007³⁶ (see Chart 15).

In Japan, banks' profitability remained weak after 2002 compared to previous years but remained in line with the profitability of the rest of the economy. Banks' ROE has been broadly aligned with the Japanese market in general and is consistent with low nominal GDP growth (see Charts 16 and 17). In this respect, the European situation has been different so far, with banks' ROE consistently lower than for other sectors of the economy.

Risk-taking in a “low for long” environment

Banks' de-risking and deleveraging was an endogenous adjustment of banks to a less favourable long-term outlook and was probably also a response to (a lack of) prompt action to resolve the NPL problem. The resolution and recognition of NPLs, albeit late, was at least able to stop the deleveraging of the economy. Low interest rates might not necessarily lead to excessive risk-taking in a context of low growth expectations or low bank capital, and both these aspects are currently being discussed in several countries of the euro area. If low growth and low rates persist, the role of banks in Europe could become similar to that of their counterparts in Japan, where banks have become less oriented towards allocating resources to the most promising investment opportunities, and more focused on financing the intertemporal consumption smoothing of households and governments.

At any rate, in a “low for long” environment, excess savings and a lack of investment opportunities could lead to banks following low-risk strategies. With the benefit of hindsight, the key issue in Japan when reforming the banking sector should have been how to encourage banks to take enough risk “of the good sort” to support the economy and allocate resources to the most promising sectors and firms. Indeed, at the same time as Japan proceeded in the direction of building safety into its financial system, its long-term growth settled at a lower steady state. Establishing causation between these two trends goes beyond the scope of this box, but one clear conclusion is that a weak growth outlook and low rates have been accompanied by a progressively safer, but very passive, banking system. European banks are still at the stage of having to deal fully with their NPLs, and solutions have to take into account: i) how to spur banks into being active contributors to growth; and ii) that if this is unlikely, banks could end up in a low risk/low profits situation as they have in Japan.

³⁵ The Z-score equals the return on assets plus the capital-asset ratio divided by the standard deviation of asset returns. The measure has been shown to be inversely related to the probability of default of individual banks (see Roy 1952, and Laeven and Levine 2009).

³⁶ Banking sector risks, as perceived by financial markets, were seen to decrease after 2002. The volatility of banks' stock price index was relatively high during the “lost decade”, but dropped after 2002 and remained at relatively low levels until the 2009 recession.



Section 3

Funding of credit institutions

3.1 Market and retail funding in an environment of low interest rates

In recent years, banks' cost of funding has continued to show a broad-based decrease across EU countries, a trend which reflects developments in both deposit and market funding. In the meantime, banks have altered their funding structure by decreasing their reliance on wholesale market funding and by increasing deposits. This may also be attributable to the behaviour of banks in response to the financial crisis (banks have reduced maturity mismatches between assets and liabilities, mainly by lengthening the maturity of liabilities and moving towards more stable sources of funding), to monetary policy measures, and to the new liquidity regulations (LCR/NSFR).

In an environment of low interest rates, questions arise about banks' capacity to transmit reductions in interest rates to the rate on monetary deposits. Despite the decline in deposit rates, which should reduce the demand for deposits, banks have increased their share of deposit funding (Chart 18) in line with monetary policy stimulus, their downside stickiness and the incentives imposed by regulators. Banks have been reluctant to reduce deposit rates below 0% due to uncertainty as to the reaction of depositors to negative deposit rates or, on occasion, due to national regulations. In a low-rate environment, depositors may be incentivised to move funds to higher-yielding products (e.g. investment funds or life insurance products). There are, however, other factors that could limit this arbitrage by depositors, such as depositors' stickiness or risk aversion, or the imperfection of alternative products as substitutes for deposits in terms of the liquidity, guarantee level and payment services that are embedded in a deposit. Besides, banks may, in some cases, increase the commission on deposits to cut their real costs. In line with this, Chart 19 shows that the increase of the deposits of households (measured as the ratio between the transactions in the last four quarters and the closing balance) has remained fairly stable in recent years, when compared with the long-term average. In comparison, there seems to have been more intense activity in shares or units of investment funds since 2011.

The low interest rate environment has reduced banks' market funding cost. Since early 2012, the search-for-yield phenomenon has led investors to increase their appetite for bank debt instruments which offer higher yields than sovereign debt. In particular, this has led to an increase in investor allocation for bank debt, capital and contingent convertible (CoCos) instruments. Banks' market funding costs have reduced as a consequence. In such an environment, banks are incentivised to issue more hybrid debt and longer-maturity debt because of the low or even negative yields investors may receive on high quality assets like sovereigns. Thus, a significant increase in the issuance of Tier 1-compatible contingent convertible (CoCos) capital instruments has been observed (Chart 20). Besides, according to data on sectoral Securities Holdings Statistics (SHS), it transpires that the average maturity of securities held by credit institutions has increased. The compression of spreads stimulates the supply of longer-term securities and, at the same time, demand grows as investors' search for yield is intensifying.

Regarding the high level of CoCo issuance, there are two channels through which the search-for-yield environment could impact banks' future resilience and financial stability. First, low spreads on AT1 instruments suggest that investors may not be fully pricing in risks associated with CoCos (trigger, dividend cancellation). In the event of risk re-pricing, banks may find it more difficult to



attract new funding via these instruments³⁷. Second, excessively low spreads on AT1 could encourage banks to over-rely on AT1 (which may not be as loss-absorbent as equity) to fulfil capital and leverage requirements. These instruments have never been tested in times of crisis and there is some uncertainty regarding their effectiveness.

At the same time, however, very low short-term interest rates reduce incentives for debt holders to provide short-term financing to banks. Low short-term interest rates reduce the profitability of the money market funds that are key providers of short-term funding for many large banks and other financial institutions (Chart 21)³⁸. From 2013 to March 2015, the number of money market mutual funds active in the euro area declined from about 900 to around 700. This situation has led to a reduction in volumes³⁹ and, if it continues in the long term, could lead to further constraints on European banks' access to short-term funding.

The cost of equity is still high, albeit declining, and is above the cost of market-based debt. While the cost of bank debt may be observed, the cost of bank equity cannot and has to be estimated. According to ECB estimates (Chart 22), at the end of January 2016 the cost of euro area bank equity was 7.6%, following the descending trend that began in 2014, and 5% lower than the level for the second half of 2012.

3.2 Structural changes in funding due to prolonged low interest rates

In a scenario where low interest rates remain low in the long term (at least ten years), retail funding costs have little room to fall further, as there may be constraints that do not allow deposit rates to go below a specific threshold or to move into negative territory. Low interest rates reduce the opportunity costs to savers of receiving zero interest; savers may therefore leave their cash in non-interest-bearing current accounts, which then represent "interest-free funding" for banks. In such a low interest rate environment, greater competition between banks and non-banks for such a cheap resource could also modify savers' behaviour – making deposits less stable. Within the banking sector, new entrants (such as online banks that need to build a deposit base) can offer very attractive rates which prevent more traditional banks from adjusting their deposit rates downwards. In addition, non-banks (such as life insurance companies) offer higher rates for their contracts, with features that are similar to deposits in terms of availability of funds. This increased competition for deposits could trigger massive outflows of deposits from banks' balance sheets under the scenario. It would certainly increase the volatility of this source of funding and the reliance of banks on market funding, which is already a more volatile source than deposits.

Under this scenario, the search for yield would reduce the market cost of funding, even for weaker banks, since the market would have more appetite for the higher-yielding securities issued by banks (e.g. CoCos) or debt with longer maturity. Furthermore, where the cost of market-based debt financing would be following a declining trend, the high cost of equity would incentivise banks to issue debt, given that it is cheaper than equity⁴⁰.

³⁷ To a certain extent, this was observed in the first weeks of 2016, although it was limited to a small number of EU financial institutions.

³⁸ The entry into force of the new regulation on money market funds in the US, foreseen for October 2016, may further constrain the role of money market funds as providers of short-term funding for banks. For further information on the new regulation, please refer to [Press Release https://www.sec.gov/News/PressRelease/Detail/PressRelease/1370542347679](#).

³⁹ According to ECB statistics (see [reports https://sdw.ecb.europa.eu/reports.do?node=1000003507](#)), the volume of loans of MMFs to monetary financial institutions (mostly composed of banks) was EUR 88.1 billion at the end of 2013 and EUR 79.6 billion at the end of June 2015, with an accumulated decline of EUR 7 billion in transactions.

⁴⁰ Alternatively, banks may wish to boost their return on equity by increasing their leverage.



A second scenario could involve a return to higher interest rates over a horizon of two to three years. For banks depending heavily on market financing or with significant short-term (re)financing needs, an increase in interest rates would increase their cost of funding, depending on the maturity structure of the debt and on the interest rate type (fixed vs. floating). Such a scenario may be associated with higher market volatility and a lower market risk appetite, which could have implications for banks' ability to access debt markets (concurrent recourse to capital markets by many issuers could trigger a loss of market access for lower-rated banks). Those banks that rely more on short-term funding sources may therefore be vulnerable to the withdrawal of funds by short-term investors such as money market funds. To protect themselves against a loss of market access under such a scenario, these banks could further diversify their investor base and the timing of their issuance to avoid the clustering of maturing debt. Under this scenario, if sources of market financing dried up⁴¹, the result would be greater competition for deposits between banks to attract this funding and consequently, the cost of deposits could increase.

⁴¹ This is what we observed at the height of the crisis: the increasing cost of wholesale funds led to greater price competition in deposit markets. Notably, these developments were pronounced in those euro area countries that experienced deposit outflows but also took place in less vulnerable countries where some banks were too reliant on market-based funding, with no deposit base.



Section 4

Impact on liquidity and maturity transformation

Under normal circumstances, banks take short-term deposits from customers and grant long-term loans to the real economy, which allows them to match the differing requirements of depositors and borrowers⁴². This is a key aspect of the intermediation role of banks in the economy and the financial system. During the process of taking deposits from savers and granting loans to borrowers, banks usually take a highly heterogeneous product, in the form of depositors' savings, which can be withdrawn at short notice, and transform this into a longer-term product, e.g. a loan, which can be traded in the market and which is more standardised than the pool of underlying deposits. In this case, long-standing relationships with customers allow banks to enjoy a certain information advantage over competitors. This makes it difficult for borrowers to obtain credit from other sources and may lead to higher interest rates on loans or lending policies that are more tailored to borrowers⁴³.

A prolonged period of low interest rates would have, as outlined in previous sections, a significant impact on both the assets and the liabilities of banks. A combination of the forecast trends for assets and liabilities could determine either a widening or a narrowing of the maturity transformation function of banks. For maturities on the asset side the effect is mixed. On the one hand, greater risk appetite translated into a greater appetite for short-term holdings could, hypothetically, diminish the average maturity of financial assets other than loans in banks' portfolios⁴⁴. However, the structural reform of banks and other items of regulation are more likely to reduce banks' trading activities, irrespective of the level of interest rates. At the same time, the volume of loans would grow under a low interest rate environment, and mortgages currently seem to be the driving force behind this type of growth. Mortgages have relatively long contractual maturities and they usually remain on banks' balance sheets for long periods of time, which would suggest an increase in maturities on the asset side. On the liabilities side, leaving aside the effects of monetary policy operations, the main impact would be on extended maturities in market funding, with the amount of deposits remaining fairly stable, albeit subject to a certain amount of pressure from competitors or close substitutes from the insurance or the asset management sectors. In other words, a prolonged period of low interest rates could lead to increased maturity transformation due to a search for yield, but a flattening of the term structure (as is currently being seen) could have the opposite effect, as the relative remuneration for holding longer-term assets would decrease, as would the relative cost of issuing longer-term liabilities. This is especially true if the volatility of long-term rates is increasing, which would reduce the carry-to-risk ratio – something that has been observed in recent years.

The final impact would depend on the degree to which market funding is covering the loan portfolio of banks (in other words, on the loan-to-deposit ratio) and, more fundamentally, on the slope of the yield curve. Considering the first factor, in those banking systems with a narrow deposit base and which, therefore, rely more on market funding, the maturity mismatch with assets would decrease given the expected longer maturities of market liabilities, and so the maturity transformation function of banks would weaken. At the same time, however, reliance on market funding would then make banks more sensitive to conditions in the financial markets. In the regulatory domain, the NSFR is

⁴² See, among others, Yorulmazer (2014), Goodhart and Perotti (2015) and Dybig (2012).

⁴³ See, among others, James (1987), Dell'Ariccia and Marquez (2004), Schenone (2010) and Carter et al. (2004).

⁴⁴ Even if the maturity of the underlying assets held for trading is longer, the nature of the trading book is such that assets are not held until they mature, but rather exchanged in financial markets in the very short term to extract a gain from price differences. At the same time, a shift of holdings towards longer-maturity securities could be expected due to search for yield, and has already been observed in the recent past.



intended to address the excessive maturity and liquidity mismatch between banks' assets and liabilities. However, the NSFR requirement provides banks with few incentives to fund themselves with maturities exceeding one year and, if effectively implemented, should address this weakness. With regard to the slope of the yield curve, the persistence over a prolonged period of time of a flat yield curve would cause the maturity transformation function of banks to weaken, as uncertainty could stop banks from engaging in long-term transactions on the assets side.

Furthermore, the expected increase in the share of market funding and the lengthening of maturities on the assets side, combined with low secondary market liquidity, would (since these are all reactions by banks to a prolonged period of low interest rates) increase pro-cyclicality and, at the same time, increase the risk of fire sales, if vulnerabilities were to emerge and all banks tried to correct their positions in a certain segment of the financial markets. If market liquidity is defined as "the ability to transact quickly without exerting a material effect on prices" (Walsh (2007) then, in the event of fire sales, market liquidity would practically evaporate from financial markets.

Under the scenario of a return to higher interest rates, the expected impact on maturity mismatch would be mitigated as the result of this scenario would probably be an increase in the stability of the depositor base and a decrease in the maturity of loans on the assets side⁴⁵.

⁴⁵ Recent expansionary monetary policy measures increase money supply in aggregate terms, an increase which may be translated into an increase of deposits. For the purposes of this paragraph, considering that these expansionary policy measures are very recent, it is assumed that the increase in the money supply would be directed towards products with higher yields than deposits. In a longer-term horizon, that should occur, since depositors would adjust their behaviour accordingly.



Section 5

Interconnectedness

Banks are one of the main actors in the financial system and, as such, are highly interconnected with other financial sectors such as insurance corporations, investment funds, hedge funds and money-market funds. This interconnectedness also exists within the banking system, with very significant interbank exposures, and across countries, with cross-border activities having increasingly more weight than domestic activities⁴⁶.

The main impact of a prolonged period of low interest rates on the interconnectedness between different types of financial institutions would be the extension of loan granting and deposit taking to non-bank financial institutions. With regard to the latter, the low remuneration from deposits puts pressure on savers to look for close substitutes that can yield a higher return. Even if close substitutes for deposits are difficult to find in terms of payment and liquidity, some flow from banks to insurance corporations and investment funds is certain. Such a movement would not, in itself, affect the interconnectedness between banks and these institutions, but would weaken the dominant role of banks in the financial system in general.

As described in previous sections, low interest rates are likely to negatively impact the profitability of banks, possibly make issuing equity to meet additional capital requirements more difficult and, in the case of widespread forbearance, crowd out sound credit opportunities to the advantage of forborne loans. The combination of these three factors makes a clear case for the granting of credit by non-bank institutions, an opportunity which emerges both from the demand side (sound investment crowded-out by forbearance looking for alternative sources of credit) and from the supply side (the need to cover the provision of credit to the real economy which banks might not be able to deliver). This would entail considerable risk, especially for the institutions granting credit, since they would be subject to the appropriate supervisory requirements. Again, this would decrease the weight of the banking system in the overall financial system of the EU⁴⁷.

A related impact in this area would be the increased recourse to financial markets by non-financial corporations which, instead of taking out a loan with a bank would rather issue their own debt instruments in the market. In this regard, the proposal for a Capital Markets Union seems an interesting attempt to address overreliance on banks in the EU. Banks could then receive revenues from their advisory services via fees, something which would not happen if other institutions stepped in to grant credit to the real economy. The impact of the Capital Markets Union on households would be much more limited, since they would not, for example, be able to approach financial markets directly to obtain a mortgage loan.

In terms of the banks' information advantage described in the previous section, structural changes (basically related to IT and new ways of accessing information more easily and more widely) and the increased recourse of non-financial corporations to financial markets without the intermediation of banks, may put the traditional business model of banks at risk. In this case the information advantage which banks currently enjoy over their customers would be lost, since potential lenders would be able to access information on borrowers currently available only to the lending bank.

⁴⁶ See, for a first review and for further references, ESRB (2013), Nitschka (2012), Rancan et al. (2015) and Bank of England (2015).

⁴⁷ According to data from the US Mortgage Bankers Association, 43% of mortgages granted in 2014 in the US were granted by non-banks. In 2007, the percentage of mortgages granted by non-banks was 23%.



If market funding by banks increases as forecast, the link between financial markets and banks will be strengthened and could potentially give rise to a more pro-cyclical reaction of banks to market movements and increase the risk of fire sales, as explained in the previous section.

The low interest rate environment is expected to lower the importance of interbank exposures when they are driven mainly by yield. In those situations banks would look for alternative, higher-yield investments, even if that implies taking on more risk. However, interbank exposures seem to be driven by factors other than yield, and that are more focused on the target of ensuring liquidity in the very short term. Under such circumstances, interbank exposures would be expected to remain mostly unaffected by the level of interest rates.

The trend described above is expected to be an extremely drawn out process, consisting of gradual, small steps. Should interest rates return to normal levels over a short time horizon (three to four years), the process may not even begin and the banking system will return more or less to how it is at the moment.



Section 6

Market structure and concentration

The EU banking system is characterised by being too large in comparison with its international peers and, to some extent, by a high degree of concentration around a number of large institutions (ESRB (2014)). In fact, the EU is the jurisdiction with the highest number of banks labelled as SIFIs by the FSB (out of 30 global SIFIs, 14 are located in the EU). Behind these two broad characteristics, though, there are significant differences across countries in respect of the structure of each banking system, especially in the domain of profitability.

The lower profitability that banks would face in an environment of prolonged low interest rates makes a strong case for further merger and acquisition activity. If banks, just like any other institution, are not able to generate sufficient profits for their shareholders, they must either be resolved or seek a merger with a peer, which could improve their profitability through further cost reductions and synergies⁴⁸. Those countries where the profitability of the banking sector is already very low would, most probably, witness further concentration of their banking activities. These activities may be spurred by the expected difficulty of raising fresh capital to meet the new requirements, and the expansion of banks' balance sheets as a result of expansionary monetary policy. Therefore, in the long term, one consequence of the low interest rate environment may be the further concentration of the EU banking system into a smaller set of institutions.

A reduction in the number of institutions within the EU banking sector would have some notable consequences including, on the positive side, greater financial integration and diversification from local conditions, and enhanced efficiency. The negative consequences would include exacerbation of the "too big to fail" issue, with more banks being labelled as SIFIs, either globally or at European level. How regulatory reform of SIFIs and regulation on resolution can address and reduce the risks deriving from "too big to fail" remains to be seen. At the same time, the new structure of the EU banking system may mean that some countries may not have a domestic institution among the most important banks operating in their jurisdiction. That could have very serious consequences for the cross-border exposures of banks and on the financial stability policies designed by the host countries, and could be a focus of potential conflict between home and host jurisdictions. For anyone who believes that the EU banking system is too large, the consolidation envisaged in the very long term following a prolonged period of low interest rates would certainly contribute to addressing the issue.

Second, competition between banks may be reduced as a consequence of a reduction in the number of institutions operating in the EU although, at the same time, it may be strengthened by a wider range of existing institutions. In this respect, it is difficult to predict whether the existing banks (and, potentially, other non-credit institutions) would engage in a race towards further competition or whether they would operate more like a theoretical oligopoly.

Finally, although independent in terms of interest rates, the role of the new financial intermediaries (Fintech)⁴⁹ must not be left out of the equation, even if they are still currently small and mostly active in the US and the Far East. Nonetheless, the expected future development of these intermediaries may push banks to further cut operating costs to retain customers and to engage in costly IT projects in order to adapt to the new environment (see, for example, The Economist (2015), Deutsche Bank (2014 and 2015) and Accenture (2015)).

⁴⁸ For further information on this please see Hernando et al. (2009).

⁴⁹ Financial technology, also known as Fintech, is a line of business based on using software to provide financial services, including, for example, online access to trading platforms.



B. Risk assessment and prioritisation



Section 7

Risks warranting policy actions

The earlier sections of this report identified several risks and vulnerabilities for banks, arising from an environment of low interest rates. The next step in the process entails (i) grouping these risks under broader headings (resilience, credit cycle, funding, maturity and liquidity transformation, interconnectedness, and market structure and concentration); (ii) assessing each of these, considering potential mitigating factors and amplifiers; and (iii) prioritising the risks on the basis of the need for macroprudential policy actions to either prevent or mitigate them. The summary table in Annex 2 shows the outcome of this work in detail. The following sections of the report focus on the prioritisation of each risk.

The two risks described below are considered to be the most relevant for the EU banking system. Potential macroprudential policies should therefore be explored with the aim of preventing and mitigating adverse effects should these risks materialise. The risks are not necessarily those most likely to materialise in a low interest rate environment, but rather those which would have the greatest negative consequences for financial stability in the EU, which is why they call for a macroprudential response.

7.1 Resilience (“low for long” scenario)

Under the scenario where interest rates remain low for a prolonged period of time, combined with subdued growth, banks are likely to face significant profitability pressures, derived from lower net interest margins and also in response to newly introduced regulation⁵⁰. This low profitability may reduce banks' ability to accumulate capital organically via retained earnings and to supply credit. Viability concerns could increase for those banks with a weaker capital position, and grounds could be provided for “gambling for resurrection” strategies. Finally, in the case of the banking systems most affected by the crisis, low profitability contributes to a broader risk of persistent balance sheet weakness, impeding the resolution of problem assets and leading to potentially further deteriorating asset quality (e.g. increase in NPLs, deterioration of credit standards, misallocation of capital and possible adverse macro-feedback on growth).

In particular, the following conditions must be in place for the drop in net interest margins to translate into lower profitability: (i) the expected offsetting of increased lending volumes does not occur since lending does not pick up; (ii) other income sources (e.g. fees and commissions) do not increase as activity remains muted given the depressed economic environment or as a consequence of competition from other service-providing sectors; and (iii) operating costs cannot be reduced further. From a purely theoretical point of view, the three conditions above seem to describe the current state of the EU banking system quite realistically, although there may be differences at national level. Annex 6 finds no evidence indicating a decrease in profitability over the next few years. This may be due to the fact that the quantitative models used in the note are dependent on past patterns, whereas the “low for long” scenario would be completely new for the EU banking system and does not fully relate to prior behaviour.

⁵⁰ The years prior to the recent crisis witnessed an exuberant increase in the profitability of banks, since risk-taking and more profitable activities were not adequately addressed in the prudential domain. With the introduction of the new regulatory package (namely Basel III), it is expected that past exuberant profitability trends will not be repeated.



Even though there are two significant mitigating factors (a recovery of growth which may overcompensate for the decrease in the net interest margin, and enhanced micro- and macroprudential supervision), the far-reaching consequences of this risk materialising mean that it qualifies as a risk that could warrant macroprudential policy actions. Essentially, in a low interest rate environment, the traditional business retail banking model is challenged, affecting all banking systems within the EU.

7.2 Resilience (“back to normal” scenario)

When assessing this risk, the distinction between fixed-rate loans and variable-rate loans determines the triggering of challenges to banks’ resilience.

In the case of banks for which variable-rate loans are predominant, a return to higher interest rates, even if gradual and in small steps, would reduce loan affordability for borrowers, negatively affecting asset quality (non-performing and forborne loans) and therefore increasing impairment charges. Beyond the impact of these impairment charges on the profitability of banks, the decline in asset quality would hit EU banks particularly hard in a context where balance sheets still remain weak after the crisis. The high indebtedness of households and non-financial corporations could aggravate the impact of the materialisation of this risk in terms of banks’ asset quality. In addition, the increase in interest rates would soon be transferred to the interest rates of loans, thereby affecting loan affordability for borrowers in a short time frame.

For those banking systems with a large proportion of fixed-rate loans, adjustment to the new interest rates would be slower and so the decrease in asset quality would be extended over a longer period of time. However, in this case banks could face a more fundamental vulnerability, since they would not, in an environment of higher interest rates, be able to translate the higher costs of funding to their loans. In other words, deposits and market funding would adjust to higher interest rates quickly, but for banks this would not apply to their stock of existing loans (granted at a time when interest rates were lower), which would then create issues for the net interest margin.

Under a scenario where interest rates return to a higher level, this has been identified as the main risk for banks. Its potential harmful effects on the EU banking system could be significant and, as such, further work may be needed to identify macroprudential policies to prevent or mitigate its effects. At the same time, it is important to consider whether the recovery in growth under the “back to normal” scenario would lead to an increase in the net interest margin of banks, which would offset the negative impact of higher impairment charges. This seems to be the result, in EU aggregate terms, of the quantitative analysis carried out (see Annex 6) although the impact may vary across national banking systems.

Box 3

The implications of an environment of low interest rates for fixed-rate and variable-rate loans

This document has repeatedly referred to the different impacts of a prolonged period of low interest rates when banks grant loans at fixed or variable rates. This box attempts to summarise the discussion related to bank profitability and credit risk.



When a bank grants a loan at a fixed rate it must manage the embedded interest rate risk related to financing that loan at shorter maturities over the lifecycle of the loan⁵¹. In the case of variable-rate loans the interest to be paid on the loan is usually linked to an external interest rate index (like EURIBOR) with the result that the borrower bears an interest rate risk which in turn increases the credit risk for the bank. At the same time bank profitability is less of an issue as long as lending and funding rates move in line. Taking a broader perspective, an interesting aspect is whether fixed and variable-rate loans coexist with a highly leveraged banking sector or real economy, in which case this leverage could further amplify financial stability implications.

Chart 23 shows the current share of variable-rate new loans granted by EU banks as a percentage of total new loans per country. Unfortunately, there is currently no similar indicator for the outstanding stock of loans. Over the last few years (since 2008), a trend has been observed whereby banks are granting more fixed-rate loans than in the past (Chart 24).

Scenarios where interest rates either remain low for a prolonged period of time (“low for long”) or return to previous levels having remained subdued for a number of years (“back to normal”) create different vulnerabilities for banks granting predominantly fixed-rate or predominantly variable-rate loans. The two main vulnerability areas are credit risk (debt affordability) and resilience, the latter being connected to the trend for profitability via the net interest margin. The key factor is that under a scenario of low interest rates, funding rates are likely to experience a lower bound and move more sluggishly when approaching that boundary. Another important factor to consider in this analysis is the time dimension, i.e. at what point in the interest rate cycle were the fixed-rate loans granted. The table below seeks to summarise the vulnerabilities in the various scenarios and domains, as set out in the different sections of this report.

Table 1

Vulnerabilities associated with fixed-rate and variable-rate loans in the two low interest rate environments

		Fixed-rate loans	Variable-rate loans
Low for long	Resilience	Fixed-rate loans granted in the past with higher rates have a positive effect on the net interest margin of banks.	Variable-rate loans are promptly adjusted to the new interest rate environment.
	Credit risk	Borrowers' debt servicing costs do not improve for fixed-rate loans granted before the period of low interest rates, so borrowers may seek early repayment of older fixed-rate loans in order to obtain new loans at a lower rate.	Low interest rates are conducive to an increase in loan affordability for borrowers.
Back to normal	Resilience	An increase in interest rates negatively affects the net interest margin of loans granted in periods of lower interest rates, as funding costs adjust to the new level of interest rates.	Variable-rate loans are promptly adjusted to the new interest rate environment.
	Credit risk	Borrowers' debt servicing costs remain low in this case, since the interest rate of the loan is lower than current lending and deposit rates.	Borrowers' debt servicing costs are negatively affected by the increase in interest rates (although this can be mitigated by improving macroeconomic conditions).

From the banks' point of view, the most relevant vulnerabilities are those related to profitability/resilience in the “low for long” scenario. The difference between variable and fixed-rate loans in respect of profitability under this scenario is one of timing. Variable-rate loan banks will suffer an interest income loss more quickly, while fixed-rate loan banks will initially be sheltered by the long maturity of the loans, but will then gradually suffer losses and become more vulnerable in a “back to normal” scenario. If the pre-payment of fixed-rate loans is widespread, this will reduce the observed difference between interest income on variable-rate loans and that on fixed-rate loans.

⁵¹ The interest risk associated with fixed-rate loans is usually managed by banks using swaps and similar hedging transactions.



Section 8

Risks for which no immediate policy action is required

The two main risks for banks in an environment of low interest rates were described in the previous section, with a view to using that risk assessment as the starting point for further work in the area of macroprudential policy. However, these are not the only risks relevant to banks under these circumstances. Indeed, there are other risks which have been identified but which assessment has revealed to be less significant in macroprudential policy terms (mostly due to the existence of several mitigating factors, including regulation). Each of these risks is briefly presented in the following paragraphs, in line with the summary table in Annex 2.

8.1 Financial cycle (“low for long” scenario)

In principle, low interest rates should foster loan creation leading to an increase in loan volumes, as long as credit demand is not suppressed by expectations of low economic growth. Credit demand from the real economy would then be driven by higher loan affordability due to lower interest payments. With regard to banks, the decrease in the cost of their main sources of finance (deposits, wholesale funding) would also favour an increase in the volume of loans granted.

However, in a situation where growth is not solid and demand for credit from the real economy does not rise, low interest rates may provide incentives that encourage lower credit standards (to support an increase in volumes which the low growth does not reflect) and widespread forbearance (since the opportunity costs of forbearance decrease significantly for banks)⁵². Credit may be misallocated by banks as a consequence. This is particularly true in a context where profitability is under pressure and loan volumes aim mostly to compensate for decreasing net interest margins. Furthermore, due to asset mispricing in a low interest rate environment, borrowers' net worth is overestimated, in particular the collateral recorded in certain transactions with banks.

If the three factors mentioned above (deterioration of credit standards, incentives for forbearance and overvaluation of collateral) materialise, the asset quality of banks will be reduced in the long run, putting their profitability under additional pressure. In this context, it should be borne in mind that the main driver of banks' profitability is currently lower impairment charges. One consequence of the materialisation of this risk would be the persistent weakness of banks' balance sheets, impeding the resolution of problematic legacy assets.

One important consideration when assessing the severity of this risk relates to the net effect from heavily leveraged households and non-financial corporations. Such high indebtedness may simply prevent banks from granting loans to these customers, on the basis of affordability tests carried out by banks. On the other hand, if banks do lend to these highly leveraged households and non-financial corporations, then a negative trend in asset quality becomes more likely in the coming years.

The evidence currently available does not point towards a materialisation of this risk in the EU. However, vulnerabilities are already starting to emerge in selected countries and portfolios, and their appearance in the medium term cannot be ruled out in the current context of a global slowdown in economic activity. There is, therefore, a need to closely monitor developments in the

⁵² The higher loan affordability for borrowers deriving from an environment of low interest rates would make forbearance less likely on the borrowers' side. However, the incentives for banks to grant forbearance significantly increase with low interest rates as their opportunity costs (i.e. the alternatives for investment) do not grant high yields for banks.



credit cycle to detect and react to situations of excessive or insufficient provision of credit to the real economy.

8.2 Funding (“low for long” scenario)

With regard to the effect of low interest rates on the funding pattern of banks, the cost of funding is expected to remain low in such an environment. This could encourage banks to issue more debt instruments rather than rely on equity (negatively impacting bank resilience) and deposits to meet their funding needs. Here, greater reliance on deposit funding would improve the stability of bank funding and more equity would enhance banks’ resilience in the face of unexpected losses.

This risk may be particularly material for those banks with a relatively high cost of equity. These institutions, also facing low profitability, may be in a worse position to absorb potential shocks. Banks may, in an effort to encourage investors to purchase their shares, promise returns which are not realistic in the prevailing conditions and may engage in riskier activities to meet these commitments. However, in a context of “search for yield”, the equity premium required by investors declines, thereby reducing the above-mentioned opportunity cost.

Although the risk described in this subsection is certainly material for a number of banks across the EU, the new regulation, specifically with regard to liquidity positions, already addresses the main concerns raised in the above paragraphs. For example, the Liquidity Coverage Ratio (LCR) gives special prominence to deposits vis-à-vis market funding, so even if banks have an incentive, in terms of cost, to rely more on market funding, the regulation provides the opposite incentive in terms of the computation of the LCR. At the same time, the information on funding plans that banks need to report to supervisory authorities in accordance with Recommendation ESRB/2012/2 on the funding of credit institutions (ESRB (2012b)) provides a very effective and useful monitoring mechanism for supervisory authorities to detect potential threats to the funding patterns of EU banks at an early stage.

It is therefore concluded that developments in the funding patterns of banks should be monitored to some extent, although there is no need to launch macroprudential policy actions in the short term.

8.3 Liquidity and maturity transformation (“low for long” scenario)

In general terms, low interest rates and structural changes are posing significant challenges to the traditional banking business model. In particular, banks’ traditional ways of making money (maturity and liquidity transformation as well as exploiting an information advantage in assessing credit risk) are all at risk now, due mostly to structural changes and innovations. In particular, the flattening of the yield curve may have detrimental consequences for the maturity transformation carried out by banks in the long term, although there is some uncertainty as to whether this expected process will actually occur or not.

This risk is material in all countries, in particular those without a dynamic and competitive banking system. For those countries, how banks adapt to the new environment, not only as defined by low interest rates, is of the essence.

Institutions that are less agile in adjusting to the new conditions may also have difficulties in modifying their internal processes or systems to manage risks under the new market and liquidity pricing conditions. At the same time, they may see non-credit institutions gaining market share in the provision of credit and the flow of deposits to and from the real economy.

Low profitability, derived from a prolonged period of low interest rates, coupled with innovation and structural changes (mostly from the Fintech sector) may accelerate this trend. It may therefore be worth monitoring developments in this area, to ensure that the transition to the new banking system



does not take place in a disorderly manner and does not bring unintended consequences for the financial stability of the EU.

8.4 Interconnectedness (“low for long” scenario)

The move of depositors to similar products offered by insurers or asset managers may diminish the role of EU banks in the financial system. At the same time, if banks are not able to meet demand for credit from the real economy other financial institutions may step in and take over this role. This would increase interconnectedness across the financial system and the real economy, which is currently based mostly on relationships between banks, households and non-financial corporations.

In this vein, the effect of the shift of deposits to non-credit institutions would be more acute for those institutions that rely most on retail deposits or those unable to offer competitive remuneration on deposits (e.g. due to pressures on profitability). This would imply the reallocation of savings from banks to non-credit institutions, some of which fall outside the scope of prudential supervision. There is, however, an important mitigating factor that should be considered: the stickiness of deposits, given that they can easily be used for payments, would ensure a certain minimum level of bank deposits by households and non-financial corporations. With regard to banks' assets, an increase of interconnectedness between banks and the shadow banking sector, derived from the provision of credit by the latter and from the close ownership links between banks and shadow banks, could transform market risk into credit risk in the case of major problems, a fact which is amplified by low liquidity in a wide range of secondary markets. In other words, possible market turbulence affecting the asset management industry, for example, could hit the banks indirectly.

This risk would be particularly acute in countries with faster growing shadow banking systems and that have also witnessed large deposit outflows.

By its own nature, the risk of interconnectedness is mostly cross-sectoral, not limited just to banks, but affecting other areas of the financial system. For this reason, any macroprudential policy response should be at a cross-sectoral level. For banks, there is certainly merit in monitoring developments to ensure that the expected new channels of interconnectedness do not evolve in a way that negatively impacts the financial stability of the EU.

8.5 Market structure and concentration (“low for long” scenario)

One of the ways banks can address a prolonged period of low profitability is to seek synergies and cost reductions through mergers and acquisitions, not necessarily in the same country and/or sector of activity. From this perspective low profitability magnifies the benefits of consolidation. This could be seen as a welcome development in an excessively large EU banking system, although it also exacerbates issues concerning institutions that are “too big to fail”. At the same time, concentration in a limited number of institutions could also decrease competition within the EU banking system.

Furthermore, in the case of operations which take place across borders, tensions may arise between home and host supervisory authorities. In that case the activities of colleges of supervisors, under the aegis of the EBA, should be able to mitigate these tensions at an early stage.

This risk, like the risk highlighted in the previous sub-section has, by definition, a strong cross-sectoral component. It is therefore better to explore how macroprudential policies could address it at a cross-sectoral level instead of considering each sector in isolation. For this reason it is not considered a high priority risk for banks per se, although it is certainly an area where policy work is required at a cross-sectoral level.



8.6 Credit cycle (“back to normal” scenario)

Due to the increased debt servicing costs embedded in a scenario where interest rates return to higher levels, the supply of credit by banks to the real economy may be constrained if the trend is towards an excess of non-performing and forborne loans. Since the macroeconomic variables are expected to recover, this is not the most likely scenario and depends mainly on an evolution of bank resilience as set out previously.

In this case, the risk does not derive from the excessive provision of credit to the real economy (as in the “low for long” scenario) but, instead, relates to the insufficient provision of credit to support the improved macroeconomic conditions. This insufficient supply of credit would stem from the large stock of non-performing loans and forborne loans, which would impose a heavy burden on the asset expansion desired by banks. This could result in other participants stepping in to supply the necessary credit to the real economy or in the demand for credit remaining unsatisfied, initiating a negative feedback loop between the banking system and the real economy.

As stated before, there is currently little evidence of the materialisation of this risk in the EU. However, given the consequences it could have for the real economy, developments in this area should be monitored, also taking bank resilience policies into consideration.

8.7 Funding (“back to normal” scenario)

In a scenario where interest rates return to normal levels, banks may face tensions from their wholesale funding positions. A return to higher interest rates, which would be mirrored in the financial markets, would increase the funding costs of banks, with the potential to create some tensions in the rollover of short-term funding. In addition, in the case of hybrid bank debt (which is considered to be additional Tier 1 capital), a scenario of higher interest rates could lead investors to reconsider the low risk premium currently allocated to these and other similar debt instruments.

To add to the difficulties of rolling over short-term debt, banks would need to increase the remuneration of deposits, in line with the increase in interest rates, and could be required to rely more on secured funding sources, which would mean higher asset encumbrance. In some extreme cases, banks would be forced to deleverage because they would not be in a position to provide sustainable funding to a portion of their balance sheet. Here, as an important mitigating factor, microprudential supervision should ensure that these rollover risks in particular, and the funding structures of banks in general, do not pose excessive risks to a given bank, given the environment of rising interest rates.

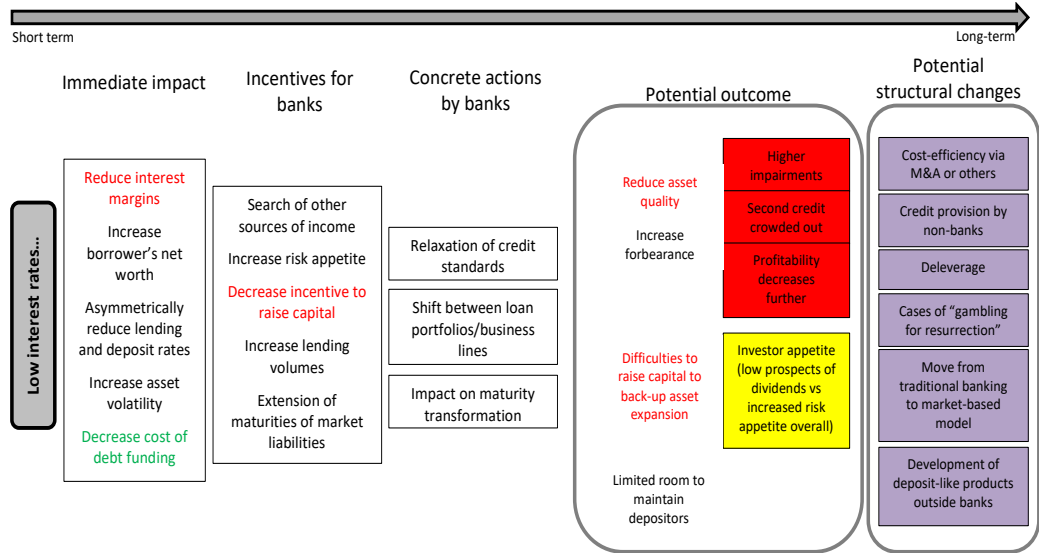
On the basis of the projections for both scenarios (“low for long” and “back to normal”), it should be possible to identify the countries that are most vulnerable to this risk. These are the countries with the greatest difference in long-term interest rates between the two scenarios (in other words, where the return to higher interest rates would cause the biggest change to interest rates).

Whereas the risks deriving from the funding of banks in the “back to normal” scenario are material for banks in the EU, recent initiatives aimed at addressing systemic risks stemming from the funding structure of banks should also be acknowledged. In this area, Recommendation ESRB/2012/2 on the funding of credit institutions (ESRB (2012b)) is a key initiative seeking to prevent and mitigate some of the vulnerabilities identified. Regulatory initiatives in the area of asset encumbrance and funding plans are among those considered in Recommendation ESRB/2012/2. On the basis of the existing regulation, therefore, this risk has not been identified as a first-order risk, but is instead classified among those for which close monitoring (which is already happening as a result of the implementation of the ESRB Recommendation ESRB 2012/2) is desirable.



Annex 1.

Expected impact of low interest rates on banks



Note: Red-coloured text denotes negative effects of the low interest rate environment, green-coloured text denotes positive effects. The assessment of potential outcomes includes boxes indicating developments, which can be verified quantitatively once the data are available (red box denotes negative effects, yellow box denotes an unknown effect due to potential interplay of several factors).



Annex 2

Risk assessment and prioritisation: summary table

Scenario Low for Long									
Risk		Parts of EU financial system		Potential spill-overs and interactions			Amplifying / mitigating mechanisms		Final assessment
Risk narrative	Assessment of severity (high / medium / low)	Most vulnerable countries (please specify countries and additionally flag "all countries" if you assess the risk is systemic at the EU-wide level)	Most vulnerable entities / activities **	Potential cross-sectoral spillovers (identify to which sectors and assess minor/substantial)	Potential cross-border spillovers (identify to which countries, and assess minor/substantial)	Potential interaction with other risks	Identified vulnerabilities / aggravating factors	Factors mitigating the risk (please specify factors other than policies)	Overall assessment of severity "warranting policy actions / possible future policy actions / no need for policy action"
Challenges for banks' profitability as a consequence of a decrease in net interest margin as well as regulatory developments. Low profitability reduces banks' ability to accumulate capital organically via retained earnings. Less capitalised banks may be less in a position to extend credit (given capital constraints) and invest in riskier assets to increase their returns ("gambling for resurrection"). In some cases, low profitability makes weak balance sheet persistent over time, impeding the resolution of problem assets and potentially further deteriorating asset quality (e.g., increase in NPLs, deterioration of credit standards, misallocation of capital and possible adverse macro-feedback on growth).	High	Countries with lower profitability levels and cost to income ratios above the EU average/median. Countries where bank's balance sheets are still weak in terms of non-performing exposures. Countries where the projected ROA suggests a gap between ROE and cost of equity.	Banks with lower profits are more likely to exchange higher risks for higher returns. Lower profits can be found among (i) less competitive institutions, (ii) banks with higher levels of impaired assets; (iii) banks with balance sheets characterised by more retail activity.	The more capital intensive lending activity of affected entities be taken over by (i) healthier banks or (ii) entities that fall outside the scope of prudential supervisory activities.			In a context of subdued economic activity, reduced yield on interest earning assets and inelastic funding costs, bank net interest margins decrease. This is compounded by the fact that the dampening effect of low long term rates on net interest margins increases with the flattening of the yield curve. However, for lower net interest margins to feed into lower profitability, the following conditions must hold: (1) the offsetting of increased lending volumes does not materialise as lending does not pick up; (2) other income sources (e.g. fees and commissions) do not increase as activity remains mute given the depressed economic environment or the competition from other service-providing sectors; (3) operating costs cannot be reduced further.	A recovery of growth may overcompensate the decrease of net interest margin (as evidenced by the quantitative work). Enhanced macro and microprudential supervision (with microprudential being the first line of defence in the scenario where "gambling for resurrection" behaviour affects a small number of institutions).	Warranting policy actions
Low interest rates should be conducive to an increase in loan volumes by fostering loan creation, as long as credit demand is not suppressed by expectations of low economic growth. However, lower credit standards and forbearance may be incentivised, reducing asset quality in the long run (especially if borrower's net worth is overestimated because of collateral mispricing in the low rate environment).	Medium (currently observed in selected countries and/or portfolios)	All countries, with particular attention to those countries which did not see a severe tightening in the run-up to the crisis, those where the financial sector is larger in terms of GDP, those where the credit-to-GDP gap is positive and those with wider forbearance.	Banks with relative pressure on profitability.			A decrease in asset quality in the medium-term (derived from loosened credit standards and low growth) may negatively affect the profitability of banks. New lending may be addressed to already heavily leveraged households and non-financial corporations, which could, in the medium or long-term, further deteriorate asset quality in banks.	Low profitability prospects may incentivise forbearance (to avoid further losses) and increasing loan volumes to less sound borrowers to compensate for the decline in margins.	Crisis experience, improved standing of CROs and high indebtedness of private sectors likely to dampen excessive balance sheet growth.	Possible future policy actions
Costs of market funding would continue to remain low in an environment of low interest rates, which could then encourage banks to issue more debt rather than equity (negatively impacting on bank resilience). Stronger reliance on deposit funding would improve the stability of bank funding.	Low	On the one hand, countries with low capital ratios and which have not increased the ratios lately. On the side of market funding, countries with high leverage and a substantial use of market funding.	Banks with relatively higher cost of equity			Banks with reduced incentives to raise equity and low profitability will be in a worse position to absorb potential shocks. To attract investors, banks may promise returns which are not realistic in the current conditions and may engage in riskier activities to meet these commitments.	Low profitability reduces banks ability to generate capital organically; if for these banks the opportunity cost of raising equity is high, they will be more likely to rely on debt-type sources of funding.	In a context of "search for yield", investors' required equity premium declines thereby reducing the opportunity cost aforementioned.	Possible future policy actions



Scenario Low for Long									
Risk		Parts of EU financial system		Potential spill-overs and interactions			Amplifying / mitigating mechanisms		Final assessment
Risk narrative	Assessment of severity (high / medium / low)	Most vulnerable countries (please specify countries and additionally flag "all countries" if you assess the risk is systemic at the EU-wide level)	Most vulnerable entities / activities **	Potential cross-sectoral spillovers (identify to which sectors and assess minor/substantial)	Potential cross-border spillovers (identify to which countries, and assess minor/substantial)	Potential interaction with other risks	Identified vulnerabilities / aggravating factors	Factors mitigating the risk (please specify factors other than policies)	Overall assessment of severity "warranting policy actions / possible future policy actions / no need for policy action"
In general terms, low interest rates and structural changes are challenging the traditional banking business model (see other risks identified by WS2). In particular, traditional ways of making money by banks (maturity and liquidity transformation as well as exploiting an information advantage in assessing credit risk) all are now at risk of being significantly challenged.	Medium; high if a major share of the sector would fail to adjust	All countries, in particular those without a dynamic and competitive banking system.	Those entities less agile to adjust to the new environment and structural changes.	Non-credit institutions may take the role of banks in what deposits or loans to the real economy are concerned.		Low profitability may be accelerating this trend, together with competence from the "fintech".	Those institutions less agile to adjust to the new conditions may also have difficulties in modify their internal processes or systems in order to manage risks under the new market and liquidity pricing conditions.		Possible future policy actions
The shift of depositors to similar products offered by insurers or asset managers may diminish the role of EU banks in the financial system.	Low-to-medium for banks, medium-to-high for savers	Countries with growing shadow banking activities and largest outflow from time deposits.	Institutions relying most on retail deposits or those unable to offer competitive remuneration to deposits.	Savings reallocation from banks to entities that fall outside the scope of prudential supervisory activities.		this risk from the banking sector perspective aggravates vulnerabilities identified by WS3; interconnectedness between banks and the shadow banking sector can transform market risk into credit risk in case of major problems e.g. in the asset management industry.	Low secondary market liquidity	Stickiness of deposits as they are used for payments.	Possible future policy actions
Low profitability may trigger mergers and acquisitions within the EU. That could either be seen as a welcome development of banking system consolidation or, could exacerbate the Too-Big-Too-Fail problem and decrease the competition in the EU banking system. In case the consolidation of the EU banking system takes place with cross-border operations, tensions in the relations of home and host supervisory authorities could be exacerbated, a situation which the EBA and the SSM would have to address.	Low	Scope to reap gains from consolidation in countries with lower profitability levels and cost to income ratios above the EU average/median. TBTF concerns may be exacerbated in those countries with high concentration or low weight of domestic institutions.	Less profitable banks	Limited		Low profitability	Low profitability increases the perceived benefits of consolidation	Functioning of colleges of supervisors under EBA aegis.	No need for policy action

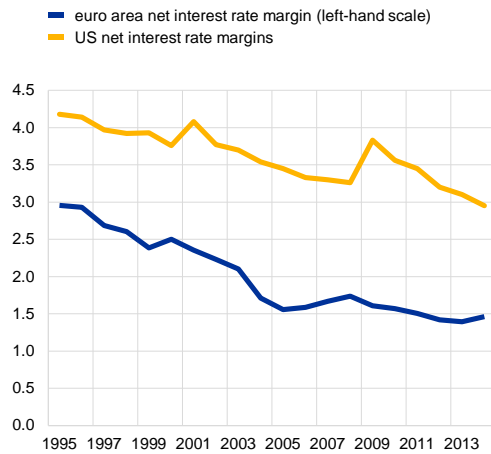
Scenario back to normal									
Risk		Potential spill-overs and interactions		Amplifying / mitigating mechanisms			Amplifying / mitigating mechanisms		
Risk narrative	Overall assessment of severity medium / high / low	Most vulnerable countries (please specify countries and additionally flag "all countries" if you assess the risk is systemic at the EU-wide level)	Most vulnerable entities / activities **	Potential cross-sectoral spillovers (identify to which sectors and assess minor/substantial)	Potential cross-border spillovers (identify to which countries, and assess minor/substantial)	Potential interaction with other risks	Identified vulnerabilities / aggravating factors	Factors mitigating the risk	Overall assessment of severity "warranting policy actions / possible future policy actions / no need for policy action"
For variable-rate loans, an increase in interest rates would increase debt servicing costs, with the potential to generate problems in the area of credit risk (non-performing loans, forbearance). For fixed-rate loans, an increase in interest rates would threaten profitability of banks, as interest income would not adjust at the same pace as interest expenses.	High, especially in countries where fixed-rate loans predominate	Countries where the households and non-financial corporations are most leveraged. Countries where bank's balance sheets are still weak in terms of capital. Countries where bank's balance sheets are still weak in terms of non-performing exposures. Countries identified in the clustering exercise (see Annex 3) with low profitability and, at the same time, an important share of fixed-rate loans.	Banks with fixed-rate loans			Excessive indebtedness of household and non-financial corporations. Excessive relaxation of credit standards during the period of low interest rates.	There seems to be an increase of fixed-rate loans across EU banking systems in the last years, which could aggravate the negative effects in case of an increase of interest rates.	Recovery of growth may compensate for the decrease in net interest margins, via lower impairments and higher volume of loans.	Warranting policy actions
A return to higher rates may hamper the loan affordability of borrowers, negatively affecting asset quality and having a negative effect on the supply of credit to the real economy.	Medium	See above	Banks with weak balance sheet	Other entities may step in to provide the additional credit to the real economy.	Recovery of growth may not occur at the same pace in those countries where banks cannot supply the required credit and no substitutes are found.	Excessive indebtedness of household and non-financial corporations. Low profitability of banks.		Micro-prudential supervision should ensure that the riskiest credit portfolios are duly assessed and accounted for.	Possible future policy action
Investors would reconsider the currently low premium they charge for holding hybrid bank debt (additional tier 1) and other debt instruments. For debt instruments, banks would need to incur higher costs to renew this source of funding.	Medium	Countries whose funding costs have been most suppressed by LIRE (i.e. those whose long term rates in LFL are furthest below the BTN scenario).					Risks associated to market perception of hybrid debt instruments. Tensions for those banks which are not able to roll-over their market funding (via increased competition for deposits, increased encumbrance of assets or deleverage).	Micro-prudential supervision should ensure that the roll-over of market funding does not pose excessive risks to the bank in an environment of raising interest rates.	Possible future policy action



Annex 3

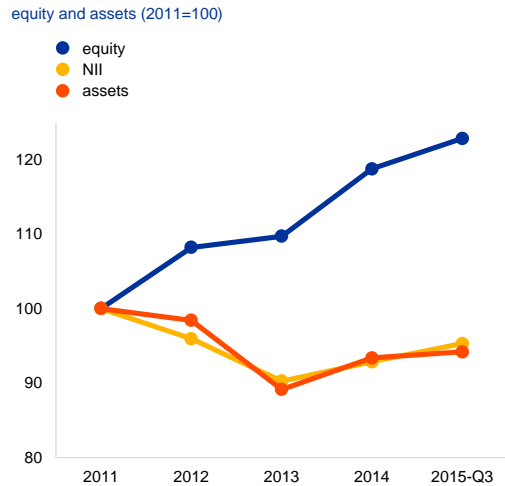
Supporting charts for the technical report

Chart 1
Trend of net interest margins in European and US banks



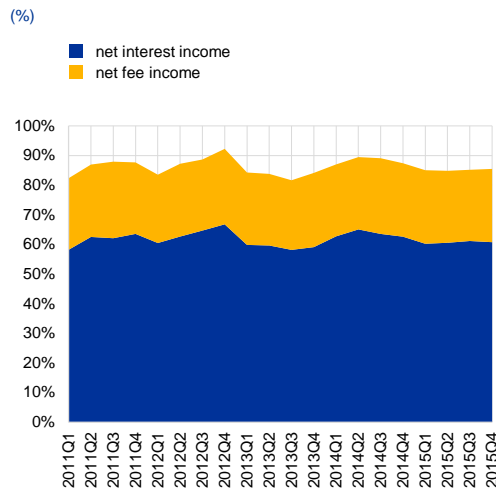
Source: Thomson Reuters, ECB calculation and Federal Reserve Bank of Saint Louis.
Note: Weighted average of 66 euro area banks.

Chart 2
Aggregate net interest income



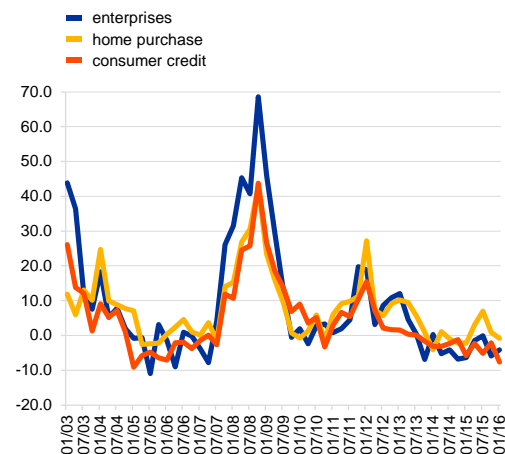
Source: SSM supervisory information (FINREP and STE) for 91 Significant Institutions.
Note: 2015Q1 results may be not fully comparable to end-of-year time series due to seasonality effects.

Chart 3
Net interest income and net fee income to total operating income



Source: EBA Key Risk Indicators.
Notes: Until December 2014, the data cover a sample of 53 major EU banking groups. From then onward, the data sample covers 195 institutions.

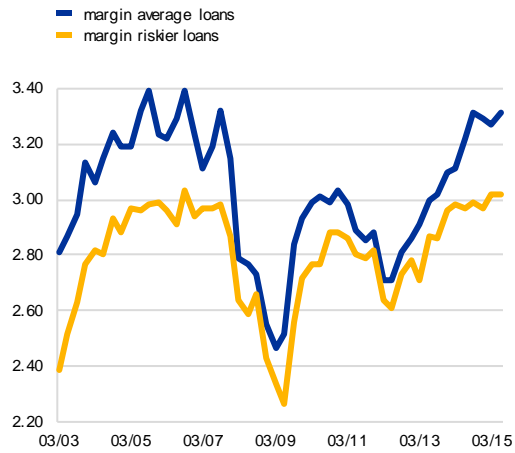
Chart 4
Weighted net percentage (tightened minus eased or reverse) of credit standards



Source: Bank Lending Survey, ECB
Notes: Weighted percentages based on the share of each country in the total loan outstanding amounts of the area aggregate and of each bank in the total loan outstanding amount of the BLS banks sample. Forward looking three months. Values above 0 imply a net tightening of credit standards and below 0 net easing.

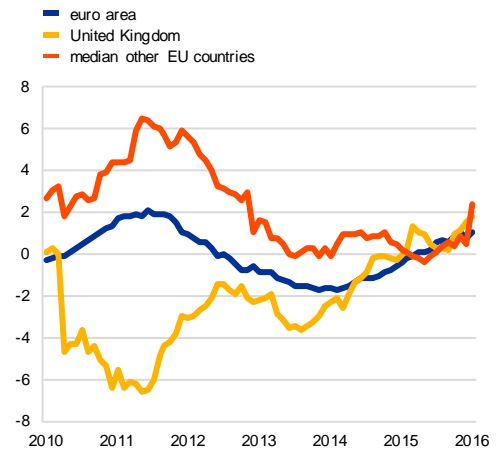


Chart 5
Commercial margins of average loans



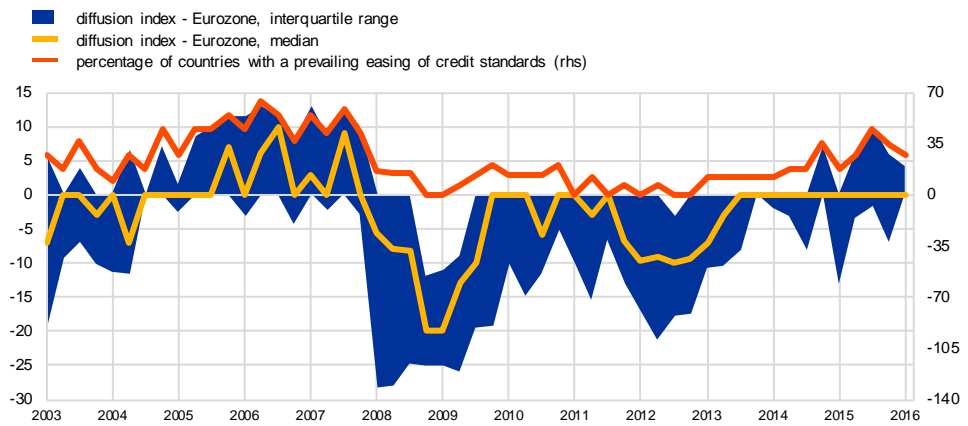
Source: Bank Lending Survey, MPAG Chart Pack, ECB
 Note: Values larger than 3 indicate narrowing, values smaller than 3 spreading of margins. For further information on the methodology of the Bank Lending Survey, please refer to <https://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html>.

Chart 7
Annual growth rate of loans to non-financial corporations and households



Source: BSI, ECB.
 Note: For non-euro countries, average of the growth rates of loans to non-financial corporations and households. Loans granted to euro area counterparts and to domestic counterparts.

Chart 6
Net easing of credit standards onhousing retail loans



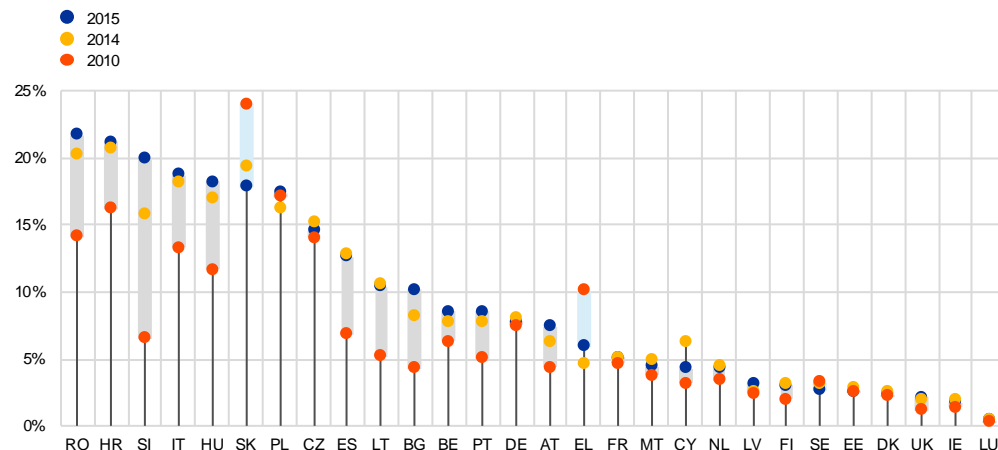
Source: Bank Lending Survey, ECB
 Note: Diffusion index is calculated as follows: Share of banks reporting considerable easing + 50 % of the share of banks reporting moderate easing - share of banks reporting considerable tightening - 50 % of the share of banks reporting moderate tightening



Chart 8

Domestic government debt securities and loans to general government, to total assets of monetary financial institutions

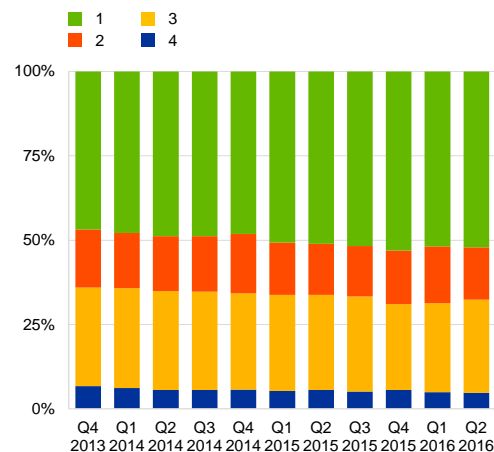
(percentage)



Source: BSI, ECB, ESRB Issues Note August 2015.
 Note: End of month liabilities for June 2015, June 2014 and June 2010. Red columns denote an increase in exposures, green columns a decrease. Exposures refer to aggregate of government debt securities and loans (both, central and local government). 2010 data for LV refer to Sep 2010 and for HR to Dec 2011.

Chart 9

Share of nominal debt securities holdings by sector and rating category, institutions in the euro area

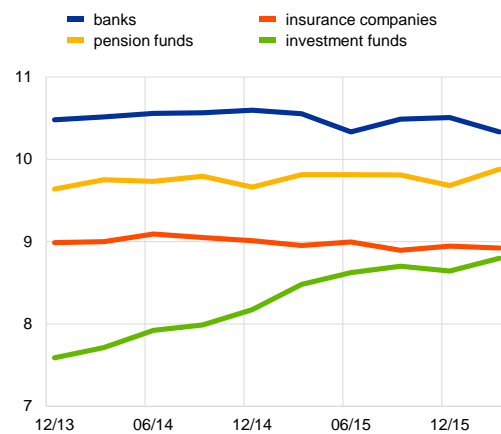


Source: ECB, ECB calculations. Financial Stability Review, ECB
 Note: Credit quality steps are defined in accordance with the Eurosystem credit assessment framework, which provides a harmonised rating scale with three credit quality steps. The first step includes securities rated from AAA to AA-, the second from A+ to A- and the third from BBB+ to BBB-. A fourth step is added, including securities with a rating below that for step three. The analysis is based on the nominal amounts of euro and foreign currency-denominated securities, including alive and non-alive securities.

Chart 10

Weighted average residual maturity of debt securities held

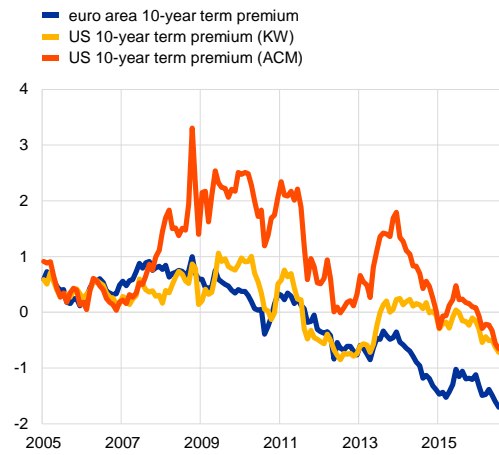
(years)



Source: ECB, ECB calculations. Financial Stability Review, ECB
 Note: All alive, rated and non-rated, euro and foreign currency-denominated debt securities are included. In order to estimate the average, residual maturities are weighted by the nominal amount held of each security by each sector over the total debt holdings of each sector.

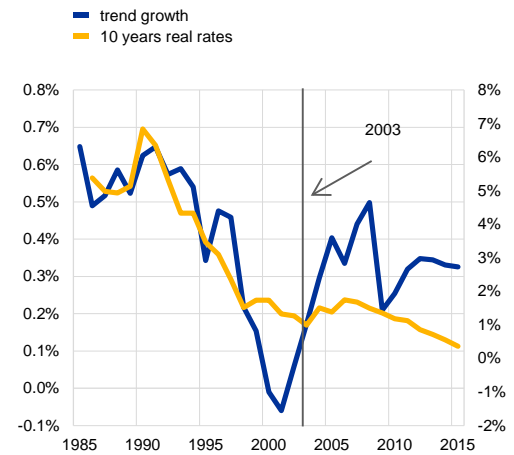


Chart 11
10-year term premia estimates for the euro area and the US



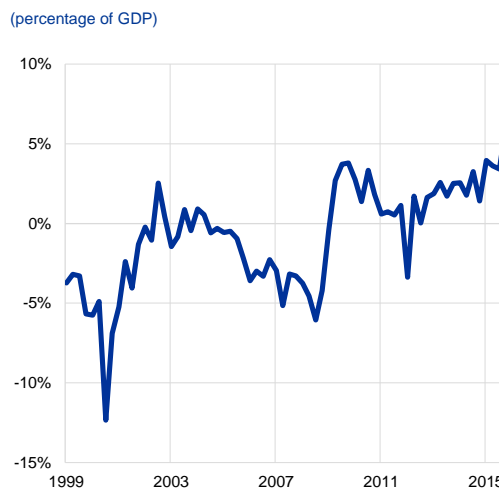
Source: Bloomberg, estimations of the term premium, MPAG Chart Pack, ECB
 Note: "KW" stands for Kim and Wright; see Kim and Wright (2005).
 "ACM" stands for Adrian, Crump and Moench; see Adrian et al. (2013).
 Latest observation: May 2015

Chart 12
Japan trend growth (lhs) and 10-year real rates (rhs)



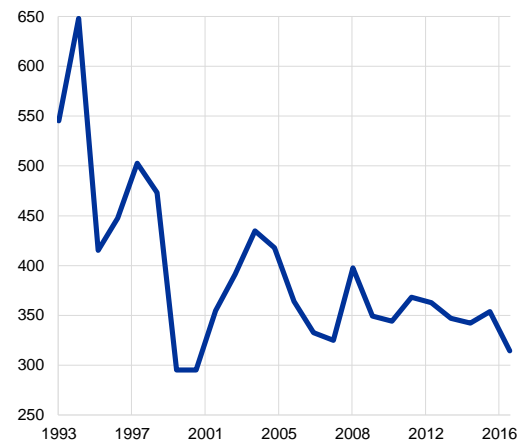
Source: Haver, KLEMS, Ministry of Internal Affairs and Communications, ECB.
 Note: Trend growth: trend TFP growth + working age pop YoY growth. Annual TFP 0.8% change from 2010 to 2016 was assumed. 10Y real rates = 10Y government bond yield – trend YoY % change in general CPI (10Y moving averages).

Chart 13
Total private non-financial sector net borrowing



Source: Source: Eurostat, Haver Analytics.

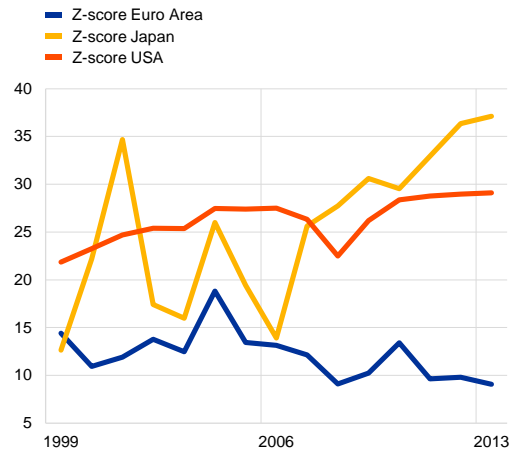
Chart 14
Debt to equity ratio of Japanese banks



Source: Bloomberg.
 Note: Topix (TSE) Bank Index. Total debt to total equity computed by the source as total debt divided by total shareholders' equity, i.e. short and long term debt/shareholders' equity*100.

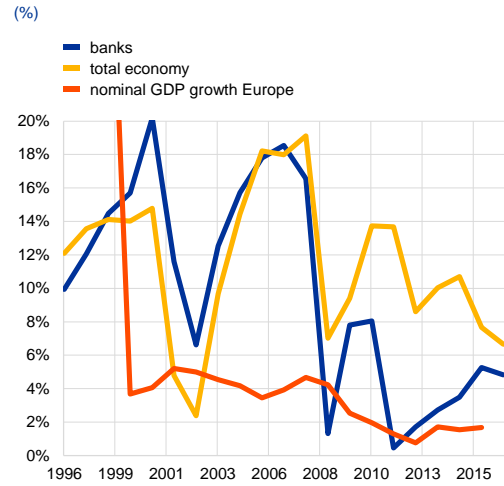


Chart 15
Z-score of Japanese, European and US banks since 1999



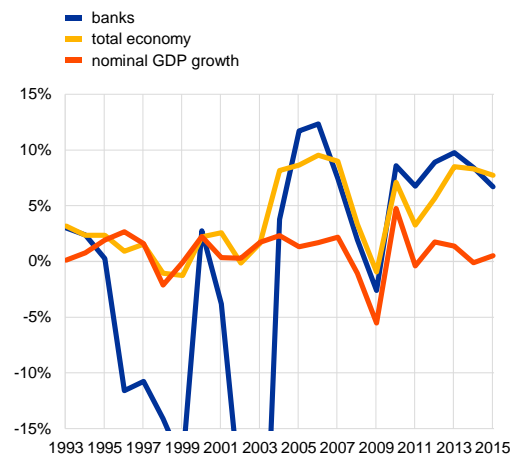
Source: Saint Louis Fed at <https://research.stlouisfed.org/fred2/series/DDSI01EZA645NWDB>
 Note: The Z score captures the probability of default of a country's banking system, calculated as a weighted average of the z-scores of a country's individual banks (the weights are based on the individual banks' total assets). The Z-score compares a bank's buffer (capitalisation and returns) with the volatility of those returns. See also Laeven and Levine (2009) for uses.

Chart 16
ROE of euro area banks versus the total economy and nominal GDP growth



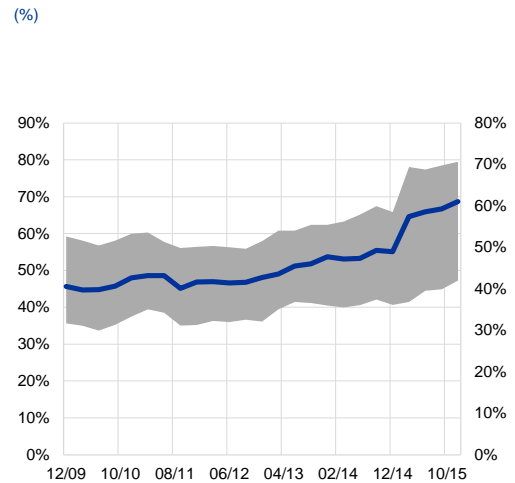
Source: MSCI Indices (Bloomberg), ECB.

Chart 17
ROE of Japanese banks versus the total economy and nominal GDP growth



Source: Topix (TSE) Index and Bank Index / Bloomberg, Cabinet Office of Japan/ Haver Analytics.

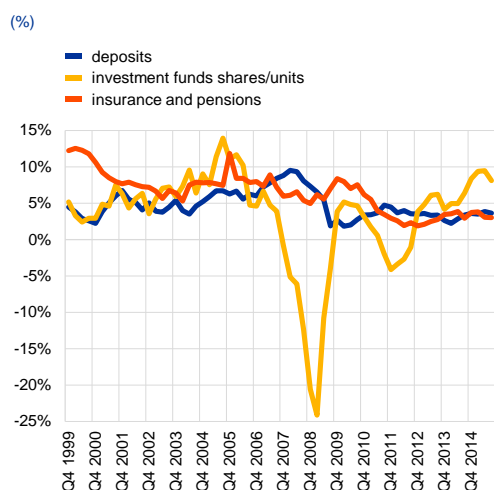
Chart 18
Customer deposits to total liabilities, interquartile range and weighted average



Source: EBA Key Risk Indicators.
 Note: Until December 2014, covering a sample of 53 major EU banking groups. From then onwards, the data sample covers 195 institutions.

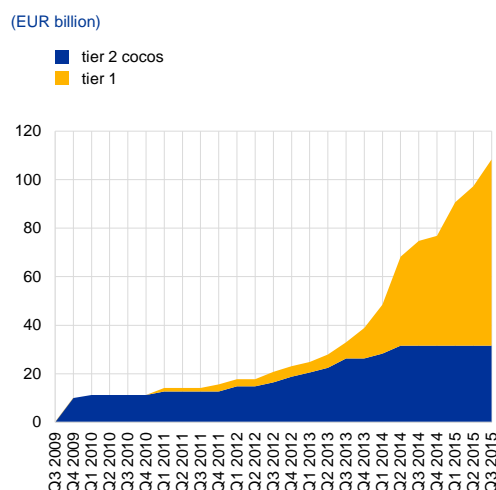


Chart 19
Transactions over the last four quarters to closing balance, assets held by households, median of EU countries



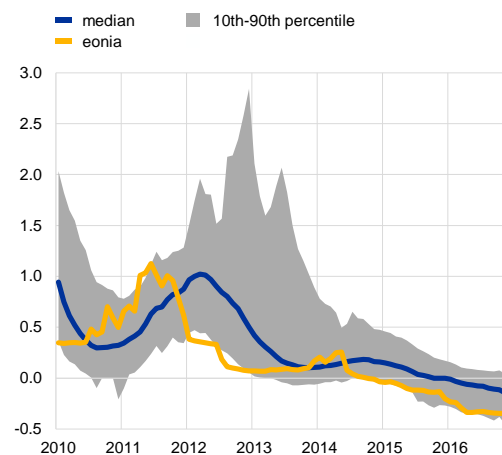
Source: Quarterly Sectoral Accounts, ECB.
 Note: Covering a different set of countries over the periods. No data available for Ireland.

Chart 20
Total cumulative issuance of CoCos by EU banks



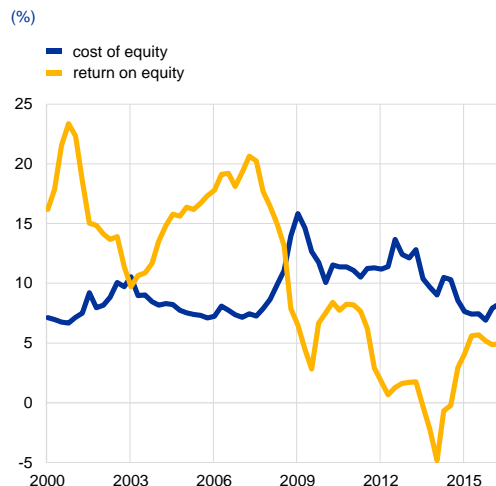
Source: SNL, Bloomberg, EBA calculations. EBA Risk Assessment of the European Banking System, January 2016.

Chart 21
Total returns of euro area MMFs, year-on-year total return



Source: Bloomberg, ECB
 Note: Sample includes 513 funds, all denominated in euros. Total returns take into account price appreciation and dividends reinvested. Latest observations: April 2015.

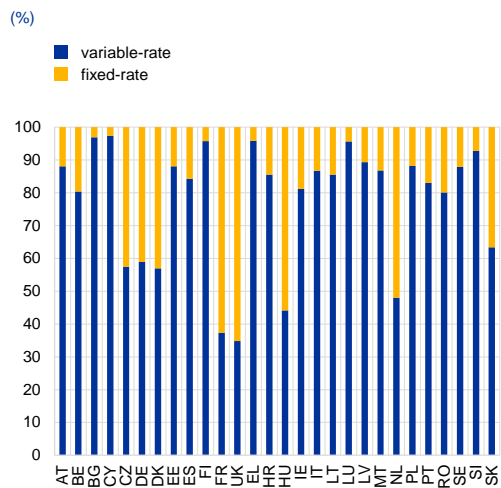
Chart 22
Euro area banks' cost of equity: cross-sectional distribution of individual estimates



Source: Bloomberg, Datastream, Consensus Economics, ECB calculations. ECB Financial Stability Review.
 Note: Based on the sample of all 33 euro area banks included in the Euro STOXX index. (Trailing) Return on equity (ROE) is the weighted average (by mkt cap) of individual ROEs. Cost of equity (COE) is the expected return on an investment in a weighted portfolio of all 33 banks, as implied by the Capital Asset Pricing Model. Betas are estimated on rolling windows of one year of daily data, with the market portfolio proxied by the Euro STOXX index. The estimate of the equity premium, for the Euro STOXX index, is based on I/B/E/S earnings forecasts and Consensus estimates of long-term real GDP growth.

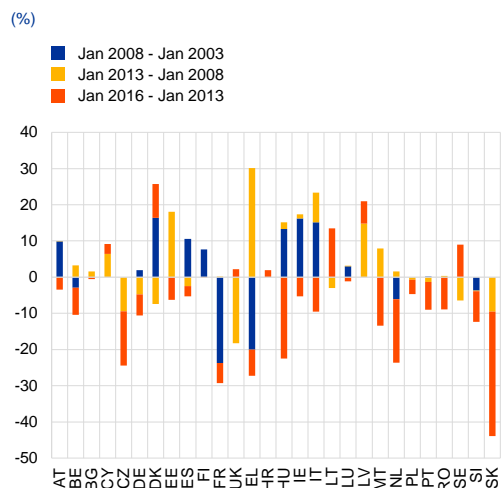


Chart 23
Share of variable-rate and fixed-rate new loans of total new loans



Source: MIR Statistics (ECB) and Bank of England
 Note: Reference date is December 2015. Data on the % share of outstanding loans are not available.

Chart 24
Difference in the share of variable-rate new loans as a percentage of total new loans



Source: MIR Statistics (ECB) and Bank of England.



Annex 4

Clustering of EU banking systems

The aim of the clustering exercise was to suggest a way of dividing national banking systems into groups that would be relatively homogenous in terms of their sensitivity to the risks for banks identified in this report. The clusters should support the assessment of whether a certain group of countries is more likely to be affected by the materialisation of the scenarios under analysis.

Fourteen variables were chosen to illustrate the areas of vulnerability described in the interim report and technical documentation. The basis for the selection of variables was the dataset from the Analysis of National Banking Systems (ANBS) report (excluding the market-based indicators). This was supplemented by other indicators selected from Consolidated Banking Data. Data completeness was used as an additional criterion – variables were omitted if at least one country filed no observation⁵³. Selected variables are presented in Tables 1 and 2, according to ANBS classification and mapping to areas analysed in technical documentation respectively.

Table 1
Selected variables according to ANBS classification

	Index	Full name	Shortcut
Profitability	02.	Return on assets	(ROA)
	03k.	Share of interest income	(Nlshare)
	04.	Cost-to-income ratio	(Cti)
Solvency	06.	Tier 1 ratio	(T1)
	08.	Leverage (assets to equity)	(leverage)
Asset structure and quality	11.	Credit to non-financial corporations and households / GDP	(NFLoans/GDP)
	13.	FX lending to the domestic private sector	(FXlending)
	14a.	Loans and advances	(loans)
Liquidity and funding	16.	Banks' liquid assets ratio	(Liq)
	18.	Proportion of market funding	(MktFund)
	18k.	Share of issued debt financing	(DebtIssued)
Structural	25.	Total banking assets to GDP	(assets/GDP)
	26.	Share of domestic credit institutions	(domestic)
	26.	Share of domestic credit institutions	(domestic)

The mapping of variables to risk areas is sometimes ambiguous and some variables could also represent other areas. This is the case for leverage (defined here as assets to capital), which is generally interpreted in the analysis of the banking sector as complementary to capital adequacy ratios, showing the resilience of the banking sector. In this analysis it was used as a funding measure, since it corresponds to the share of liabilities on the balance sheet and is therefore relevant to the risk of issuing debt rather than equity, as was noted in the risk assessment table.

Two important dimensions missing from the analysis due to a lack of complete data are the fixed/variable interest rates prevailing in a given country and the quality of assets. The problem with including the fixed/variable rate dimension is that it is difficult to obtain data that show this on a

⁵³ With the exception of indicator 11 "Credit to non-financial corporations and households / GDP", for which missing observations for Croatia and UK were completed using World Bank data (after verifying that for other EU countries both data sources show similar information).



continuous scale for all EU countries. Dummy variables were tried, but this is methodologically questionable and would lead to automatically grouping fixed-rate countries and variable-rate countries in separate clusters. As for asset quality, each ratio tested showed missing observations for some countries and – due to differences in definitions – a variable composed of multiple data sources would not be consistent, which would weigh on the classification of countries into clusters. Additionally, for most popular indicators (such as the share of nonperforming loans) the data are not really comparable across countries, as the definitions have been only recently harmonised. Including such a variable could distort the measurement of distance between clusters.

In the analysis presented, data as of end-2014 were used, as they were more complete than 2015H1 data (the latest available). However, most variables are strongly correlated between periods (in particular balance sheet variables and other structural indicators), so this choice should not impact the results strongly⁵⁴.

Table 2
Mapping of selected variables to areas from technical documentation

	Index	Full name	Shortcut
Resilience	02.	Return on assets	(ROA)
	03k.	Share of interest income	(Nlshare)
	04.	Cost-to-income ratio	(CtI)
	06.	Tier 1 ratio	(T1)
Credit growth / cycle	11.	Credit to non-financial corporations and households / GDP	(NFLoans/GDP)
	13.	FX lending to the domestic private sector	(FXlending)
	14a.	Loans and advances	(loans)
	25.	Total banking assets to GDP	(assets/GDP)
Funding	18k.	Share of issued debt financing	(DebtIssued)
	08.	Leverage (assets to equity)	(leverage)
Maturity and liquidity transformation	16.	Banks' liquid assets ratio	(Liq)
Interconnectedness	18.	Proportion of market funding	(MktFund)
Market structure and concentration	26.	Share of domestic credit institutions	(domestic)
	28.	Share of the top five credit institutions	(CR5)

Countries were clustered using the hierarchical Ward algorithm with Euclidean distance measure⁵⁵. Variables used for clustering were standardised to the 0-1 range using the following formula⁵⁶:

$$variable_{stand} = \frac{variable - \min(variable)}{\max(variable) - \min(variable)}$$

The results of the clustering procedure are shown in Figure 1. No formal criterion for stopping the clustering was specified. The cut-off point was set by expert judgement at five clusters, which was also guided by other analyses. The characteristics of the five clusters proposed are shown in Table 3. The following figures show the distributions of variables in the whole sample and in each cluster (variables in a given cluster in Figures 2-7, variables across clusters in Figures 8-21⁵⁷).

⁵⁴ As a consistency check, clustering based on 2015H1 data was performed (missing observation completed using 2014 data where possible), yielding similar results.

⁵⁵ As in Halaj and Zochowski (2009). For a consistency check, the furthest neighbour procedure gave similar results, as well as both algorithms with Manhattan distance measure.

⁵⁶ See Kok Sorensen and Puigvert (2006).

⁵⁷ In these figures, the box represents the interquartile range and the whiskers the minimum and maximum.



Figure 1
Dendrogram with the proposed clustering of EU banking sectors⁵⁸

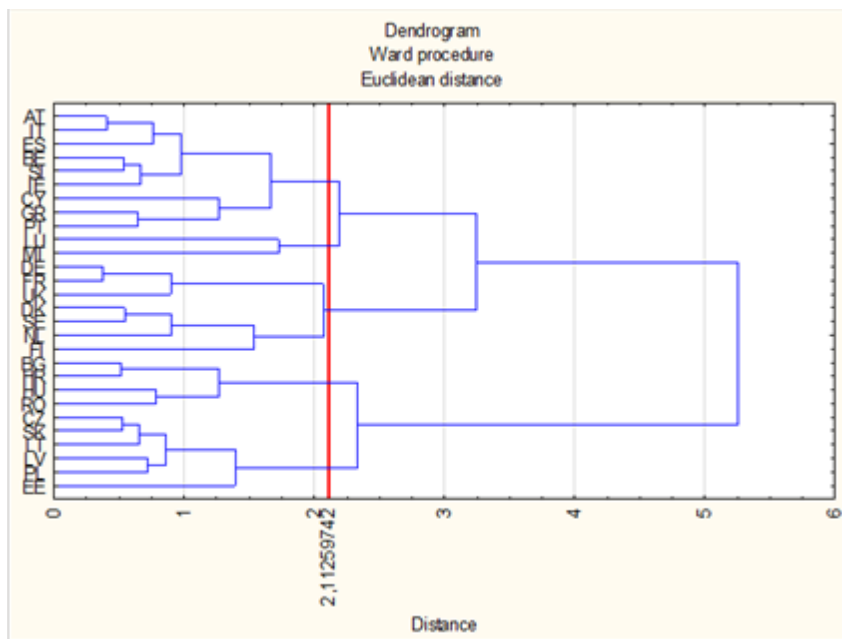
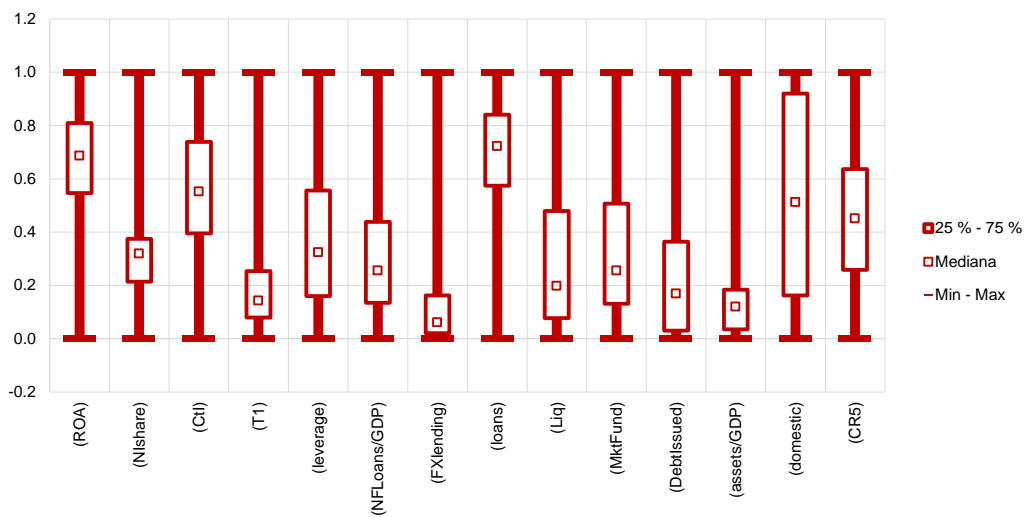


Figure 2
Distribution of standardised variables in the whole sample



⁵⁸ The red line is the proposed cut-off point for cluster selection.



Figure 3
Distribution of standardised variables in cluster 1 (LU, MT)

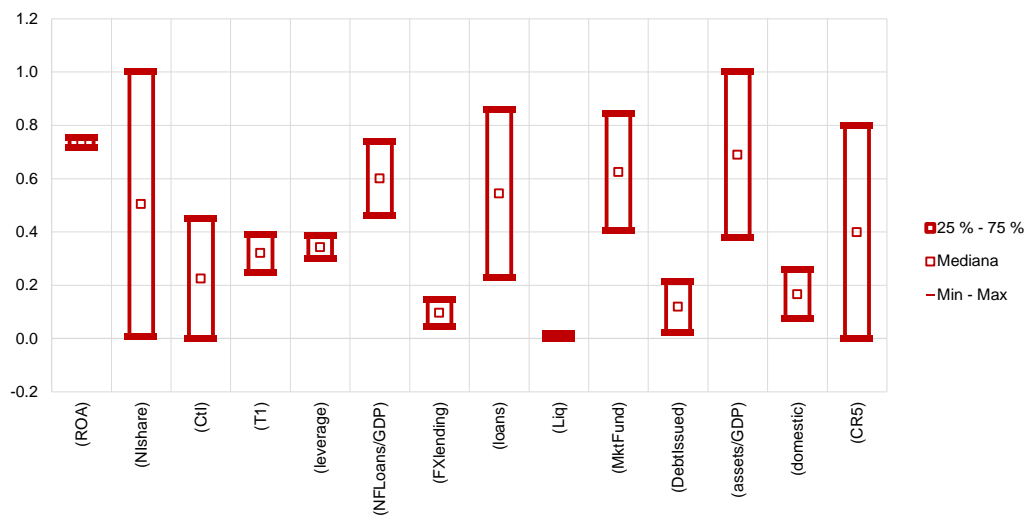


Figure 4
Distribution of standardised variables in cluster 2 (BG, HR, HU, RO)

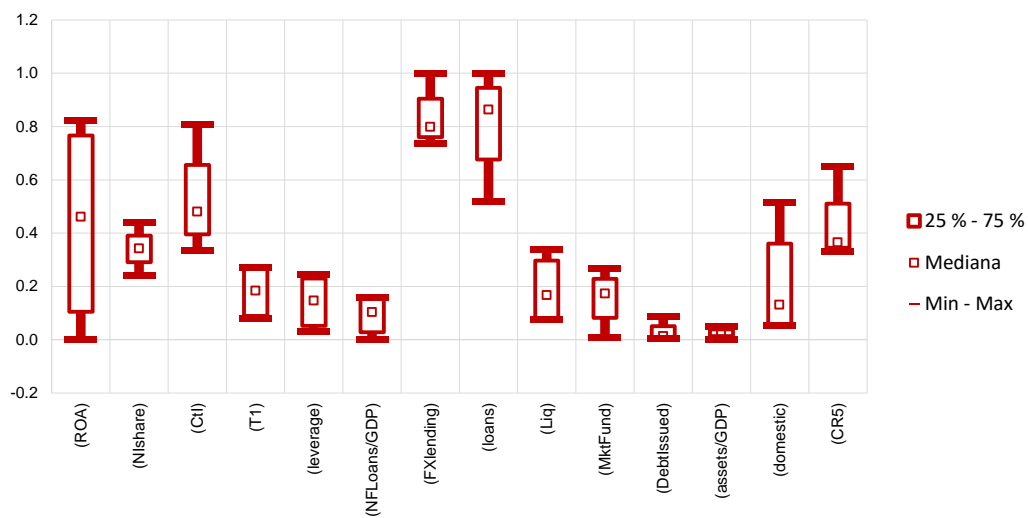


Figure 5
Distribution of standardised variables in cluster 3 (DE, DK, FI, FR, NL, SE, UK)

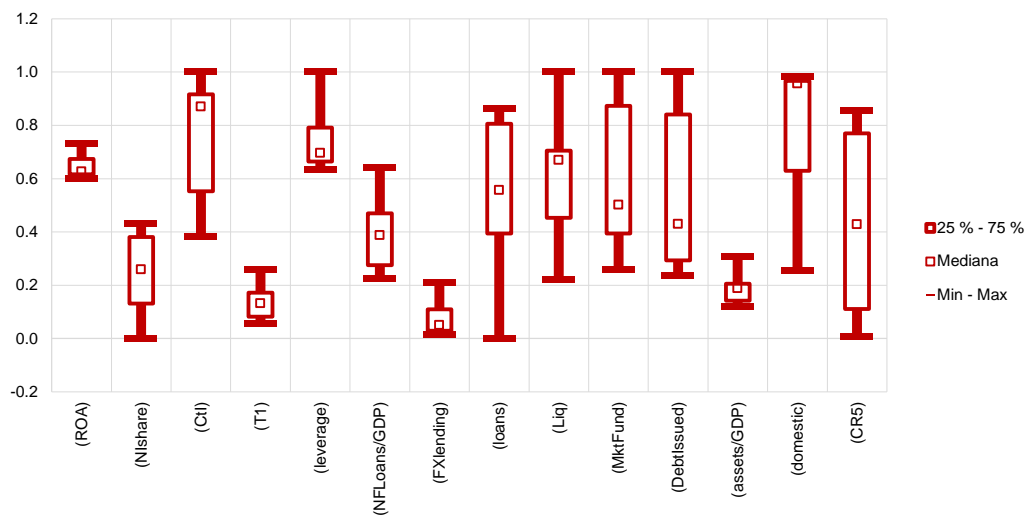


Figure 6
Distribution of standardised variables in cluster 4 (AT, BE, CY, ES, GR, IE, IT, PT, SI)

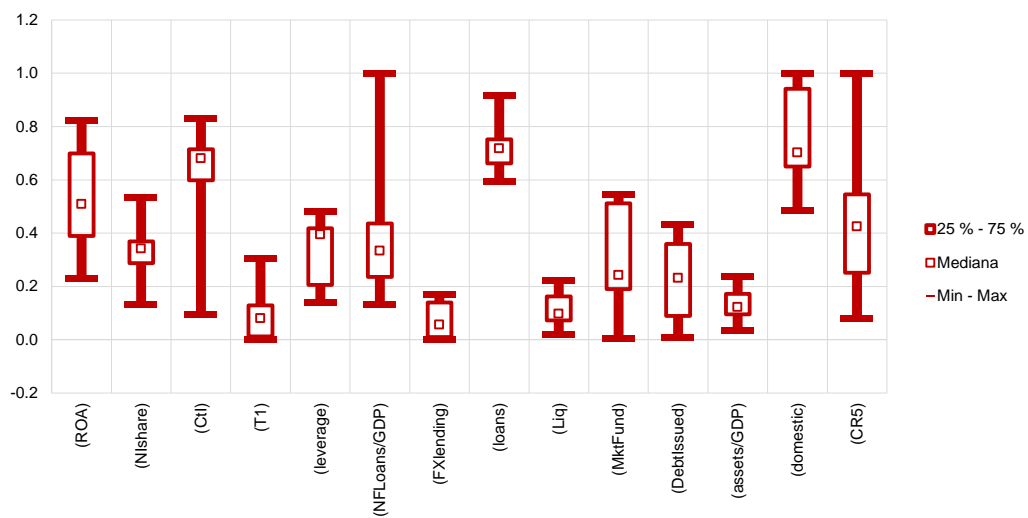


Figure 7
Distribution of standardised variables in cluster 5 (CZ, EE, LT, LV, PL, SK)

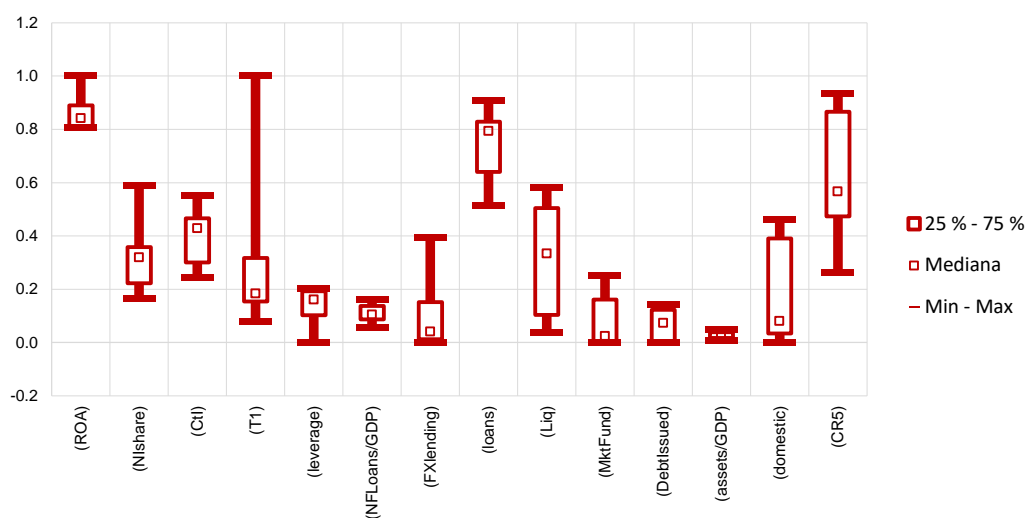


Table 3
Characteristics of proposed clusters

	Countries	Resilience	Credit growth / cycle	Funding	Maturity and liquidity transformation	Inter-connectedness	Market structure
1	LU, MT	(quite) high ROA, diverse (very low to very high) Nlshare, low Ctl, high T1	(very) high NFLoans/GDP, very high assets/GDP, diverse (low to high) share of loans, quite low FXlending	diverse (very low to medium) share of issued debt, medium leverage	very low Liq	high MktFund	very low domestic, diverse (very low to very high) CR5
2	BG, HR, HU, RO	diverse (very low to medium) ROA, medium Nlshare and Ctl, medium to high T1	very low NFLoans/GDP and assets/GDP, very high FX lending, (quite) high loans' share	(very) low leverage, very low share of issued debt	low to medium Liq	(quite) low MktFund	(very) low domestic, medium CR5
3	DE, DK, FI, FR, NL, SE, UK	quite low ROA, (very) high Ctl, diverse (low to high) T1 diverse (low to medium) Nlshare	medium to high NFLoans/GDP, high assets/GDP, (quite) low loans' share, quite low FXlending	high share of debt issued, very high leverage	very high Liq	high MktFund	(very) high domestic, diverse (low to high) CR5
4	AT, BE, CY, ES, GR, IE, IT, PT, SI	(very) low to medium ROA, quite high Ctl, diverse (low to medium) T1, medium to high Nlshare	diverse (low to very high) NFLoans/GDP, quite low FXlending, (quite) high share of loans, (quite) high assets/GDP	diverse (low to high) share of debt issued, low to medium leverage	(very) low Liq	diverse (low to high) MktFund	high domestic, diverse (low to high) CR5
5	CZ, EE, LT, LV, PL, SK	(very) high RoA, medium Nlshare, quite low Ctl, high T1	very low NFLoans/GDP and assets/GDP, diverse (low to quite high) FXlending, quite high loans' share	(very) low leverage, low share of issued debt	diverse (quite low to high) Liq	(very) low MktFund	(very) low domestic, diverse (medium to very high) CR5
	Countries	Resilience	Credit growth / cycle	Funding	Maturity and liquidity transformation	Interconnectedness	Market structure
1	LU, MT	(quite) high ROA, diverse (very low to very high) Nlshare, low Ctl, high T1	(very) high NFLoans/GDP, very high assets/GDP, diverse (low to high) share of loans, quite low FXlending	diverse (very low to medium) share of issued debt, medium leverage	very low Liq	high MktFund	very low domestic, diverse (very low to very high) CR5

Note: qualitative assessment based on the relative position of a cluster in the distribution of all countries (no absolute thresholds used); areas deemed vulnerable in bold



Figure 8
Return on assets

(by clusters)

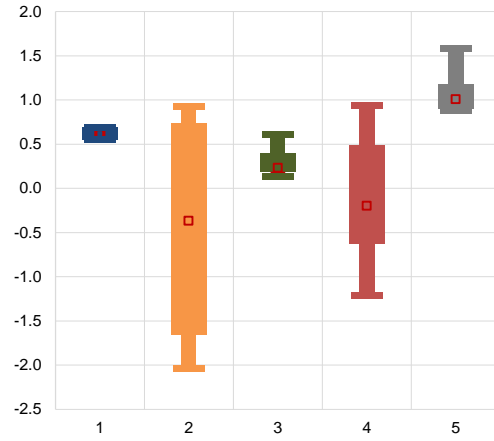


Figure 9
Share of interest income

(by clusters)

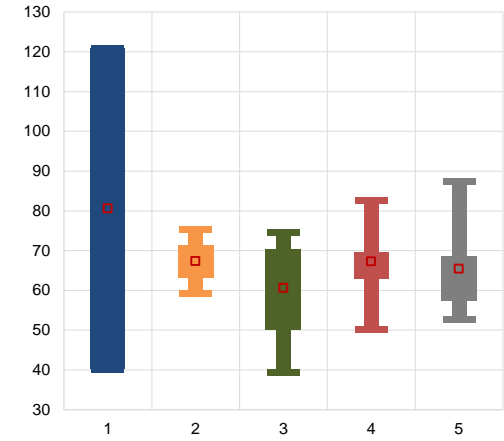


Figure 10
Cost-to-income ratio

(by clusters)

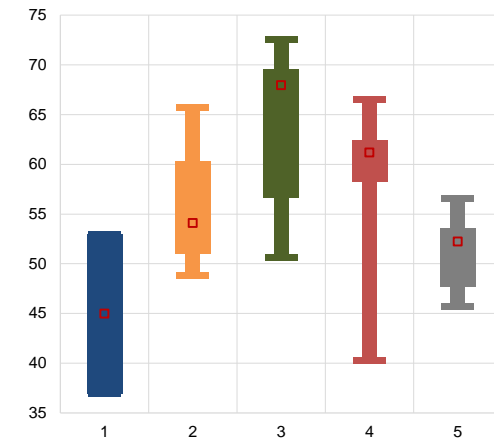


Figure 11
Tier 1 capital ratio

(by clusters)

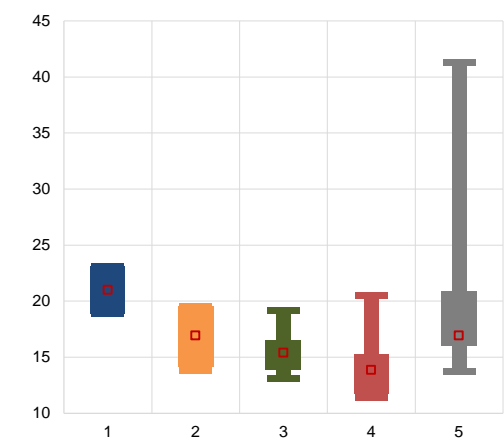


Figure 12
Leverage

(by clusters)

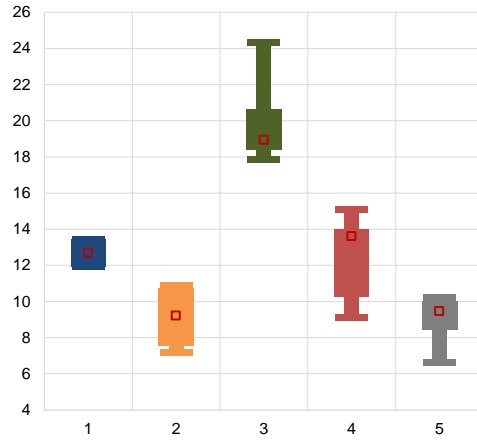


Figure 13
Credit to non-financial corporations and households to GDP

(by clusters)

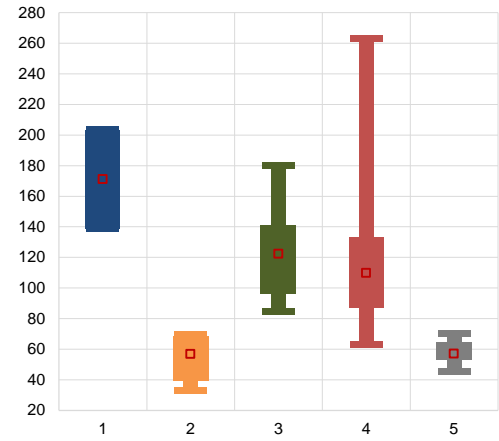


Figure 14
Share of FX lending to the domestic private sector

(by clusters)

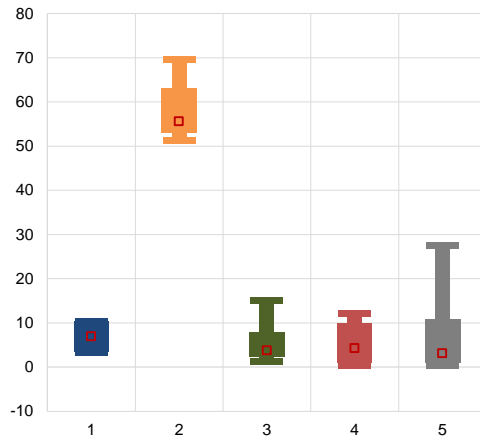


Figure 15
Share of loans and advances

(by clusters)

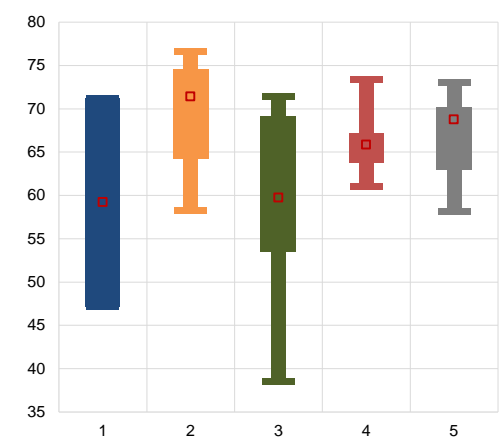


Figure 16
Liquid assets ratio

(by clusters)

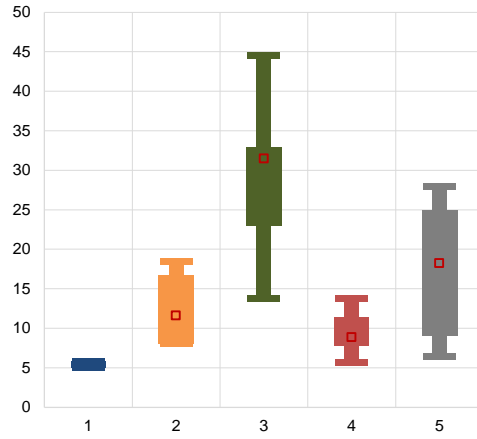


Figure 17
Market funding share

(by clusters)

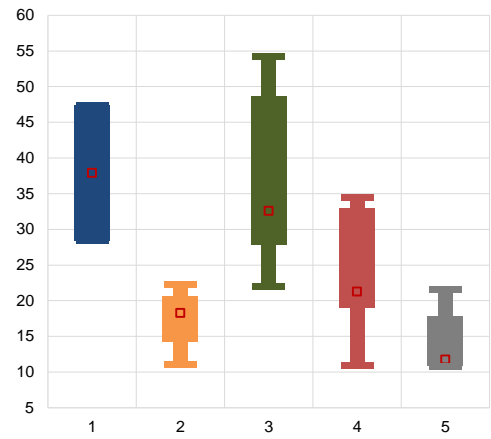


Figure 18
Share of issued debt financing

(by clusters)

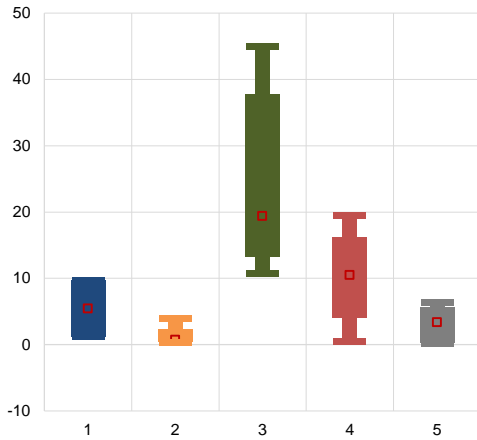


Figure 19
Banking assets to GDP

(by clusters)

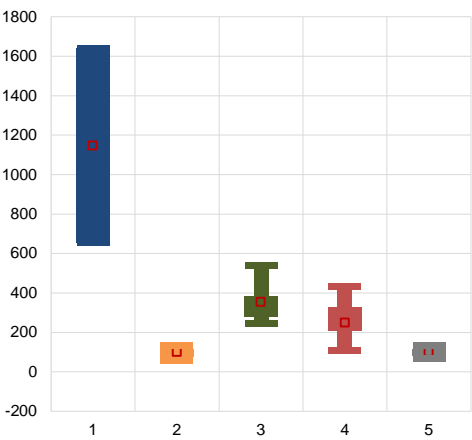


Figure 20
Share of domestic credit institutions

(by clusters)

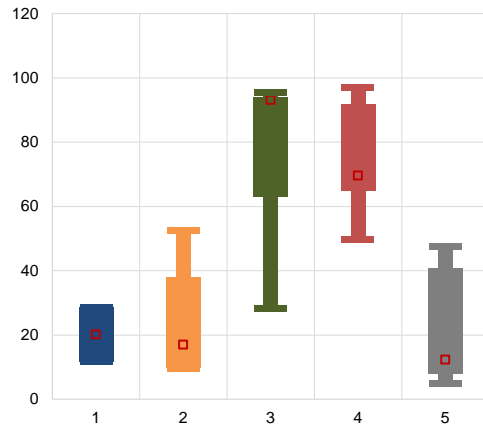
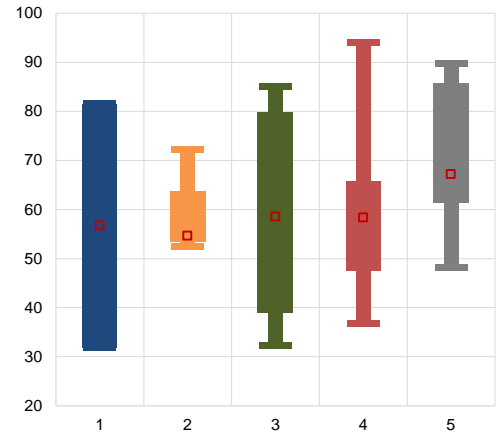


Figure 21
Share of the top five credit institutions

(by clusters)



Annex 5

A simulated path of net interest income for fixed-rate loans

This annex seeks to provide a rough estimate of the potential impact a “back to normal” scenario would have on the resilience of banks for which fixed-rate loans predominate, focusing in particular on the expected trend for net interest income. The very nature of the exercise means that significant caveats and strong assumptions are needed. On that basis, the results of the analysis should be treated cautiously, and seen as indicating possible trends rather than signaling specific and precise effects.

Fixed-rate loans in the EU banking system

Unfortunately no data are available for the whole of the EU as to the proportion of outstanding loans that were granted at a variable or a fixed rate. This information does exist, however, for the amount of new loans (flow), and provides useful insights into the practice of fixed-rate lending in the EU (Charts 23 and 24 in Annex 3). A general trend can be seen across the EU towards more fixed-rate lending, especially since 2013 (when the bars remain negative for the majority of countries).

However, together with the information on the flows, it is important to consider the share of variable and fixed-rate loans of the outstanding loan amount. As already mentioned, there is no direct indicator for this, but market intelligence and proxies (such as the average of new loans since 2003) seem to suggest that in Germany, Denmark, France, Great Britain and the Netherlands fixed-rate loans have a more significant share (Chart 23 in Annex 3). Fixed-rate new loans in these five countries account for approximately 37% of the total loans to non-financial corporations and households in the EU, while the total stock of fixed-rate loans represents around 42% of the loans to non-financial corporations and households.

Estimation of Net Interest Income under the “back to normal” scenario

Net interest income is calculated using the following formula:

$$NII = (ShareVariable) * (InterestLoansVariable - InterestLiabilities) * Credit + \\ + (1 - ShareVariable) * (InterestLoansFixed - InterestLiabilities) * Credit$$

where

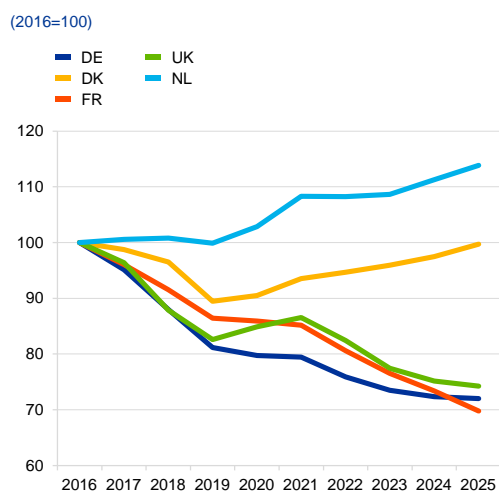
- *ShareVariable* is the six-period moving average of the share of variable-rate new loans to households and non-financial corporations of total new loans to households and non-financial corporations (source: MIR);
- *InterestLoansVariable* is proxied as the long-term rates projected in each scenario (source: Section A of the report);
- *InterestLiabilities* is short-term rates, as projected in each scenario (source: Section A of the report);
- *Credit* uses the credit projections of (source: Section A of the report) applied over the stock of loans to households and non-financial corporations at 2015Q3 (source: Consolidated Banking Data);



- *InterestLoansFixed* is the sum of the weighted moving averages (up to 2015) of the margin of loans to households and non-financial corporations (source: MIR), and the remuneration of deposits at agreed maturity of less than two years (source: MIR).⁵⁹

Setting the value of the net interest income calculated above to 100 in 2016, Chart 1 shows the estimated trend of net interest income for those countries where fixed-rate loans predominate.

Chart 1
Path of estimated net interest income between 2016 and 2025



Source: MIR Statistics (ECB), Consolidated Banking Data (ECB), Bank of England, Section A of the report and ESRB Secretariat calculations.

Table 1
Share of variable-rate new loans of total new loans used in the simulation in Chart 1

(% of total new loans)

	DE	DK	FR	GB	NL
2010	64.42	58.51	36.91	50.95	51.96
2011	63.15	65.45	44.74	37.80	58.80
2012	63.67	40.96	49.02	32.65	52.91
2013	63.98	72.77	43.01	26.50	56.41
2014	60.51	45.73	41.64	28.85	58.79
2015	58.87	56.99	37.36	35.20	48.06
2016	62.43	56.74	42.11	35.33	54.49
2017	62.10	56.44	42.98	32.72	54.91
2018	61.93	54.94	42.69	31.87	54.26
2019	61.64	57.27	41.63	31.75	54.49
2020	61.25	54.68	41.40	32.62	54.17
2021	61.37	56.18	41.36	33.25	53.40
2022	61.79	56.04	42.03	32.92	54.28
2023	61.68	55.92	42.02	32.52	54.25
2024	61.61	55.84	41.85	32.49	54.14
2025	61.55	55.99	41.72	32.59	54.12

Source: MIR Statistics (ECB), Bank of England and ESRB Secretariat calculations.

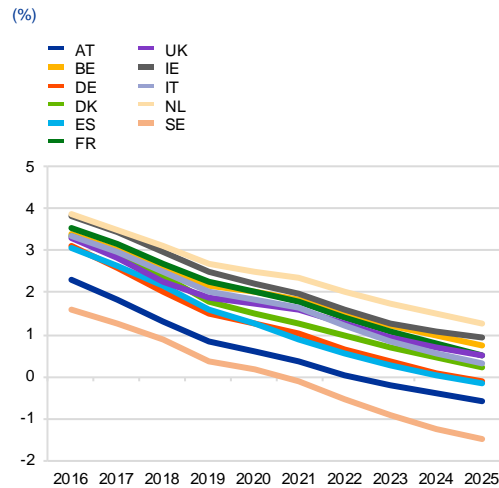
The path followed by net interest income towards values that are lower than those of 2016 is explained by the difference between *InterestLoansFixed* and *InterestLiabilities* (which is the spread of the fixed-rate loans). The latter takes the short-term rates as projected by the scenario and these rates start to rise in line with the scenario itself. At the same time, the first component (*InterestLoansFixed*) moves lower as the weight given to the 2015 data (which is the lowest in the time series) increases. Then the difference (i.e. the spread) moves closer to zero and in some cases even goes negative. However, it is interesting to note how this happens mostly in those countries where variable-rate loans predominate and, to a much lesser extent, in the five countries under consideration (see Chart 2).

Chart 1 signals a deterioration of net interest income in countries where fixed-rate loans dominate, under a “back to normal” scenario. Table 2 below puts into context the relevance of net interest income in the profit and loss accounts of banks in these five countries. Even with some variability across these five countries, it can be seen how net interest income is the main source of income for banks (to a lesser extent for French and UK banks, giving their extensive trading and similar activities).

⁵⁹ The sum of the margins and the rates paid to the deposits should equal the lending rates.



Chart 2
Estimated trend of the “spread” of fixed-rate loans for the most significant EU banking systems



Source: MIR Statistics (ECB), Consolidated Banking Data (ECB), Bank of England, Section A of the report and ESRB Secretariat calculations.

Table 2
Importance of net interest income for the profitability of banks

	Net interest income / Total income	Net fee income / Total income	Net interest income / Total assets
DE	57.71	25.48	0.84
DK	70.39	25.3	0.86
FR	46.39	32.32	0.74
GB	48.78	26.56	0.22
NL	69.84	16.89	0.94

Source: Consolidated Banking Data (ECB) and ESRB Secretariat calculations.

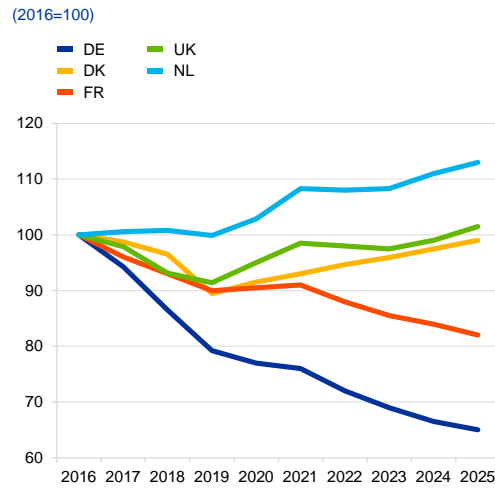
Further discussion of margins

The key components of the estimation shown in the section above are margins for variable-rate and fixed-rate loans. From the projections used in this exercise the trend for lending margins cannot be estimated over the time horizon to 2025, which is the main reason margins have been proxied using the long and short-term rates projected. However, two important issues need to be addressed in this regard: (i) how margins related to long and short-term rates in the past, and (ii) the potential room for banks to increase margins (by raising the lending rate, reducing the remuneration of liabilities, or both) in order to maintain an appropriate level of earnings.

On the latter point, 2003 lending margins could be used to proxy the spread for variable-rate loans – this is possible for variable-rate loans. If, for example, the 2003 lending margins (which are generally higher than those for 2015) were used, this would not significantly change the overall picture for the five countries under consideration. However, this would not make sense for fixed-rate loans since the heart of the vulnerability for these loans lies precisely in the fact that their spread is negatively affected by a rise in interest rates. One could argue that banks may try to increase their loan margins. However, for fixed-rate loans, the interest rate of the loan cannot be changed (because it is fixed, hence the term “fixed-rate”) whereas there would be little room to reduce banks’ funding costs. Even considering this important caveat, Chart 3 assumes that banks are able to finance themselves at half the low interest rates projected for the next ten years.



Chart 3
Path of estimated net interest income between 2016 and 2025 with lower funding costs



Source: MIR Statistics (ECB), Consolidated Banking Data (ECB), Bank of England, Section A of the report and ESRB Secretariat calculations.
 Note: Short-term rates projected have been divided by two on the assumption that banks can find cheaper sources of funding.

Table 3
Comparison of projections of long and short-term rates and lending margins

(%)

	Difference long-term and short-term rates as projected by WS1 in 2016	Difference long-term and short-term rates as projected by WS1 in 2025	Lending margin 2015	Lending margin 2003
DE	1.14	1.98	1.43	2.05
DK	1.19	2.03	1.74	2.00
FR	1.65	2.49	1.42	1.67
GB	1.79	2.63	1.91	1.08
NL	1.43	2.27	1.30	1.63

Source: MIR Statistics (ECB), Bank of England, Section A of the report and ESRB Secretariat calculations.

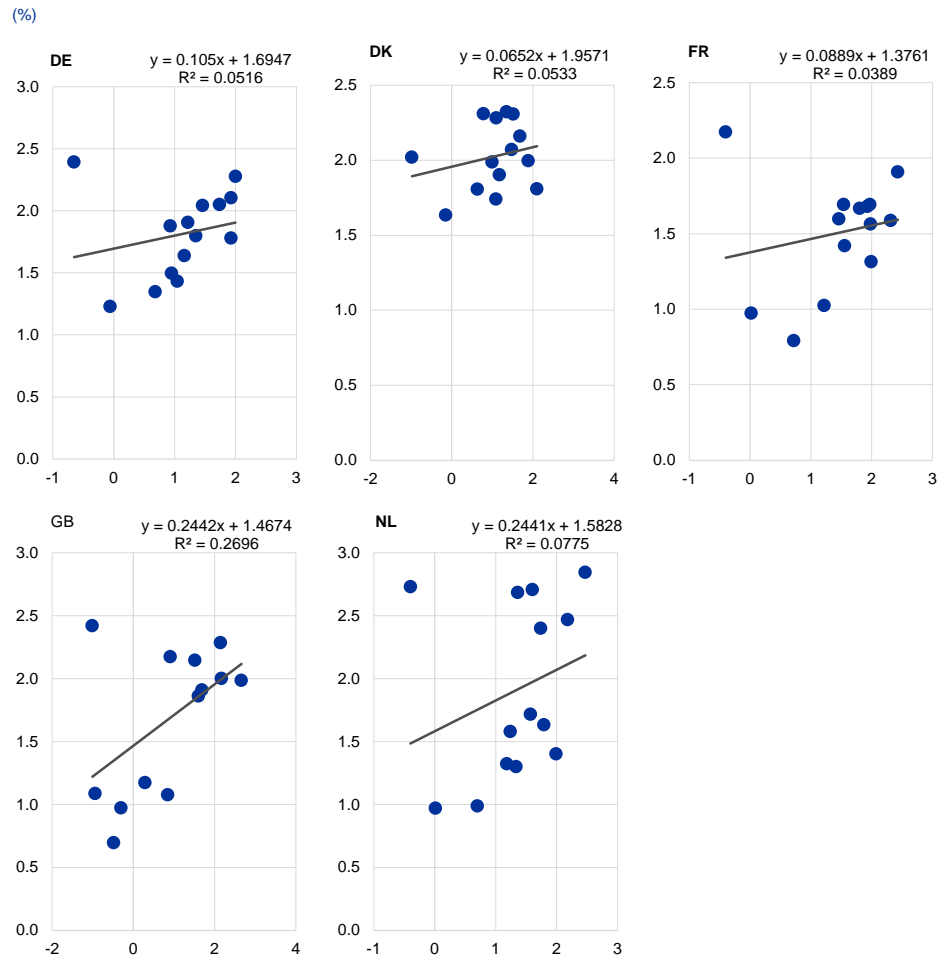
The assumption in Chart 3 certainly implies an improvement in the absolute level of net interest income although, in general terms, the negative trend for the period 2016-2025 does not disappear completely. Ultimately, under a “back to normal” scenario, banks would find it challenging to obtain funding at half the short-term interest rate, as assumed in Chart 3.

With regard to the relation between margins and the difference between long and short-term rates, Chart 4 shows the scatter plots of the yield curve slope and lending margins, and the results of regressing the spread between long and short rates on the lending margins. It is evident that in the past, using the slope of the yield curve as a proxy for lending margins would have underestimated the lending margins in times of flat yield curves, e.g. at 1%. This is not the case for term spreads closer to 2%, as predicted by Section A of the report for the five countries in this exercise. We therefore assume that using the term spread as a proxy is reasonable and should suffice for the modest purposes of this exercise.



Chart 4

Scatter plots of net interest margins and the slope of the yield curve, and results of the regression



Source: MIR Statistics (ECB), Bank of England, Section A of the report and ESRB Secretariat calculations.

A comparison with the “low for long” scenario

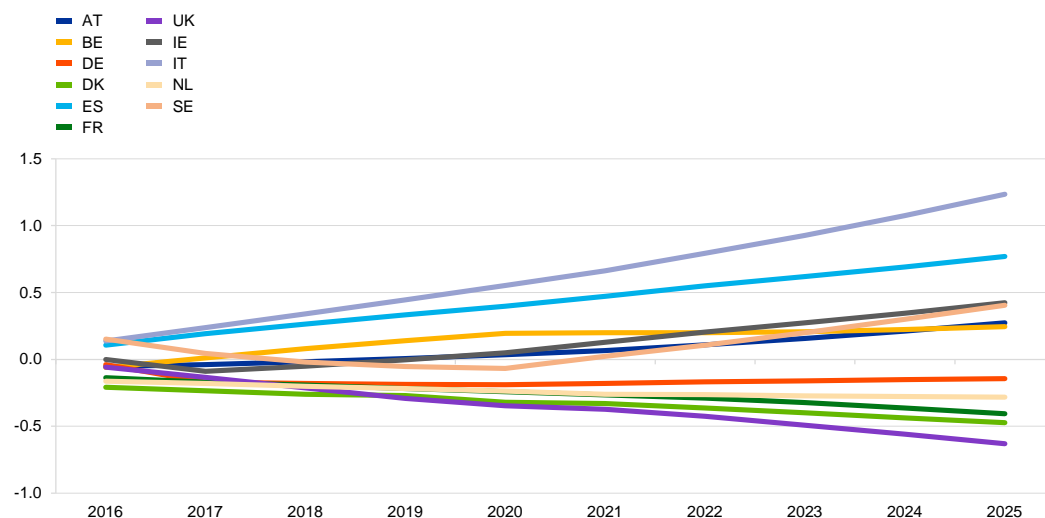
As for the exercise above, net interest income can be estimated using the projections for the “low for long” scenario. In this vein, it could be generally assumed that bank profitability would be most negatively affected under the “low for long” scenario. However, when comparing the net interest income between the two scenarios, it can be seen that the “back to normal” scenario is not the most benign for the net interest income trend in banking systems where fixed-rate loans dominate (Chart 5).



Chart 5

Difference between the net interest income projected under the “low for long” scenario and under the “back to normal” scenario

(% of total assets as of 2015Q3)



Source: MIR Statistics (ECB), Consolidated Banking Data (ECB), Bank of England, Section A of the report and ESRB Secretariat calculations.

Sensitivity analysis of the share of variable loans

The calculations made so far are very sensitive to the proportion of variable loans of the total stock of loans. However, as stated previously, there is currently no appropriate time series and the share of new loans must be used as a proxy. Chart 6 shows the trend for net interest income over the period 2016-2025, with different values of the variable ShareVariable for the major banking systems in the EU. It can be seen that the trend for net interest income is very sensitive to the proportion of variable-rate loans of total loans for any banking system in the EU (for instance, Spain and Italy are examples of countries where variable-rate loans predominate).

Chart 6 is based on calculations which make the very strong assumption that banks do not change their behaviour during adversity. The goal of Chart 6 is not to model the behaviour of banks over the next ten years, but rather to flag potential negative trends which, if they remain unaddressed, could have significant consequences for the EU banking system as a whole. However, by combining Charts 5 and 6 it is possible to estimate how much the share of variable-rate loans would need to change in order to ensure, as a minimum, a level of net interest income at least equal to that of 2016.

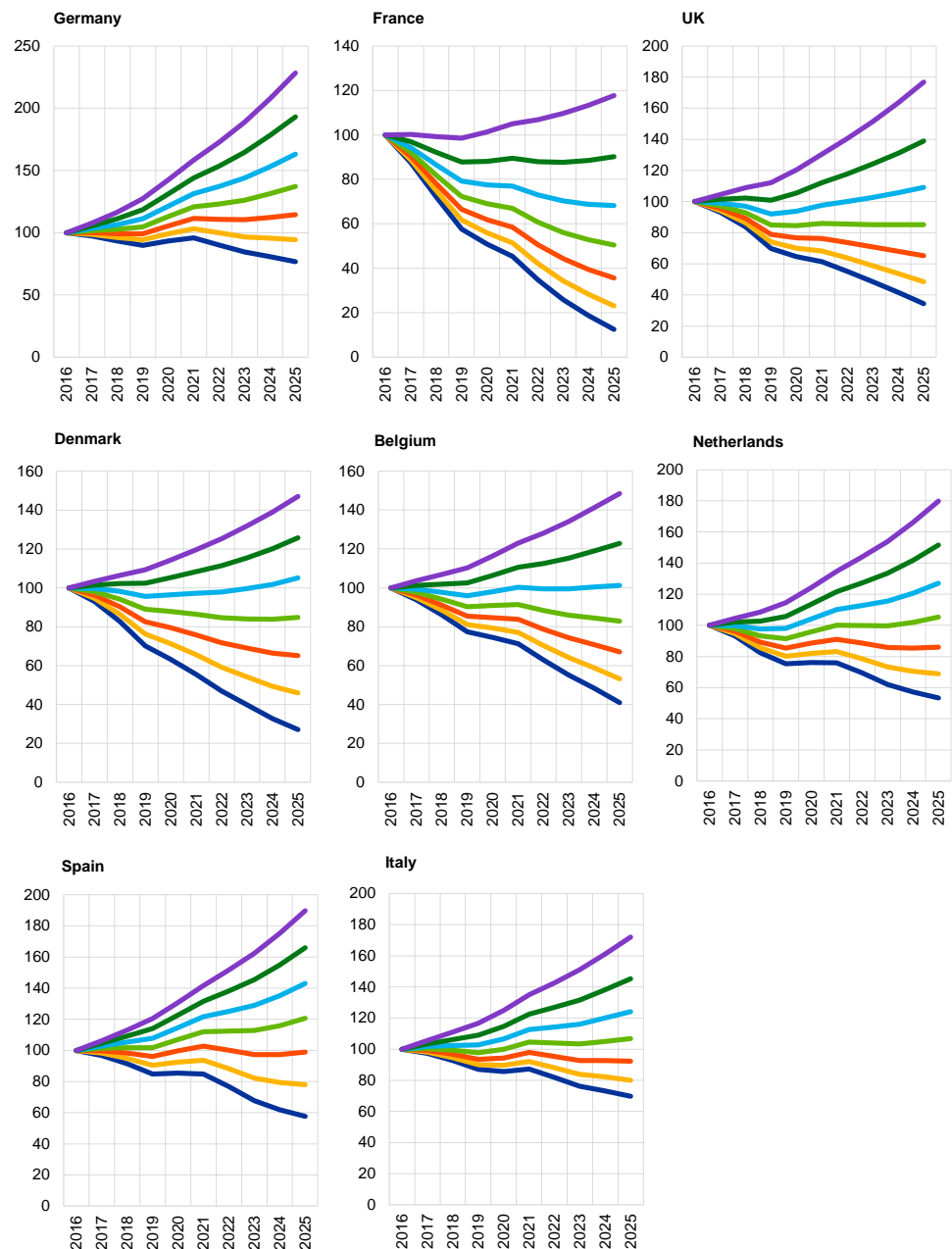


Chart 6

Estimates of net interest income for different shares of variable-rate new loans

(2016=100)

- variable=20
- variable=30
- variable=40
- variable=50
- variable=60
- variable=70
- variable=80



Source: MIR Statistics (ECB), Consolidated Banking Data (ECB), Bank of England, Section A of the report and ESRB Secretariat calculations.



Table 4

Discussion of possible adjustment to the share of variable-rate loans

(%)	Average of variable-rate loans (2010-2015) (A)	Lowest share of variable-rate loan generating a net interest income as of that in 2016 in 2025 (B)	Distance between B and A	Average change in the share of variable-rate new loans per year to reach the share in (B)	Change of share of variable-rate new loans in 2015
DE	62.43	80.00	17.57	1.95	-0.50
DK	56.74	60.00	3.26	0.36	13.43
FR	42.11	60.00	17.89	1.99	-2.42
GB	35.33	50.00	14.67	1.63	5.95
NL	48.06	50.00	1.94	0.22	-8.66

Source: MIR Statistics (ECB), Bank of England, Section A of the report and ESRB Secretariat calculations.

Table 4 compares the current share of variable-rate new loans with the rate of variable-rate loans that would guarantee a net interest income above the 2016 level at the end of the projection period. It then computes how much, on average, the share of variable-rate new loans would need to change to reach that target and, finally, compares this with the change in the share of variable-rate new loans observed in 2015. In 2015 a trend towards more fixed-rate loans was seen in some cases, which is contrary to the direction that would be expected to ensure an appropriate level of net interest income under a “back to normal” scenario. However, this increase in the use of fixed-rate lending would be fully rational under a “low for long” scenario, which expects interest rates to remain at their current levels or to decrease slightly in the long term.

A short reflection on hedging

One of the most obvious ways for banks to address interest rate risk in their loan portfolio is to hedge that risk. This is particularly relevant in the case of fixed-rate loans, as in variable-rate loans the interest rate risk is transferred to the borrower. A “back to normal” scenario should, in principle, provide a crystal-clear case for hedging, which could also be done cheaply given that current market expectations lean more in the direction of a “low for long” scenario.

Using data from CCPs available to the ESRB according to EMIR, some light may be shed on the hedging practices of EU banks in the field of interest rate risk. The picture is obviously incomplete, but it could help us reach a better understanding of how and what banks are hedging. Table 5 shows that EU banks are the largest players in the interest rate swap market, according to data reported to the DTCC (by number of contracts as well as by notional amounts).

According to the relevant literature, the dollar value (DV) denotes the dollar value of a one-basis point increase in the forward curve. The perturbation of a one-basis point parallel upward shift is an arbitrary shock, intended to elicit contracts’ sensitivity to an upward change in interest rates. When the net dollar value is small and close to zero (when compared with the gross), this means that positions held by an institution are mostly neutralised, implying that such an institution is a dealer in that market. When amounts are negative, institutions are mostly protecting themselves from interest rate risk. This would be the case, for example, for the insurance and pension funds in Table 5 (ICPF). However, EU banks generally have a relatively small net dollar value, which implies that they do not clearly hedge interest rate risk, but instead engage actively in trading in this segment of the market. In the same vein, the percentage of pay-fixed contracts is close to 50% in the case of EU banks, in contrast with, for example, insurance corporations and pension funds, where there is a clear trend towards pay-variable transactions.

In terms of cross-sectoral interactions, Table 6 draws an interesting picture as it seems that the interest rate risk of the pay-fixed transactions of EU banks is not transferred to other parts of the financial sector, but remains instead with the banks. For banks from fixed-rate countries, the main



counterparties in interest-rate swap transactions are banks from the same countries. Indeed, German, Danish, French, British and Dutch banks are the main counterparties of transactions for all sectors, which also points to the important role played by these banks as dealers.

Table 5
Dollar value of interest rate swaps by sector

	No. of contracts	Outstanding notional	%pay-fixed contracts	Net DV01	Gross DV01	Net/Gross DV01
DE, DK, FR, GB, NL banks	502,467	35,786	47.8	72	21,902	0.3
Other EU banks	106,265	5,138	47.5	44	3,119	1.4
Non-EU banks	37,498	3,117	49.5	65	1,965	3.3
ICPF	8,440	676	39.3	-395	950	-41.6
Other financials	59,259	3,966	53.0	-102	2,932	-3.5
NFC	32,013	656	86.1	160	354	45.3
Other	249,826	24,009	50.5	156	13,869	1.1

Source: DTCC OTC interest rate swap dataset (based on the 02/11/15 trade state report plain-vanilla fixed-for-floating 6M Euribor IRSs).
Note: "Other" includes governments, central banks, CCPs and counterparties with an unidentified sector. Observations where the reported mark-to-market value of the contract is missing are excluded from this table.

Table 6
Matrix of share of interactions between market participants, weighted by notional

(%)

	Pay-Float								Total
	DE, DK, FR, GB, NL banks	Other EU banks	Non-EU banks	ICPF	Other financials	NFC	Other		
DE, DK, FR, GB, NL banks	24.8	5.4	9.4	1.7	6.5	1.1	2.4	51.1	
Other EU banks	5.4	0.8	0.6	0.1	0.4	0.2	6.8	14.3	
Non-EU banks	9.8	0.7	0.0	0.1	0.2	0.0	0.0	10.8	
ICPF	1.2	0.1	0.0	0.0	0.4	0.0	0.0	1.8	
Other financials	5.9	0.5	0.1	0.9	0.5	0.1	0.1	8.1	
NFC	2.6	0.5	0.0	0.0	0.1	0.0	0.0	3.2	
Other	3.7	7.0	0.0	0.0	0.1	0.0	0.0	10.8	
Total	53.3	15.0	10.2	2.7	8.1	1.4	9.3	100.0	

Source: DTCC OTC interest rate swaps dataset (based on the 02/11/15 trade state report).
Note: This table includes only trades which are not centrally cleared.

It is precisely the fact that banks act as dealers in the derivatives markets that means the hedging that banks with predominantly fixed-rate loans perform to protect themselves against interest rate risks is unclear and difficult to pinpoint. Given this situation, the positions they take in their capacity as dealers seem to compensate for such hedging.



Annex 6

Bank resilience in the low interest environment: empirical analysis

The impact of the low interest rate environment on the profitability of banks, as captured by the level of the short-term rate and the slope of the yield curve, is analysed using the estimates from two dynamic panel models created using country and bank-level data respectively. Each model is estimated for net interest margin and for return on assets. The estimated coefficients are used to project bank profitability into the future, based on the path of the exogenous variables under the “low for long” and “back to normal” scenarios generated by the ESRB⁶⁰.

Model 1

Model 1 uses country-level data from the OECD Financial Statements of Banks database. As this dataset was discontinued in 2010, the time series are prolonged using data obtained from the ECB’s Consolidated Banking Data (CBD) statistics. Specifically, given the differences in the data and the reporting populations of these two sources, the CBD ratios are used to extend the OECD series after 2010 by applying the following equation, which imposes changes in CBD variables to the original OECD data: $Y_{OECD_{it}} = Y_{OECD_{it-1}} + (Y_{CBD_{it}} - Y_{CBD_{it-1}})$.⁶¹ Data are collected for eleven EU countries (Austria, Belgium, Germany, Spain, Finland, France, Ireland, Italy, the Netherlands, Slovenia and Sweden). The final panel is unbalanced and includes long time series on bank profitability starting as far back as 1980 for most of the above countries (data for Ireland start in 1995, those for Slovenia in 2002). For the purposes of robustness the model is created using only data from 1995 onwards, excluding the ERM crisis.

Model 1 employs a dynamic modelling approach to account for the potential time persistence of profitability. The baseline specification is estimated in levels of the dependent variable (Y_{it} ; i.e. the relevant income component as a ratio of total assets) and includes on the right hand side of the regression one lag of the dependent variable, the short-term interest rate, the slope of the yield curve (measured as the difference between the 10-year government bonds and the short-term rate) and several control variables based on the annual macroeconomic database (AMECO) of the European Commission. The number of explanatory variables must be kept low given the limited size of the sample.

To account for the fact that the interest rate structure was significantly affected by sovereign stress events during the years of the financial crisis, we include a crisis dummy that takes the value of 1 in those years and countries where the 10-year domestic sovereign bond yield stood at elevated levels.⁶² The annual real GDP growth rate, the annual growth rate of the stock market index, the inflation rate, the ratio of loans to total assets, and credit growth are included as controls of macroeconomic conditions in each country (denoted as $[X_{it}]$ in the equation below. A panel fixed-effect estimator is used because the dynamic panel bias should decline as T increases:⁶³

$$Y_{it} = \gamma_i + \beta_1 Y_{it-1} + \beta_2 STR_{it} + \beta_3 CRISIS + \beta_4 SLOPE_{it} + \beta_5 [X_{it}] + u_t$$

⁶⁰ For further information on the scenarios, please refer to Technical Documentation, Section A.

⁶¹ The prolongation was cross-checked using data from national central banks, if available (Austria, Germany and Italy).

⁶² The dummy is equal to 1 in Spain (2010, 2011, 2012), Finland (1994), Ireland (2009, 2010, 2011, 2012) and Italy (2011, 2012).

⁶³ Our sample has between 15 and 20 time periods, so any bias that may arise in a dynamic setting with lagged dependent variables as regressors declines as T increases. We run all regressions with fixed effects with White-adjusted standard errors.



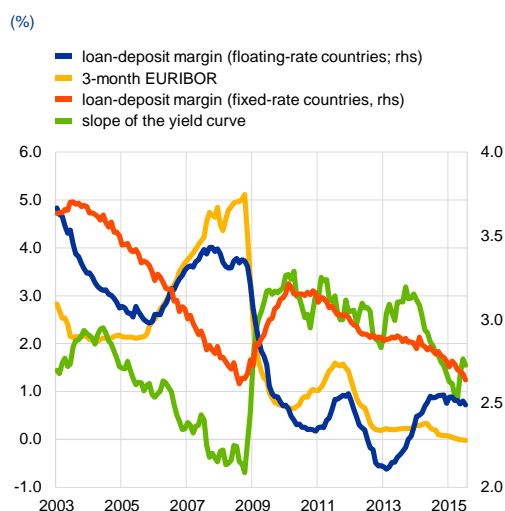
Two versions of Model 1 are estimated, the first for Net Interest Margin (NIM), the second for Return on Assets (ROA). The estimated coefficients of the variables included in Model 1's baseline regression for bank net interest margin are in line with the literature (Table 1, column 1). The short-term rate and the slope increase bank net interest margin (scaled by total assets). The lagged dependent variable is positive and statistically significant; the size of the coefficient suggests that the degree of persistence is quite strong. The coefficient of real GDP is positive but not significant, suggesting that general macroeconomic conditions primarily affect volumes, and through this channel the interest margin, though not necessarily the unit margin.

The regression shown in column 2 is considered to enhance the predictive capacity of the model as it includes some country/year-specific dummies that capture extreme values reflecting large negative profitability shocks not determined by macroeconomic factors. A comparison between columns 1 and 2 suggests that the signs and sizes of the coefficients of the main determinants are not significantly affected. Column 2 coefficients are used for the in-sample and out-of sample projection exercises.

Banks might be affected differently depending on the predominance of floating versus fixed-rate loans in their portfolios. The slope of the yield curve positively affects the NIM but its impact should be greater for banks that engage in more maturity transformation, borrowing short and lending long in terms of duration (e.g. Alessandri and Nelson, 2014).

Given that we use aggregate data, we divide countries into those where either fixed or floating-rate loans predominate. Countries are identified as having mostly either fixed or floating-rate loans on the basis of the following approach. First, by using information on banks' balance sheet structure (using data from BSI outstanding amounts) we ascertain whether loans to non-financial corporations or to households are the larger category of loans held by banks. Second, information on loan flows from the MIR statistics is used to identify banking systems with a larger share of fixed than floating-rate loans, with a particular focus on household loans given that loans to corporates are largely short term (floating-rate loans are all loans with an initial rate fixation of below five years). The resulting FIX dummy takes value 1 for Germany, France, Belgium and the Netherlands.

Chart 1
Short-term rate, slope of the yield curve and loan-deposit margins for fixed and floating-rate countries



Source: ECB and own calculations.

As shown in Chart 1, there is a strong correlation between the short-term rate and the net interest margin of banks in countries where floating-rate loans are predominant. Conversely, there is a fairly strong correlation between the slope of the yield curve and the net interest margin of banks in countries where fixed-rate loans are predominant.

To determine the impact of a fixed or floating-rate loan portfolio we estimate the model using the full sample of available countries and make the short-term rate and the slope of the yield curve interact with a FIX dummy to determine whether the term premium affects profits differently (specification in column 3). For the purposes of robustness we split the sample and estimate the same regression as in column (2) for fixed and floating-rate countries separately. Splitting the sample produces less reliable results as it uses smaller underlying samples.



Table 1
Net interest margin regressions

	Full sample	Full sample	Full sample	Split sample (Fixed rate)	Split sample (Floating rate)
	(1)	(2)	(3)	(4)	(5)
NIM (lag)	0.74*** (0.030)	0.74*** (0.034)	0.69*** (0.040)	0.68*** (-0.10)	0.71*** (0.039)
STR	0.021* (0.010)	0.020* (0.010)	0.036** (0.012)	0.013 (0.0095)	0.030** (0.012)
STR*FIX			-0.032*** (0.0085)		
SLOPE	0.022* (0.011)	0.021 (0.012)	0.017 (0.010)	0.067* (0.027)	0.018 (0.010)
SLOPE*FIX			0.053** (0.021)		
SOVCRI	-0.21** (0.090)	-0.23** (0.086)	-0.21** (0.090)		-0.20** (0.076)
Stock Market Index (agr.)	-0.056 (0.062)	-0.026 (0.0620)	-0.045 (0.069)	-0.16* (0.057)	0.017 (0.075)
Real GDP (agr.)	0.0025 (0.0056)	0.0024 (0.0058)	0.0063 (0.0059)	0.0021 (0.0063)	0.0058 (0.0076)
Inflation	0.0092 (0.011)	0.011 (0.0100)	0.0024 (0.013)	-0.028 (0.028)	0.013 (0.011)
Loans to assets ratio	0.0073* (0.0038)	0.0074* (0.0036)	0.0054 (0.0032)	0.0065 (0.0045)	0.005 (0.0040)
Constant	-0.14 (0.20)	-0.15 (0.20)	-0.019 (0.18)	-0.035 (0.25)	-0.014 (0.23)
Observations	211	211	211	80	131
R-squared	0.904	0.919	0.927	0.884	0.937
Number of c	11	11	11	4	7

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, *p<0.1

The results suggest that the NIM of banks in fixed-rate systems is more sensitive to changes in the level of the slope. While the net interest margin displays a strong degree of persistence in both groups of countries, the coefficient of the slope variable is only significant (and positive) in the case of fixed-rate countries (this result is confirmed when looking at the full and split sample estimations). This finding is consistent with the intuition that banks in fixed-rate countries exploit maturity transformation and term spread, whereas those with floating-rate lending are mostly affected by the level of short-term rates.

Model 1 is also estimated for ROA. Credit growth is included among the explanatory variables instead of loans to assets, now insignificant. While interest rates have a significant impact on net interest margin, overall profitability appears to reflect economic activity. ROA is positively and significantly related to the annual growth rate of real GDP and to the growth in the stock market index of the respective country (Table 2, columns 1 and 2). The sovereign debt crisis has a significant and negative impact on overall bank profitability and credit growth has a positive, though not significant, effect on profitability.



Table 2
ROA regressions

	Full sample	Full sample	Full sample	Split sample (Fixed rate)	Split sample (Floating rate)
	(1)	(2)	(3)	(4)	(5)
ROA (lag)	0.40*** (0.095)	0.37*** (0.10)	0.35** (0.11)	0.69** (0.18)	0.23** (0.074)
STR	0.011 (0.012)	0.0053 (0.013)	0.017* (0.0085)	-0.029 (0.029)	0.024* (0.0092)
STR*FIX			-0.041 (0.026)		
SLOPE	0.026 (0.039)	0.038 (0.045)	-0.045 (0.040)	0.13** (0.028)	-0.052 (0.047)
SLOPE*FIX			0.18*** (0.047)		
SOVCRI	-0.89*** (0.22)	-0.92*** (0.23)	-0.68*** (0.20)		-0.65** (0.21)
Real GDP (agr.)	0.039* (0.019)	0.042* (0.021)	0.042* (0.020)	0.04 (0.023)	0.029 (0.027)
Inflation	-0.068 (0.037)	-0.052 (0.030)	-0.065** (0.023)	-0.12 (0.077)	-0.06 (0.031)
Credit (agr.)	0.0028 (0.012)	0.0055 (0.013)	0.0043 (0.013)	-0.014 (0.021)	0.014 (0.016)
Constant	0.30*** (0.068)	0.27*** (0.065)	0.34*** (0.058)	0.22 (0.096)	0.52** (0.12)
Observations	179	179	179	79	100
R-squared	0.433	0.467	0.509	0.604	0.511
Number of c	9	9	9	4	5

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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Overall profitability does not appear to be influenced by the prevalence of fixed versus floating-rate loans. When considering the full sample, the interacting FIX dummy is neither significant nor does it alter the sign of the coefficients of the short-term rate or the slope (Table 2, column 3). The relevance of macroeconomic variables is confirmed for this specification, with real GDP growth, inflation and the growth of the stock market index contributing positively to overall profitability. Finally, the splitting of the sample into fixed and floating-rate countries shows that the impact of macroeconomic variables differs between the two country groups (column 4 and 5). Nevertheless, the difference disappears when crisis years are excluded (inflation and credit recover their positive sign in fixed-rate countries).

Model 2

Model 2 is based on a panel of individual bank data. A dynamic modelling approach is used to account for the potential time persistence⁶⁴ of both the individual bank NIM⁶⁵ and ROA. To address

⁶⁴ For example, Berger et al. (2000) argue that banks' profitability tends to be persistent over time, mainly owing to imperfect market competition and limited informational transparency in the banking markets.

⁶⁵ The NIM is defined as net interest income over total earning assets.



possible dynamic panel bias most effectively,⁶⁶ the model is estimated using a system generalised method of moments (GMM) estimator based on the work done by Arellano and Bover (1995), and Blundell and Bond (1998). The analysis uses an unbalanced panel of annual observations from 1994 to 2015 referring to a sample of 105⁶⁷ EU banks for the NIM regressions, and 100 EU banks for the ROA regressions.⁶⁸

Two different model specifications are determined, featuring the NIM as dependent variable. The first⁶⁹ includes, as explanatory variables, the lagged dependent variable and several macroeconomic factors: (i) real GDP growth, (ii) the inflation rate, (iii) the short-term rate and (iv) the slope of the yield curve.⁷⁰ The results of this first specification (see column 1 in Table 3⁷¹) show that the coefficient of the lagged dependent variable is positive and significant, confirming the persistence of net interest income over time found in the aggregate data.

Moreover, as expected, the results indicate that the NIM is positively and significantly related to both the level of short-term interest rates and the slope of the yield curve. These results can be attributed to the two key services supplied by banks and that are reflected in their interest income earnings; specifically, maturity transformation services and deposit transactions services. The effect of the slope of the yield curve reflects the return from maturity transformation. The short-term interest rate result reflects the fact that bank deposit rates are typically lower and stickier than market rates because banks apply a mark-down to deposit rates in exchange for liquidity services provided. Moreover, the results show that the NIM is positively and significantly related to the macroeconomic cyclical indicators, i.e. real GDP growth and the inflation rate.

⁶⁶ The inclusion of a lagged dependent variable in a panel framework might yield biased and inconsistent estimates owing to the correlation between the lagged dependent variables and the error terms. This is referred to as dynamic panel bias; see Nickell (1981) and Kiviet (1995).

⁶⁷ The dataset includes 105 (100) banks after the implementation of some outlier filtering. More specifically, banks for which fewer than five years of observations for the dependent variable were available were dropped from the sample. The selection of banks included in the sample was constrained by limited data availability.

⁶⁸ The banking data were taken from Bloomberg. The macroeconomic variables were sourced from the World Bank's World Development Indicator database.

⁶⁹ Heteroskedasticity and autocorrelation robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Here it is also worth mentioning that for both specifications, the Hansen test of over-identifying restrictions confirms that the (internal) instruments are valid, and the Arellano-Bond test rejects significant second-order serial correlation in the error term. These test results indicate the overall validity of the GMM approach. Furthermore, the Wald test indicates that all the estimated coefficients are jointly significant.

⁷⁰ The slope of the yield curve is defined as the spread between the 10-year sovereign bond yield and the short-term rate.

⁷¹ Heteroskedasticity and autocorrelation robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Here it is also worth mentioning that for both specifications, the Hansen test of over-identifying restrictions confirms that the (internal) instruments are valid, and the Arellano-Bond test rejects significant second-order serial correlation in the error term. These test results indicate the overall validity of the GMM approach. Furthermore, the Wald test indicates that all the estimated coefficients are jointly significant.



Table 3
Net interest margin regressions

	Net interest margin	
	(1)	(2)
L.Net interest margin	0.384** (0.167)	0.257** (0.1240)
CPI inflation	0.110*** (0.0340)	0.0369* (0.0222)
Real GDP growth	0.0352** (0.0138)	0.0171** (0.00733)
Short term interest rate	0.177*** (0.0520)	0.140*** (0.0347)
Slope of the yield curve	0.142*** (0.0475)	0.317*** (0.0573)
Short term interest rate_dummy floating		-0.0150 (0.0311)
Slope of the yield curve_dummy floating		-0.284*** (0.0512)
Dummy floating interest rate		1.087*** (0.219)
Chi2	1999.2	2133.2
Hansenp	0.172	0.211
AR2p	0.298	0.995
N	1349	1349

Table 4
ROA regressions

	Return on assets	
	(1)	(2)
L.ROA	0.275*** (0.0619)	0.284*** (0.0614)
Real GDP growth	0.0109** (0.00530)	0.0120** (0.00522)
Short term interest rate	0.0289*** (0.0112)	0.0262*** (0.00961)
Residential price growth	0.0505*** (0.00904)	0.0506*** (0.00891)
Credit growth	0.0134*** (0.00414)	0.0132*** (0.00417)
Slope of the yield curve		0.00719 (0.0112)
Chi2	461.6	556.1
Hansenp	0.201	0.187
AR2p	0.84	0.769
N	1225	1225

Like Model 1, Model 2 investigates whether the sensitivities of the NIM to changes in the interest rate and to the slope of the yield curve are significantly related to the propensity of banks to lend at fixed rates or at floating rates. A second model specification encompassing the NIM as dependent variable is determined. This second NIM specification (see column 2 in Table 3) is similar to the benchmark regression shown in column 1 except that two additional interaction terms and a dummy variable for floating-rate lending country are included. The dummy variable for floating-rate lending takes the value of 1 if the bank is based in Austria, Cyprus, Denmark, Finland, Great Britain, Greece, Ireland, Italy, Latvia, Luxembourg, Malta, Slovenia, Spain, Sweden or Portugal, while it takes the value of 0 if it is based in Belgium, France, Germany or the Netherlands. The two interaction terms are obtained from the product of the short-term rate and the slope of the yield curve with the dummy variable for floating-rate lending.

As expected, the results suggest that the slope of the yield curve plays a more relevant role in contributing to the net interest margin for banks with a stronger propensity to lend at fixed rates. This finding is consistent with that obtained from the Model 1 estimation using country-level data. On the other hand, the results offer a qualitative indication that the opposite holds for the short-term rate.

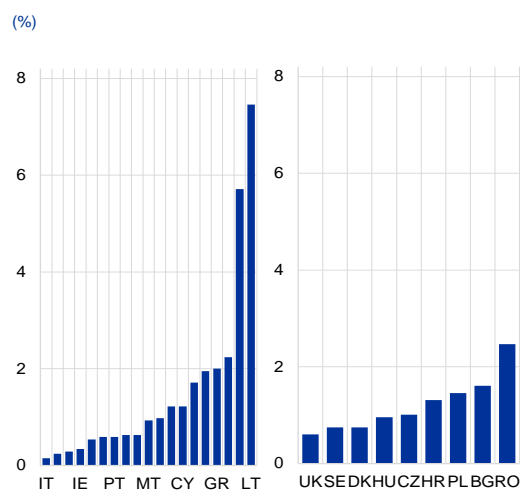


A system GMM estimator is also used to estimate the relationship between the ROA and some key macroeconomic variables. More specifically, the ROA model includes, as independent variables: (i) real GDP growth, (ii) credit growth, (iii) residential price growth, (iv) the short-term rate, and (v) the slope of the yield curve (Table 4). All the estimated coefficients display the expected signs. In particular, the results point to the persistency of profitability over time and to the role played by macroeconomic conditions. Indeed, there is a positive and significant relationship between the ROA and all macroeconomic variables included in the regression, apart from the spread.

Main features of the two scenarios⁷²

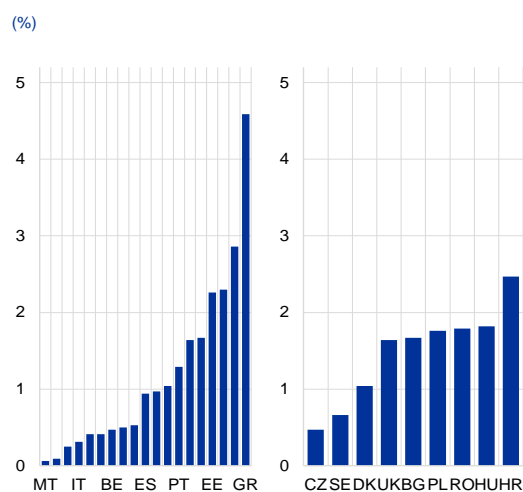
The impact of low interest rates has been assessed under two scenarios – “low for long” and “back to normal”. Under the “low for long” (LfL) scenario short and long-term interest rates are expected to remain low over the next decade⁷³. The rationale behind this scenario is that structural factors, such as demographic changes, total factor productivity and an increased preference for scarce safe assets, along with cyclical factors, will push interest rates to low levels. Under the “back to normal” (BtN) scenario interest rates are expected to rise gradually to reach pre-crisis levels within ten years, reflecting improved output and investment growth. The key macro variables under the two scenarios are estimated through a panel VAR with exogenous variables (VARX) which uses country-level data from 1990 to 2015.

Chart 2
Cross-country variation in real GDP growth at the end of the projection horizon in the two scenarios



Sources: ESRB.
Note: The difference shown is defined as: $\text{Diff}_i = X_{\text{BtN}} - X_{\text{LfL}}$.

Chart 3
Cross-country variation in the slope of the yield curve at the end of the projection horizon in the two scenarios



Source: ESRB.
Note: The yield curve is defined as the long-term rate minus the short-term rate. The difference shown is defined as: $\text{Diff}_i = X_{\text{BtN}} - X_{\text{LfL}}$.

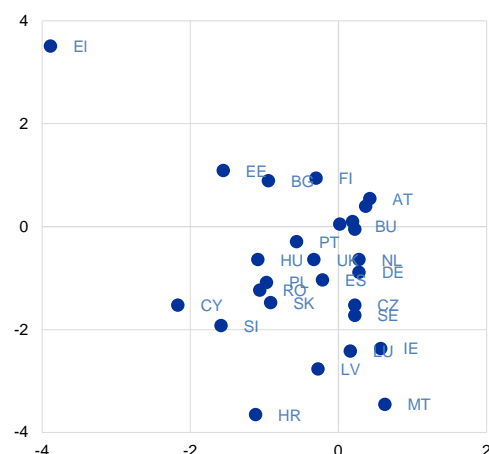
⁷² Sections 4.1 and 4.2 use projections estimated using data spanning from 1990 to 2015.

⁷³ For further information on the scenarios, please refer to Technical Documentation, Section A.



Chart 4
Scatter plot of the difference in real GDP growth and the slope in the “low for long” scenario, 2025 – 2015

(%; x-axis: change in slope; y-axis: change in real GDP agr.)



Source: ESRB.

Note: The difference shown is defined as: $\text{Diff}_i = X_{\text{BtN}} - X_{\text{LFL}}$.

Looking at individual countries, the final level of selected macro variables varies significantly in the two scenarios. For example, the difference in the yield curve at the end of the projection horizon between the “low for long” and the “back to normal” scenarios mainly ranges from 4% to 0%, with some countries actually seeing a steeper yield curve under the “low for long” scenario (Charts 2 and 3). With regard to the annual growth rate of real GDP, for most countries the difference in growth rates seen at the end of the forecast horizon amounts to between 1% and 2%, although for some countries (IE, ES) the difference between the scenarios is negligible (Chart 3). A similar pattern is observed for inflation, although in this case there are a few country outliers. When compared to the last available data point (2014 for Model 1 and 2015 for Model 2), the annual growth of real GDP increases for half the sample of countries in the “low for long” scenario. For nine of these countries, the increase in GDP is accompanied by a flattening of the slope of the yield curve (Chart 4, upper-left quadrant).

Scenario outcomes⁷⁴

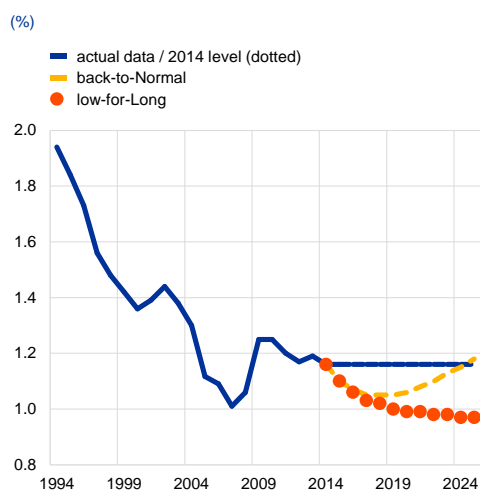
It is essential to underline that any projection of bank income variables based on such a long period of time is subject to a large degree of uncertainty. Accordingly, the model outputs should be used as instruments that inform the view of the policymaker as to the probable dynamics of profitability for each of the two scenarios. Model-based analyses provide information on the central projection for a variable, given a simplified representation of macroeconomic developments. In this exercise, uncertainty over the projected macro variables for the two scenarios is added to the uncertainty which surrounds the dynamic panel model analyses (Model 1 and Model 2) and the parameters estimated.

Bearing this uncertainty in mind, both Model 1 and Model 2 see net interest margins continuing to decline under the “low for long” scenario, and picking up under the “back to normal” scenario (Charts 5 and 6). In addition, they suggest that net interest margins are expected to decline more in fixed-rate countries than in floating-rate countries, where they remain relatively stable, though subdued (Charts 7 and 8).

⁷⁴ The projections are based on a linear model for rates so they cannot account for floor effects, nor can they account for the possibility of negative interest rates.

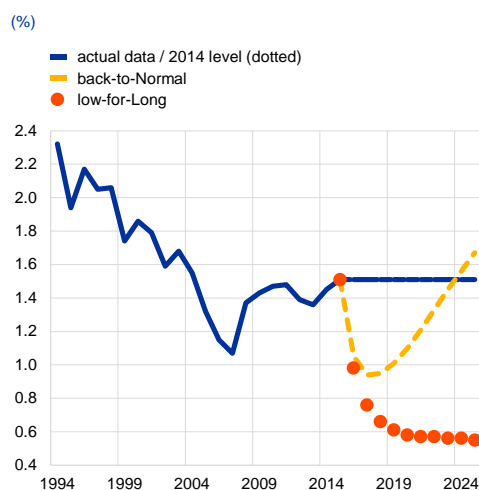


Chart 5
Aggregate net interest margin projections
for all countries in the sample based on
Model 1



Source: OECD, CBD, Section A of the report, ECB and Banca d'Italia calculations.

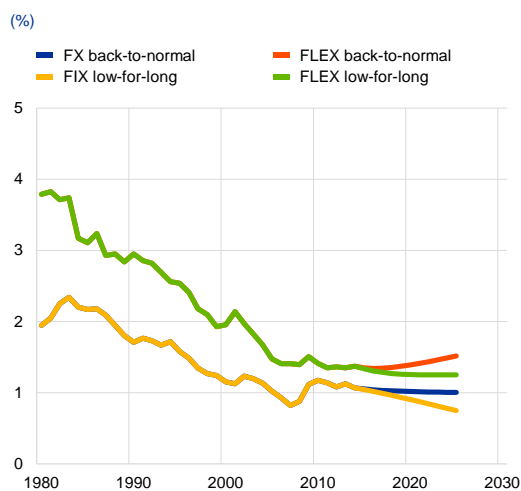
Chart 6
Aggregate net interest margin projections
for all countries in the sample based on
Model 2



Source: Bloomberg, Section A of the report and ECB calculations.

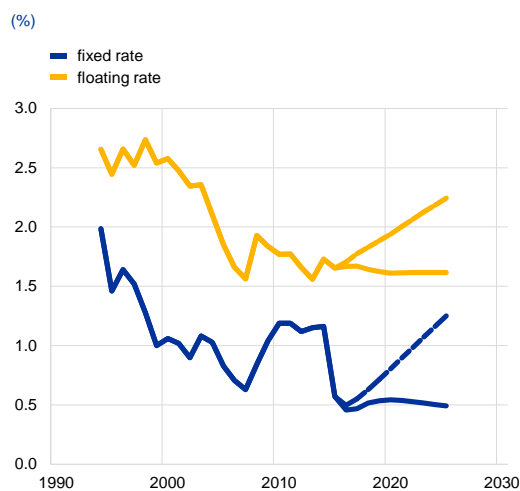
The difference between the projections for NIM for fixed and floating-rate countries is explained by two factors: (i) the different coefficients estimated for the short-term rate and the slope in the two country types, and (ii) the projected paths of the exogenous variables in the countries (e.g. scenario differences). As far as (i) is concerned, the impact on NIM of a 1% change in the short-term rate is very small for fixed-rate countries (0.4 basis points on average vs. 4 basis points for floating-rate countries). However, the effect of the slope is larger (7 basis points for fixed-rate vs. 2 basis points for floating-rate countries). All things being equal, a flat yield curve reduces the NIM much more in fixed-rate countries, where the NIM has been – historically – almost completely insensitive to short-term rates.

Chart 7
Aggregate net interest margin projections
for all countries in the sample: fixed and
floating-rate countries based on Model 1



Source: OECD, CBD, Section A of the report, and ECB and Banca d'Italia calculations

Chart 8
Aggregate net interest margin projections
for all countries in the sample: fixed and
floating-rate countries based on Model 2



Source: Bloomberg, Section A of the report and ECB calculations.



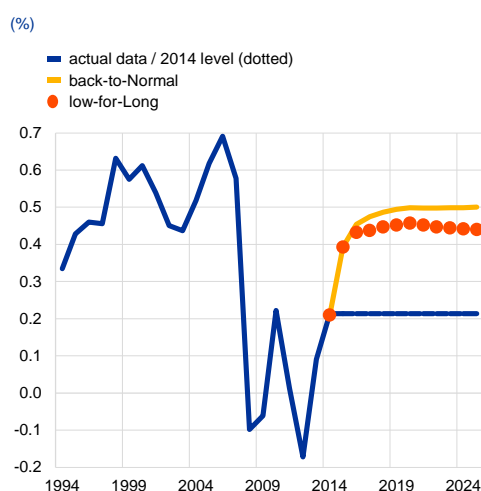
Greater sensitivity to the slope could reflect the fact that when the slope decreases banks issue new loans at lower rates, also as a result of prepayments, although their funding cost changes more slowly, leading to a stronger effect than in floating-rate countries. In addition, in some fixed-rate countries regulatory and institutional frameworks create a de facto floor for deposit rates.

It is essential to note that differences across countries are also strongly dependent on the scenarios designed and the projected paths followed for the macroeconomic controls, as the simplified models on which they are based rely on common coefficients – besides the distinction between fixed and floating-rate countries – and fixed effects. With regard to the contribution of the different scenario variables, it should be noted that the level of the slope is higher, on average, in floating-rate countries. This is due to differing underlying demographic and macro fundamentals, as discussed in Technical Documentation, Section A.

Both models also suggest that overall profitability increases under both scenarios at the end of the projection horizon, compared to the last available data point (2014 for Model 1 and 2015 for Model 2), although only marginally under the “low for long” scenario (Charts 9 and 10). This increase occurs as the role of interest rate dynamics in affecting banks’ overall profitability is less relevant than that observed for net interest margins. Banks’ overall profitability is positively affected by economic activity in general, through a number of different channels (lending activity, level of impairments etc.)

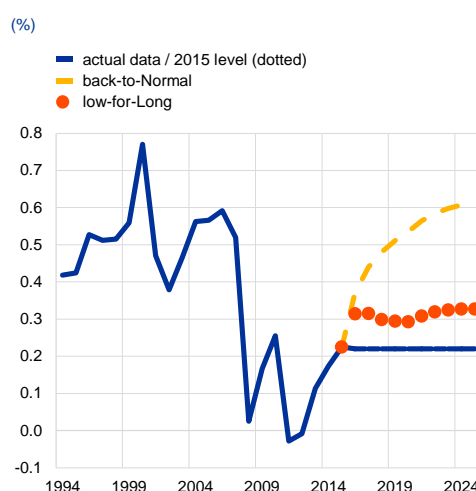
The difference between the projected paths for the two scenarios provides an assessment of the impact of the “low for long” scenario compared with that of the “back to normal” scenario. A focus on the difference has the benefit of being less subject to model misspecification that could influence the levels of the projected variables. At the end of the projection horizon, under the “low for long” scenario the EU weighted average bank ROA would be 0.15-0.2% below that projected under the “back to normal” scenario. The country differences range from almost 0% to 0.4%. A crucial difference compared with extrapolations based on the literature is that this result is based on a consistent macroeconomic scenario, and is not a ceteris paribus projection exercise based only on assumptions regarding the future level of interest rates.

Chart 9
Projections of overall profitability for the EU based on Model 1



Source: OECD, CBD, Section A of the report and ECB and Banca d'Italia calculations.
Note: Out-of-sample estimation starts in 2014.

Chart 10
Projections of overall profitability for the EU based on Model 2



Source: Bloomberg, Section A of the report and ECB calculations
Note: Out-of-sample estimation starts in 2014.

While profitability reverts to pre-crisis levels under the “back to normal” scenario, the results under the “low for long” scenario are less clear. For the latter, Model 1 predicts that overall profitability



would approach its pre-crisis level while Model 2 offers a more muted assessment. Composition effects in the two models determine this outcome.

As reported in the literature,⁷⁵ a flatter yield curve is expected to parallel lower loan losses. Therefore, the improvement observed in countries that currently have very high levels of impaired assets could be attributed to their reduction along the projection horizon. The finding that profitability improves more in floating than in fixed-rate countries may in fact be attributable to this dynamic: the economic recovery documented by the two scenarios is indeed stronger for the former group of countries.

Capital building in a low interest rate environment

This section shows the results of a scenario analysis on the possibility of capital building in a low interest rate environment, given three alternative hypothesized values for bank profitability. The exercise employs the path of growth rates of loans for each country over a 10-year period, generated by the VARX model developed under the “low for long” scenario. Bank profitability levels are instead exogenous. The analysis is conducted on the sample of 93 European banks that reported data in the EBA 2015 transparency exercise, and therefore covers a significant portion of the EU banking system.⁷⁶ The results show that under the more conservative assumption for profitability the EU banks in the sample may, at system level, just be able accommodate the (unconstrained) credit growth path generated under the “low for long” scenario and at the same time reach a target CET1 ratio of 12.5% of risk weighted assets – assuming full profit retention and constant composition of assets.

The analysis builds on two key projections:

- a projection for balance sheet growth, under the assumption that total assets grow at the same speed as the credit growth rates designed under the “low for long” scenario;
- a projection for capital growth, based on exogenous profitability assumptions for the relevant banks.

These projections are calculated at the level of individual banks and correspond to the numerator and denominator of bank capital ratios. The capital ratios projected ten years into the future are compared with a benchmark capital ratio assumed to be 12.5% (on a fully loaded basis, compared with 11.8% at the starting point of the analysis).

In the analysis, a deficit against the benchmark capital ratio implies that a bank cannot meet the projected credit growth and at the same time meet the benchmark ratio. This means the bank will either have to increase lending at a slower rate than forecast, or take other measures such as changing the composition of assets or issuing new capital instruments. A surplus against the benchmark implies that the bank can accommodate balance sheet expansion beyond projected credit growth and still meet the benchmark ratio. It should be noted that the model employed to forecast loan growth does not include bank capital and, therefore, does not take into account the complex links between economic activity, bank capital, lending dynamics and portfolio risk.

From a macroprudential perspective, a projected deficit at an individual bank is not a problem, if it can be compensated for by a projected excess at another bank which can grow its balance sheet. Deficits can become problematic if they are widespread throughout the banking system because

⁷⁵ See Borio et al. (2015).

⁷⁶ Out of the 105 reporting banks, 12 had to be excluded due to data limitations.



the system would not be able to fully accommodate credit growth without taking further measures (e.g. measures to boost profitability, or share issues) or substantially increase non-bank lending.

Conducting the exercise requires a number of assumptions to be made:

- bank assets (i.e. risk exposure amounts) grow at the same rate as credit growth; portfolio composition and RWA density remains unchanged;
- capital growth is determined by one of three Return on Equity (ROE) scenarios: 5%, 8% or 10% per year,⁷⁷ assumed to hold for all banks in the sample;
- the benchmark capital ratio is assumed to be the same for all banks at 12.5% CET1/RWA;
- banks retain all profits (no distributions).

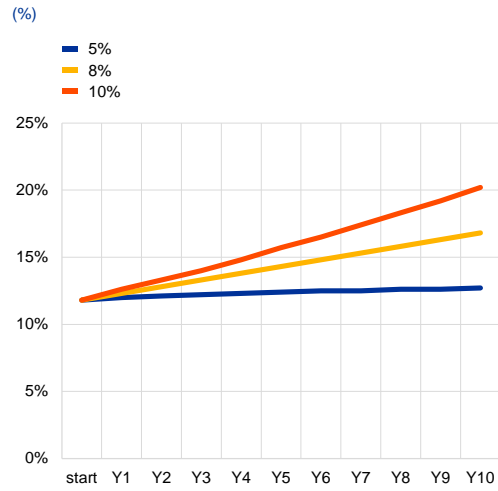
Chart 11 shows the trend for the CET1 ratios under the assumption of full profit retention for the three different ROE scenarios. The assumption of full profit retention is not realistic, but does show the upper bound of how the sample capital ratios could evolve under the “low for long” scenario, for an assumed ROE. Under the 5% scenario capital ratios are expected to increase only slightly, even with full profit retention. Chart 12 shows the sum of the total capital gap for deficit banks and the sum of the total capital in excess of that required to support lending for surplus banks.

Under the 5% scenario, the projected total capital surplus for the entire sample is still larger than the projected capital deficit suggesting that, assuming full profit retention, on aggregate the banks should be able to accommodate credit growth and meet a given capital target. However, strains could be expected in the more likely event of distribution of dividends by banks that have capital surpluses, particularly if there are deficits at several banks that are active in the same markets, unless other lenders step in. In this respect, it should be noted that the results among countries are heterogeneous. In the 8% and 10% ROE scenarios, total surplus markedly exceeds total capital deficit, suggesting that (at aggregate level) the surplus banks may step in and expand lending enough to compensate for balance-sheet constrained banks. That would still be true if the surplus banks distributed a portion of their capital excess (for example 30%-50%) as dividends.

⁷⁷ According to Consolidated Banking Data, EU-wide ROE was about 3% in 2014. The data published by the EBA (2015) risk assessment of the European banking system report a figure of 3.5% in December 2014 and 7.8 in June 2015.

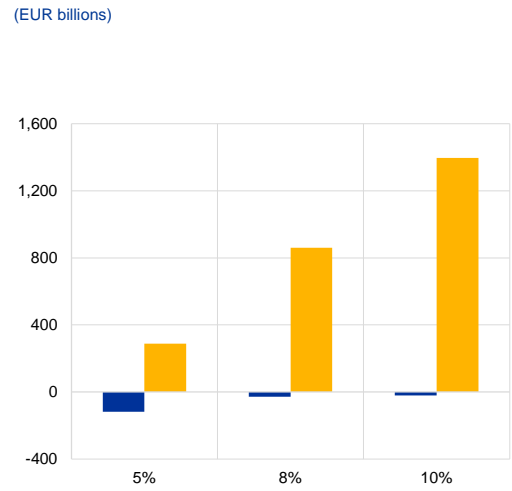


Chart 11
Trend of CET1 ratio for the three scenarios



Source: DNB

Chart 12
Sum of total capital deficit (dark blue) and surplus (light blue) for the three scenarios



Source: EBA and DNB calculations .



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Telephone +49 69 1344 0
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