FINANCIAL STABILITY REPORT

2016/2017

CNB CZECH
NATIONAL BANK

FINANCIAL STABILITY REPORT 2016 / 2017

Maintaining financial stability is defined as one of the CNB's main objectives in Act No. 6/1993 Coll., on the Czech National Bank, as amended:

Article 2

(2) The Czech National Bank shall perform the following tasks:

…

e) set macroprudential policy by identifying, monitoring and assessing risks jeopardising the stability of the financial system and, in order to prevent or mitigate these risks, contribute by means of its powers to the resilience of the financial system and the maintenance of financial stability; where necessary, it shall cooperate with the relevant state authorities in setting macroprudential policy;

…

The CNB defines financial stability as a situation where the financial system operates with no serious failures or undesirable impacts on the present and future development of the economy as a whole, while showing a high degree of resilience to shocks. The CNB's definition is based on the fact that financial stability may be disturbed both by processes inside the financial sector that lead to the emergence of weak spots, and by strong shocks, which may arise from the external environment, domestic macroeconomic developments, large debtors and creditors, economic policies or changes in the institutional environment. Any interaction between weak spots and shocks can result in the collapse of systemically important financial institutions and in disruption of the financial intermediation and payment functions of the financial system.

The CNB's aim with regard to financial stability is above all to ensure a degree of resilience of the system that minimises the risk of financial instability. To fulfil this aim, the CNB as a monetary and supervisory authority uses the instruments made available to it by the Act on the CNB, the Act on Banks and other applicable laws. Cooperation with other national and international authorities is also very important in this area. In order to maintain financial stability, the CNB focuses on prevention and broad communication with the public regarding the potential risks and factors posing a threat to financial stability. This Financial Stability Report is an integral part of such communication.

The global financial crisis has led to a strengthening of the importance of the objective of financial stability in central banks. Macroprudential policy, which is intended to contribute to the maintenance of financial stability, was formally introduced in the Czech Republic in 2013 through an amendment of the Act on the CNB No. 227/2013 Coll. The main aim of macroprudential policy is to mitigate systemic risk, i.e. the risk of instability of the financial system as a whole. A debate about the tools of macroprudential regulation, i.e. the set of pre-emptive measures intended to prevent financial instability, is going on at international level. The European Systemic Risk Board (ESRB) has been operating at the European level since the start of 2011. Together with three pan-European sectoral supervisory authorities (EBA, ESMA and EIOPA) it makes up the European System of Financial Supervision (ESFS). If it identifies increased risks of a systemic nature, the ESRB issues warnings and recommendations to mitigate those risks. CNB representatives are involved directly in the ESRB's work; the CNB Governor and another board member are members of the General Board of the ESRB, and CNB experts participate in its working groups. Since 2011, the CNB has also been represented in the Regional Consultative Group of the Financial Stability Board established by the G20.

The CNB regularly monitors and closely analyses developments in all areas relevant to financial stability. The members of the CNB Bank Board meet with experts from key sections at regular meetings on financial stability issues. A wide range of information on developments of risks in the domestic financial system and abroad is presented at these meetings. The position of the Czech economy in the financial cycle is assessed and – if any risks to financial stability are identified – discussions are held regarding the use of regulatory, supervisory and other economic policy tools to suppress such risks or their potential effects.

BOXES

The Czech National Bank is pleased to present its thirteenth Financial Stability Report (FSR) to the public. The aim is to analyse and identify the risks to the financial stability of the Czech Republic. This year's FSR focuses mainly on the risks that may arise in connection with prices of risky assets in global financial markets, the environment of very low interest rates and the financing of property purchases. Significant space is devoted to macroprudential capital buffers and instruments aimed at mitigating systemic risk arising in connection with mortgage lending.

The FSR is based on an advanced analytical and modelling framework and contains stress tests of individual segments of the financial sector. The FSR also contains the results of bottom-up micro stress tests conducted by the CNB in partnership with selected banks, stress tests of households and a public finance stress test, which the CNB uses to assess the management of sovereign exposure concentration risk in individual financial institutions.

The financial sector's resilience is tested by means of an adverse macroeconomic stress scenario entitled the *Adverse Scenario*. This scenario, whose probability is very low, describes the risk of a pronounced and long-lasting decline in domestic economic activity caused mainly by low external demand. The adverse economic situation will erode the financial reserves of households and non-financial corporations and cause a significant deterioration in their ability to service their debts. This will lead to sizeable credit losses in the banking sector. The *Adverse Scenario* also assumes a pronounced increase in long-term bond yields, which will result in financial institutions incurring losses due to market risk. This stress scenario is compared with the *Baseline Scenario*, which is based on the CNB's official forecast published in the Inflation Report I/2017. The impacts of both scenarios are assessed not only from the perspective of the financial sector, but also with regard to the property market and the non-financial corporations and household sectors.

The FSR is divided into five main sections followed by thematic articles that respond to selected topical issues relating to financial stability. The *Real economy and financial markets* section deals with the macroeconomic environment, property markets, corporations and households and analyses overall developments in the financial markets. The section called *The financial sector* discusses developments in the banking and non-banking financial sector. This year, the *Stress tests* section is presented separately for the first time. It assesses the resilience of sectors on the basis of stress tests and sensitivity analyses. The section *Macroprudential policy* contains an overall risk assessment, information on macroprudential instruments for mitigating risks identified, and an analysis of risks associated with developments in the regulatory environment.
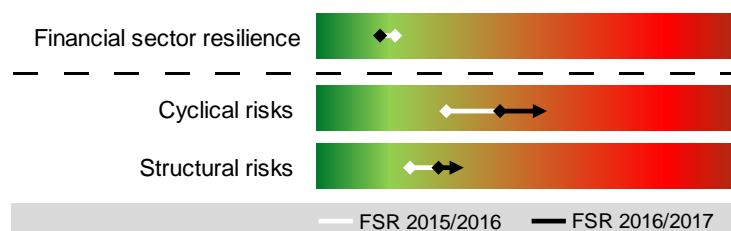
This FSR was approved by the CNB Bank Board at its regular meeting on financial stability issues on 25 May 2017 and was published on 13 June 2017. It is available in electronic form at http://www.cnb.cz/.

PART I

OVERALL ASSESSMENT

The Czech financial sector has developed favourably since spring 2016. According to the aggregate dashboard, it has maintained a high level of resilience to possible adverse shocks. This was fostered mainly by still relatively high capitalisation, stable funding sources and a sufficient buffer in the form of quickly available liquidity. As regards potential sources of risks to financial stability in the future, the aggregate macroprudential dashboard indicates a further increase in cyclical risks and a very modest rise in structural risks. The most significant domestic risk of a cyclical nature is that of a continued spiral between property prices and property purchase loans. The CNB is responding to the increase in cyclical risks on an ongoing basis by configuring relevant macroprudential instruments. The CNB's monetary policy is also likely to help mitigate these risks in the period ahead. A major potential risk – whose source, however, lies outside the domestic economy – is a sudden and disorderly increase in risk premia on global financial markets, which might lead to high volatility on asset markets with an impact on the real economy. The modest increase in structural risks is due mainly to a further rise in maturity transformation of deposits and loans in the banking sector, a rising share of non-residents on the domestic debt securities market and increasing concentration of bank exposures to the residential and commercial property sector.

DEVELOPMENTS IN 2016 AND 2017 Q1

The global economic recovery is being reflected in favourable domestic economic activity

Following a slowdown in 2016, the world economy is expected to accelerate this year and the next. The euro area economy grew at a solid pace and the current outlooks are also optimistic. Nonetheless, significant differences persist among Member States. The domestic economy also slowed in 2016, but according to the CNB's forecast published in Inflation Report II/2017, the rate of growth of the Czech economy should increase this year and the next. The growth will be driven mainly by robust growth in household consumption and a recovery in investment amid continued growth in external demand. Favourable domestic economic activity, optimistic income expectations of both households and corporations and low interest rates also affected the conditions and activity on the domestic credit market. Total bank loans to the private sector rose by almost 6.7% year on year in 2015. Bank loans for house purchase increased by more than 8% and loans to non-financial corporations by more than 6% in the second half of last year. Year-on-year growth stayed at the same level in 2017 Q1.

The Federal Reserve raised its monetary policy rate in December 2016 and again in March 2017. Financial markets are expecting monetary conditions to continue tightening in the USA this year. By contrast, the ECB is keeping its monetary policy rates at very low or negative levels and is continuing to pursue unconventional monetary policy. However, it reduced its monthly net asset purchases in April 2017. Interest rates and yields on bonds with longer maturities are gradually rising in line with growing optimism in US and European markets. The CNB discontinued the use of the exchange rate as an additional monetary policy instrument in early 2017. The exit from the exchange rate commitment was the first step towards a gradual return of the overall monetary conditions to normal. Subsequent increases in monetary policy rates, which remain at technical zero, will be conditional on the evolution of all key macroeconomic variables, including the exchange rate of the koruna. Consistent with the CNB's forecast published in Inflation Report II/2017 is an increase in market interest rates in 2017 Q3 and later also in 2018.

Central banks' monetary policies remain accommodative, but yields are steadily increasing at longer maturities

Last year's slower domestic economic growth was reflected in a slight decline in the profitability of non-financial corporations. Although credit risk indicators showed a partial deterioration, the overall riskiness of loans remains well below the levels observed in the crisis years. Exposures to the energy and construction sectors are showing an increased level of credit risk. Despite a slight slowdown, the growth rate of loans to non-financial corporations was strong and one of the highest in the European context. An observed increase in foreign currency bank loans is linked mainly with a higher degree of natural hedging against exchange rate risk before the end of the exchange rate commitment. Such loans thus do not represent a source of systemic risk.

The financial condition of non-financial corporations is good despite a slight decline in profitability

Growing consumer confidence and a persisting environment of low rates resulted in a renewed pick-up in growth in total household debt. Debt servicing costs remain sustainable due to low interest rates and rising income. However, growth in interest rates, the probability of which is increasing due to the global situation, may give rise to repayment problems in some indebted households. The stress test indicates increased sensitivity mainly in low-income households with a debt-service-to-income (DSTI) ratio of over 40%. Credit risk indicators improved during 2016 thanks to wage growth and a low unemployment rate.

Total household debt is increasing

Residential property prices accelerated in 2016 and at the start of 2017. At 11%, the year-on-year rate of growth in transaction prices was one of the highest in the EU in 2016 Q4. Prices reached – or even exceeded – the level of their previous cyclical peaks in 2008 in all categories except apartments outside Prague. At the same time, apartment prices considerably outpaced wages, so the affordability of apartments deteriorated. One of the factors behind the growth in residential property prices may be restricted supply. Prices of commercial property also increased last year. Prime yields were at their lowest levels since 2000 in all categories of this segment. At the same time, 2016 was a record year

Prices of residential and commercial property continue to rise

in terms of transaction volume, which exceeded the previous high recorded in 2007 by 25%.

Developments in the domestic financial sector were favourable and financial institutions remained profitable overall

The developments recorded in the Czech financial sector were positive in 2016. Continued growth in economic activity was reflected in an increase in profitability, sustained relatively high capitalisation and favourable liquidity of the banking sector. Insurance companies are also well capitalised and most of them are maintaining stable profitability. Investment funds are continuing to show dynamic growth. The importance of pension funds as a household investment vehicle is also increasing.

RISKS TO FINANCIAL STABILITY AND ASSESSMENT OF THE FINANCIAL SECTOR'S RESILIENCE

The most significant domestic risk is that of a continued spiral between property prices and property purchase loans.

The most significant domestic risk is that of a continued spiral between property prices and property purchase loans. The total stock of housing loans increased by CZK 96 billion last year. The year-on-year growth rate of genuinely new mortgage loans accelerated to almost 30% in 2017 Q1. Such fast loan growth is not sustainable. Residential property prices are currently above the level consistent with fundamentals according to the CNB's analyses. Not only residential property, but also commercial property may be moderately overvalued. However, the amount of new commercial property financing loans provided by domestic banks is not rising significantly and there is no visible softening of credit standards.

High financial asset prices may be a source of market risks and increased volatility on global and national financial markets

A sudden and disorderly increase in risk premia leading to high volatility on asset markets is the main global risk to financial stability. The existence of this risk is indicated by a global decrease in spreads on risky corporate bonds to historical lows, which can be interpreted as a reduced ability of investors to perceive and value risk. It is obvious that increased optimism in an environment of exceptionally low interest rates has created an incentive to take on risk on riskier asset markets. A sudden change in market sentiment (for example in response to an excessively fast tightening of the monetary conditions or escalating geopolitical risks) could lead to a sharp revaluation of bonds and shares and hence substantial market losses. This increases the importance of high-quality interest risk management in financial institutions. Some increase in bond yields is positive for financial stability from the long-term perspective, although it may represent an adverse shock for vulnerable economies with financial and macroeconomic imbalances.

Fluctuations in the real economy and the euro area financial system remain a concern influencing ECB policy

Despite the economic recovery, there are persisting concerns in the euro area about fluctuations in the real economy and the financial system. Countries with high total debt and an unfinished process of banking sector stabilisation continue to face the risk of a return to recession. Given low growth in nominal GDP, a more pronounced rise in interest rates might trigger financial sector turbulence in some countries. Partly for this reason, the ECB's monetary policy remains highly accommodative and the ECB as a supervisory authority is, within the SSM, advocating

a very cautious approach to the implementation of some globally introduced rules for the functioning of the banking sector.

The persisting low market interest rates and returns on financial assets are adversely affecting the income and profitability of financial institutions in the Czech Republic. In the case of banks, this is occurring primarily via declining interest margins on the stock of loans. Its main source is a gradual decline in interest rates on existing mortgage loans as those loans are refixed and refinanced. This may negatively affect domestic banks' ability to maintain their capital adequacy at the current level. The performance of financial institutions may also be adversely affected by low yields on government bonds and other assets or increased volatility of their prices in the longer run.

The profitability of financial institutions continues to be pressured by the environment of exceptionally low interest rates

Non-residents' growing interest in Czech government securities, largely motivated by speculation, pushed down returns on such assets deeper into negative territory. The relatively high share of non-residents in holdings of Czech government debt might represent a potential source of interest rate risk-related vulnerability for the domestic financial sector. Higher sales of Czech securities by non-residents combined with low market liquidity could result in increased market volatility and potentially also a marked drop in their prices. This risk is partly dampened by the ECB's very easy monetary policy and overboughtness of the koruna market.

The risk of a sudden repricing of Czech securities remains elevated

Credit risk, which is the principal source of potential losses in the domestic banking sector, has decreased in terms of the backward-looking non-performing loan (NPL) ratio. The structure of NPLs has also improved, as has their coverage by provisions. The provisions created by banks at the aggregate level seem to be sufficient to cover the current expected loss given default. However, there are significant differences in the prudence of banks with regard to NPL coverage. The importance of loans for financing residential and commercial property is increasing in banks' balance sheets. These loans currently account for almost 60% of total loans to the private non-financial sector. A further increase in the concentration of loan exposures to the real estate sector combined with a decrease in the risk weights of these exposures would lead to a rise in the structural risk of the banking sector.

The banking sector remains highly resilient, credit risk has decreased, but some sources of structural risks are intensifying

Building societies responded to the market conditions by changing their business strategy towards the provision of loans not secured by property. These are a credit product with potential for higher interest rate profit but simultaneously higher credit risk. The CNB will therefore closely watch practices in this area and assess whether building societies' internal credit risk management systems take sufficient account of this change.

The importance of unsecured loans is increasing in building societies' portfolios

The evolution of financial assets and liabilities forming the links between institutions in the financial sector does not indicate significant changes in their interconnectedness. The risk of transmission of financial distress across segments in the event of adverse developments remains low. The

The interconnectedness of financial institutions has not increased and the risk of contagion remains low

potential for contagion is also being suppressed by the banking sector's large liquidity buffer.

The domestic financial system was subjected in stress tests to a very adverse scenario assuming a deep V-shaped recession

The resilience of the domestic financial system was verified by means of stress tests on banks and pension management companies using alternative economic scenarios. The *Baseline Scenario* is based on the CNB's forecast published in Inflation Report I/2017 and is considered by the CNB to be the most probable at the three-year horizon. The probability of the *Adverse Scenario* is conversely very low. Its configuration reflects a rule stating that a higher level of stress should be applied at times of favourable economic growth than, for instance, in periods of recession. The *Adverse Scenario* assumes a sizeable fall in domestic economic activity accompanied by deflationary pressures and a rise in unemployment. The adverse economic situation will erode the financial reserves of households and non-financial corporations and cause a significant deterioration in their ability to service their debts. This will lead to sizeable credit losses in the banking sector. The scenario also assumes a pronounced increase in government bond yields, which will result in financial institutions incurring losses due to market risk. In sensitivity analyses for the banking sector, the *Adverse Scenario* was extended to include other shocks, such as losses arising from operational risks and the collapse of the largest debtors of each bank. The banking sector stress test was also supplemented with a new test with a five-year horizon aimed at assessing the banking sector's resilience to a sustained build-up of risks in a growth phase of the economic and financial cycle.

According to the stress tests, banks are highly resilient and pension management companies are showing a slightly riskier asset structure and higher sensitivity to interest rate risk

The stress test results demonstrate that the banking sector remains highly resilient to adverse scenarios. While the *Baseline Scenario* predicts credit risk to remain flat, materialisation of the *Adverse Scenario* would mean, among other things, that the banking sector's credit losses would more than triple over the three-year test horizon. However, the banking sector has a large capital buffer which enables it to absorb highly adverse shocks and maintain its overall capital adequacy sufficiently above the regulatory threshold of 8% even in a highly unfavourable scenario. The regulatory minimum will not be breached even in a stress test with a horizon extended to five years. However, the results of this test illustrate that the banking sector's actual resilience in a sustained growth phase of the financial and business cycle may be lower than the standard approach to macro stress tests indicates. If the economy has been showing favourable developments for a time, optimistic expectations grow and banks and their clients consequently start to be willing to take on greater risks. These may then build up unnoticed in the financial system for an extended period. The CNB will take stress test results into account in the assessment of capital adequacy in the SREP. The banking sector is also highly resilient to short-term liquidity risk. The LCR took an aggregate value of 188%, well above the currently required 80%. All banks would also be compliant with the highest regulatory value of 100% to be required from 2018. The net stable funding ratio (NSFR) confirmed sufficient stable funding sources. Its aggregate value for the domestic banking sector as a whole reached 124% at the end of 2016. The sensitivity of the pension management companies sector to growth

in yields on securities holdings is increasing, and a slightly riskier asset structure has reduced their excess capital. Together, this has led to a moderate year-on-year decrease in their resilience.

MACROPRUDENTIAL POLICY

When setting the countercyclical buffer rate, the CNB assesses credit growth and other indicators of the financial cycle. In December 2015, the CNB announced a countercyclical capital buffer rate (CCyB) of 0.5% with effect from 1 January 2017. Since the announcement of the 0.5% rate, the domestic economy has recorded a significant upward shift in the growth phase of the financial cycle. This is characterised by rapid growth in loans in a number of credit segments, which, on aggregate, ranks among the highest in Europe. To ensure that capital buffers are consistent with any losses that the banking sector might be exposed to in the future, the CNB regards it as necessary to raise the CCyB rate to 1% with effect from 1 July 2018. Most banks comfortably meet the overall capital requirement consisting of the minimum regulatory level in Pillar 1, the requirements based on supervisory review of risks in Pillar 2 and capital buffers. Assuming reasonable dividend policies, banks have sufficient space for any increase in the CCyB and growth in their credit portfolios on an aggregate level.

The domestic economy recorded a further upward shift in the growth phase of the financial cycle, consistent with which is an increase in the countercyclical buffer rate to 1%

The CNB's decision on the CCyB rate is made using a set of quantitative approaches. However, it is always based on a comprehensive assessment of systemic risks, not on mechanical application of the result of these approaches. However, if tendencies to underestimate the existing financial risks increase, credit growth remains high, lending standards ease and systemic risks relating to the financing of property purchases grow, the CNB will stand ready to increase the CCyB rate further. Conversely, if the financial cycle enters a downturn and the risk of excessive credit growth decreases, the CNB will stand ready to lower the CCyB rate immediately.

The CNB's approach to setting the CCyB rate is forward-looking and flexible

In view of the risks presented in the two previous Financial Stability Reports, the CNB published a *Recommendation on the management of risks associated with the provision of retail loans secured by residential property* (the ''Recommendation''). It set quantitative LTV limits and qualitative criteria for prudential provision of mortgage loans. Based on the identification of increasing risks, the CNB tightened the recommendations on the LTV ratio (the ratio of the loan amount to the value of collateral) in June 2016 in order to gradually reduce the share of new loans with LTVs of over 80%. The reduction of the LTV limits is consistent with the rise in the estimated overvaluation of residential property prices, which is leading to an increase in the riskiness of mortgage loans for the providers of such loans. An assessment of detailed data on new loans shows that institutions mostly observed the LTV limits on an aggregate level in the first three quarters of 2016. They observed the tighter limits in effect from 2016 Q4 to a far lesser extent. Loans with LTVs of over 95% accounted for 5% of total loans and loans with an LTV of 85%–95% for 20%, exceeding the recommended

The recommended LTV limits were mostly met in the first three quarters of 2016, but compliance with the tighter limits in effect from 2016 Q4 was much lower

aggregate limit of 10% by 10 pp. However, a sharp reduction in the amount of loans in excess of the limit was recorded in December.

Institutions provide loans with high LTVs to clients with riskier characteristics

Institutions continue to provide loans with LTVs above the recommended limits which simultaneously have high LTI and DSTI ratios. For many of loan applicants, the loan amount is more than eight times their net annual income (LTI) and their instalments account for more than 40% of their net income (DSTI). In the event of shocks in the form of interest rate growth or a drop in income, some of these borrowers could run into repayment problems. The share of loans negotiated by intermediaries increased year on year to two-thirds of all new loans in 2016 H2. These loans are often provided with higher LTVs. Likewise, buy-to-let loans also have higher LTI and DSTI ratios. This indicates that institutions are exposed to the risk of reliance on intermediaries, who could exert pressure for an excessive easing of credit standards. The CNB therefore recommends institutions not to create incentive schemes for intermediaries that could result in conditions favourable for the formation of systemic risks.

The CNB must respond to the growth in systemic risks associated with mortgage lending by applying instruments of both macroprudential policy and microprudential supervision

Despite the tightening announced by institutions, the CNB considers lending standards to be highly relaxed and identifies the taking on of higher risks by some of them. Loans associated with property exposures represent the principal source of risks to the stability of the domestic banking sector. These emerge and multiply in good economic times, but their impact usually occurs with a very long time lag. As a macroprudential policy and microprudential supervisory authority, the CNB must respond to emerging risks in a forward-looking manner and adopt appropriate measures in good time, even when those risks cannot be seen from the latest data at first glance

The CNB is extending the scope of application of the current Recommendation regarding subsequently provided unsecured loans to all consumer credit providers

Given the above, the CNB deems it necessary for providers to pay great attention to indicators of borrowers' ability to repay loans from their own resources even in a less favourable economic situation. To reduce the risks associated with further growth in the debt of consumers who already have a loan secured by residential property, the CNB is extending the scope of the Recommendation in the area of assessment of clients' ability to service their loans and to withstand increased stress to other loans provided subsequently to those consumers. With a view to standardising the terms and conditions for all providers, and given the possibility of future transmission of risks to non-bank financial institutions, the CNB is simultaneously extending the scope of application of the Recommendation to all credit providers. Providers should monitor the DTI and DSTI ratios, set internal limits for them and prudently assess loan applications on the basis of them. The CNB is not setting upper DTI or DSTI limits for the time being. Nor does it regard it as necessary to further lower the upper LTV limit at the moment. The upper limit of 90% and the aggregate limit of 15% for loans with LTV between 80% and 90% thus remain in place. However, if the fast growth in apartment prices and the related increase in individual loan amounts were to continue without loan applicants' incomes simultaneously rising commensurately, the CNB would consider tightening its macroprudential

instruments, including reducing the upper LTV limits or setting upper limits on the DTI or DSTI ratio.

Providers should be particularly prudent when assessing loan applications submitted by applicants with a DTI ratio of over 8 and a DSTI ratio of over 40%. This applies notably to loans with high LTV that are subject to the aggregate limit of 15%. According to the CNB's analyses, such loans show a high level of risk across borrower income categories. Many borrowers do not have a sufficient financial reserve above the said DSTI level that is essential for the capacity to repay the loan if adverse changes occur in their income or the level of interest rates. This fact needs to be emphasised given suggestions from the market about how to "comply with", or circumvent, the LTV limits by concurrently providing unsecured consumer credit. Intentionally combining secured and unsecured loans so as to meet the LTV limits is not only in contravention of the CNB's Recommendation, but could also be in breach of the Consumer Credit Act if it were to cause a loan applicant to become overindebted.

Institutions must assess the overall debt of loan applicants with the awareness that loans with a DSTI ratio of over 40% and a DTI ratio of over 8 already show a considerably high level of risk across borrower income categories

The CNB will continue to increase the intensity of microprudential supervision of prudent provision of secured and unsecured consumer credit by credit institutions and the management of intermediary networks by individual credit institutions. The CNB will declare supervisory expectations in the area of prudent provision of consumer credit. It will introduce extraordinary reporting of credit portfolio quality and reporting on the functioning of consumer credit provision systems. It will ask institutions to perform internal assessments of compliance of their systems with the expected principles. After evaluating the information it receives, the CNB will give the institutions feedback and will choose on-site inspection procedures on the basis of a risk-oriented approach. The CNB will deal with any shortcomings by imposing remedial measures and, where necessary, an additional capital requirement for the risk management system.

The CNB will intensify microprudential supervision in the area of credit institutions' prudence in the provision of secured and unsecured consumer credit

The CNB is registering a drop in the average risk weights for exposures secured by property. This reflects a natural decrease in the estimated level of risk of these exposures at a time of favourable economic developments. However, it may lead to potentially insufficient creation of capital for mortgage loans by institutions with lower risk weights. An increase in the CCyB rate represents one, but not the only way of reducing this risk. If necessary, the CNB will be prepared to apply Article 164 of the CRR, i.e. to increase the minimum loss given default (LGD) level for banks applying their own models (IRB), and thereby boost their resilience to shocks. If necessary, the CNB can also apply Article 458 of the CRR, which enables it to respond to macroprudential or systemic risks of this type by, among other things, increasing risk weights.

The CNB will pay increased attention to risk weights for exposures secured by residential property

The current configuration of the CNB's macroprudential policy is not making mortgage loans unaffordable to applicants with slightly above-average or even average incomes in most localities. The exception is Prague, where current apartment prices imply loans which are so high that applicants with average incomes are unable to meet the

The affordability of owner-occupied housing in large cities is limited by high apartment prices, not the CNB's macroprudential measures

creditworthiness criteria. Likewise, it is difficult for applicants with normal incomes to purchase new apartments or apartments in prestigious localities. The CNB believes that it is not in the public interest for institutions to provide loans regardless of applicants' income. Mortgage loans cannot play a social role and make owner-occupied housing generally affordable. Such an approach would ultimately be very expensive for indebted households, banks and taxpayers. The CNB agrees that the rapid growth in apartment prices in selected large cities is also linked with slow housing construction due to the rigidity of related regulations. However, it may take many years for this situation to improve. It is beyond the scope of the CNB's mandate and powers to accelerate this process. In the meantime, the CNB cannot neglect its statutory duties and must respond to the growing risks to financial stability by deploying the instruments available to it.

The CNB will seek to enact the power to set risk parameters for house purchase loans

Given the lower legal force of the Recommendation, the CNB – in cooperation with the Ministry of Finance of the Czech Republic and in line with ESRB recommendations – has prepared a legislative proposal giving it the power to set risk parameters for house purchase loans. It contains the possibility to set LTV, DTI and DSTI limits under the Act on the CNB. The proposal was prepared for preventive reasons. It responds neither to existing problems, nor to purely hypothetical and distant risks. It contains two sets of indicators of critical importance. The LTV indicator is designed primarily to mitigate the risks associated with growth in property prices on the part of banks. The DTI and DSTI indicators mainly target risks connected with excessive debt and the related debt service of households. The CNB cannot carry out its statutory duties using only one indicator. The necessity of enacting legally binding LTV, DTI and DSTI limits is also referred to in the concluding statement of the IMF mission which took place in the Czech Republic in May 2017.

Given the favourable stress test results of the Czech public finances, the CNB will not apply additional capital requirements to cover the risk of concentration of sovereign exposures

Since 2015, the CNB has been applying an internal methodology for reviewing and evaluating the risk of systemic concentration of sovereign exposures under Pillar 2. It considers credit institutions' exposures to the Czech government to be systemically important and concentrated even though the share of these exposures to the total assets of these institutions declined from about 11% to 8.5% between March 2016 and March 2017. A public finance stress test confirmed that the current fiscal situation in the Czech Republic did not represent a threat to the financial stability of the domestic banking sector. Consequently, the CNB will not apply additional capital requirements to credit institutions at the three-year horizon.

The CNB pays attention to risks associated with the activities of systemically important institutions

To maintain high public and investor confidence in the stability of the Czech banking sector and the financial sector as a whole, it is particularly important to keep sufficient capital buffers in banks that are systemically important by dint of their position and character. The CNB therefore prescribes a systemic risk buffer for five banks at present. Based on a mandatory review conducted every two years, this rate was last year raised for two banks and set for the first time for one bank with effect

from the start of 2017. The rates currently in effect will be reviewed in 2018, when they will be confirmed or modified with effect from 2019.

CNB's priorities for the regulatory area are still the stabilisation of the EU regulatory framework and ensuring that national authorities have sufficient powers to respond to sources of risks in a timely and appropriate manner. The CNB is actively involved in the debate about the setting of the minimum requirement for own funds and eligible liabilities (MREL), which may significantly affect banks' behaviour and business models. The interpretation of the MREL legislation and standards has yet to be unified at the EU level. At the same time, the schedule for meeting the MREL has changed. The CNB considers it important that the future applicable framework allows a sufficiently high MREL to be set for loss absorption and possible recapitalisation, particularly for systemically important institutions. On the other hand, the framework should respect the conditions in national banking sectors and the business model, mode of financing and risk profile of each institution. As regards the review of the macroprudential policy framework in the EU, the CNB supports an increase in the flexibility of the use of capital buffers when reacting to systemic risks at the national level. In the debate on extending the macroprudential regulation beyond the banking sector, the CNB agrees that a broader scope is desirable in some areas. However, the instruments applied must reflect the specificities of the non-banking sector in EU Member States.

The CNB regards stabilisation of the EU regulatory framework and adequate powers of supervisory and macroprudential authorities at the national level as priorities

CHART II.1

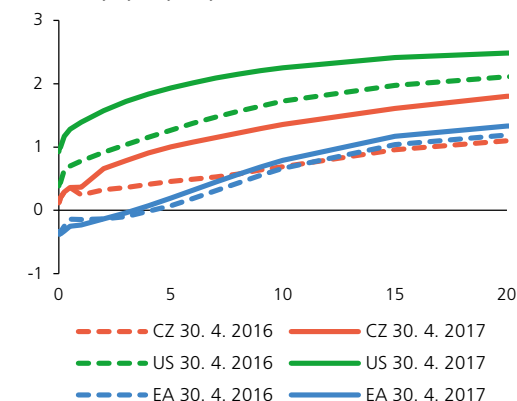**Economic growth in selected countries**
(year-on-year change in %)
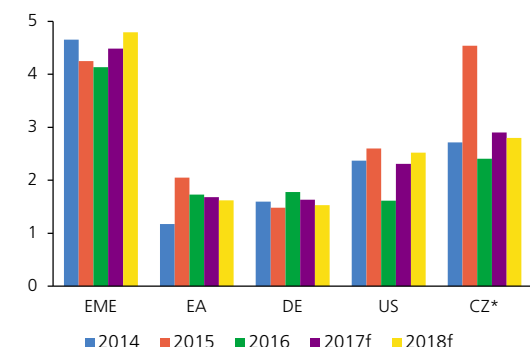
Source: IMF (World Economic Outlook, April 2017), CNB
Note: f: forecast; * The forecast for the Czech Republic is based on the CNB forecast published in Inflation Report II/2017.

CHART II.2

Movement of swap yield curves in selected economies
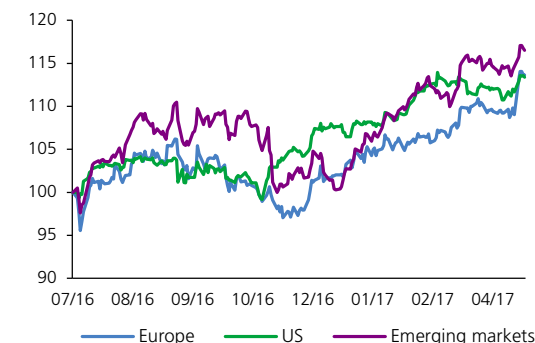(x-axis: maturity in years; y-axis: yield in %)

Source: Bloomberg
Note: The yield curves are derived from interbank rates with maturities of up to six months and swap rates denominated in the currency of the relevant region.

CHART II.3

World stock markets
(index; 1 July 2016 = 100)

Source: Thomson Reuters, CNB calculation
Note: The S&P500 was used for the US, the MSCI EUROPE for Europe and the MSCI EM for emerging markets.

2 THE REAL ECONOMY AND FINANCIAL MARKETS

2.1 THE MACROECONOMIC AND FINANCIAL ENVIRONMENT

The world economy is continuing to grow and the outlooks for the next two years are also optimistic. This is reflected in a gradual increase in market interest rates, especially for longer maturities. Increased optimism in an environment of still low interest rates may involve, as a side effect, excessive risk-taking in investment in financial assets and property, the prices of which are rising. The euro area economy also grew at a solid pace, but significant differences persisted across the euro area countries. In some euro area countries, low nominal GDP growth combined with a larger increase in interest rates could cause financial stress. Countries with high private and government debt thus continue to face the risk of a return to recession. Partly for this reason, the ECB's monetary policy remains highly accommodative.

The real growth of the Czech economy slowed to 2.3% in 2016 but is expected to rise to almost 3% this year and the next. Given sustainable fulfilment of the inflation target, the CNB discontinued its exchange rate commitment in early April 2017. The yield curve for interest rate swaps and Czech government bonds shifted upwards. From the perspective of long-term financial stability, this is a move in the right direction. Massive koruna positions had been accumulated by foreign investors, especially early this year, as the end of the exchange rate commitment neared. This was reflected in a marked rise in foreign exchange reserves and bank deposits at the CNB. The speed at which these positions are closed may significantly affect the volatility of the koruna exchange rate and Czech government bond yields in the short term. Marked growth in the share of non-residents in holdings of Czech government debt is generating a slight risk in the form of sudden repricing of bonds in domestic financial institutions' balance sheets.

2.1.1 THE EXTERNAL ENVIRONMENT

The world economy is experiencing a recovery…

Following a slowdown in 2016, the world economy is expected to accelerate this year and the next (see Chart II.1). The better outlook is evidenced not only by positive revisions of GDP growth estimates, but also by various leading indicators and confidence indicators.[1] The euro area economy grew at a solid pace in 2016 (by 1.8% year on year) and the current growth outlooks are also optimistic. Nonetheless, differences in economic growth persisted across the euro area countries. However, even in the case of the biggest euro area economy – Germany (GDP growth of just over 1.5%) – the growth rate is not expected to reach that of the US economy (just under 2.5%) or emerging economies (over 4.5%).

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1 Leading indicators and purchasing manager surveys have been relatively optimistic for several consecutive months. For example, the PMI for the world economy has been rising since July 2016 and is close to a six-year high. According to the IMF's April 2017 *World Economic Outlook*, global economic growth will reach 3.5% at the end of 2017.

…which is partly reflected in the global monetary conditions

The US Fed reacted to an increase in inflation pressures and a further improvement on the US labour market by raising monetary policy interest rates in December 2016 and again in March 2017.[2] Financial markets are expecting two further rises of 0.25 pp and an approaching end to the reinvestment of income on maturing bonds purchased by the Fed as part of its quantitative easing programme.[3] The euro area monetary conditions remain easy, as inflation in the euro area is still below the ECB's target. The ECB re-emphasised that its key policy rates would remain at the current low levels for an extended period of time, and well past the horizon of the asset purchase programme.[4] However, several changes occurred in ECB policy. The last auction of targeted longer-term refinancing operations took place in March 2017, with banks asking for four-year loans totalling EUR 233 billion. In April 2017, the ECB's monthly purchases were reduced by EUR 20 billion to EUR 60 billion. These changes were reflected in a rise in market rates (see Chart II. 2). The dollar yield curve recorded an almost parallel shift in the period under review. The slope of the euro curve increased slightly, but interest rates on new bank loans in the euro area are still very low. In April 2017, the average rate on new loans was 1.8% for loans for house purchase and 1.6% for corporate loans.

High financial asset prices may be a source of market risks

US stocks have been rising since December 2016 amid volatility in US government bond yields. Growing optimism is also visible in stock price movements in other markets (see Chart II.3) and in yield spreads on risky corporate bonds (see Chart II.4). These spreads returned to very low levels across the world. The change in market sentiment was driven mainly by improved economic activity outlooks. The planned measures of the new US administration, especially on fiscal expansion and foreign trade policy, are still an uncertainty. The fiscal measures may, on the one hand, boost business confidence, bolster investment and improve the financial results of non-financial corporations. On the other hand, they may lead to greater risk-taking in the already highly indebted corporate sector and to excessive growth in leverage.[5] High prices on stock markets and corporate bond markets coupled with potentially underestimated financial risks thus remain possible sources of systemic risk from the global perspective.

Debt-related risks in some euro area countries are postponing a return to conventional monetary policy

Overall market sentiment in the euro area and partly also renewed concerns about debt sustainability in some euro area countries affected the evolution and volatility of yields on European government bond

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2 The Fed raised its monetary policy rate for the first time since the financial crisis by 0.25 pp in December 2015. A further increase of 0.25 pp did not occur until a year later, reflecting the Fed's previous communications of a gradual tightening of monetary policy.

3 The minutes of the March FOMC meeting indirectly show an intention to start reducing the Fed's balance sheet. Federal Open Market Committee: *Federal Reserve issues FOMC statement*, March 2017.

4 The net asset purchases are to run until the end of December 2017, or beyond, if necessary, and in any case until the ECB sees a sustained adjustment in the path of inflation consistent with its inflation aim.

5 For example, tax relief in the 1980s and a tax holiday in 2004 eventually led to increased risk-taking in the corporate sector and then to a turnaround in the financial cycle and a recession.

CHART II.4

Yield spreads on risky private sector bonds
(bp)
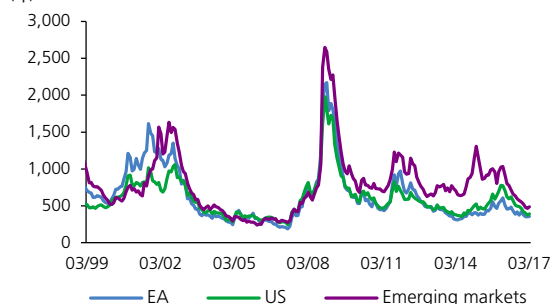
Source: Bank of America Merrill Lynch, CNB calculation
Note: The spread is the difference between yields on risky bonds and yields on government bonds adjusted for any embedded options (the option-adjusted spread). A risky bond is a speculative-grade bond (BB+ or lower).

CHART II.5

Movement of government bond yield curves in selected economies
(x-axis: maturity in years; y-axis: yield in %)
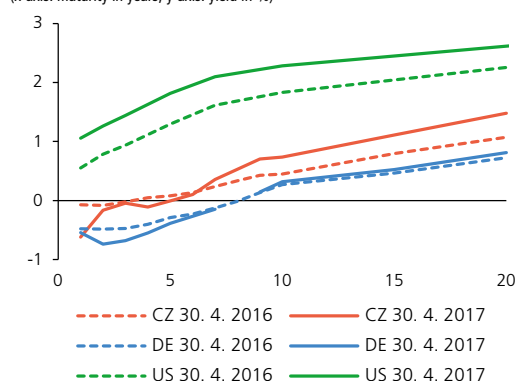
Source: Bloomberg
Note: The yield curves are derived from generic government bond yields.

CHART II.6

Government bond yields in selected countries
(%)
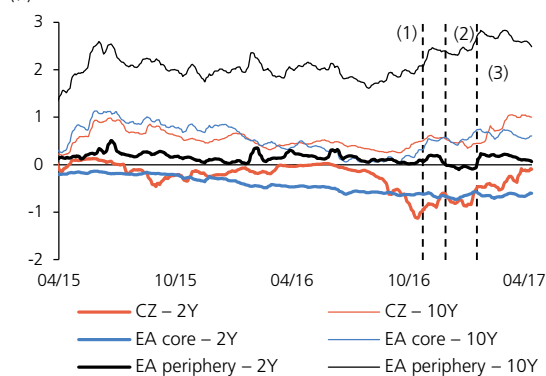
Source: Thomson Reuters, CNB calculation
Note: EA core comprises AT, BE, DE, FR and NL. Periphery consists of ES, IT and PT. The figures for groups of countries are the simple averages of the yields. The series are smoothed by the 5-day moving average. (1) The election of Donald Trump as US President in November 2016. (2) The Fed's rate hike in December 2016. (3) The resurgence of concerns about debt sustainability in highly indebted euro area countries at the start of February 2017.

Private and government debt in selected EU countries in 2016
(% of GDP; x-axis: private debt; y-axis: government debt)
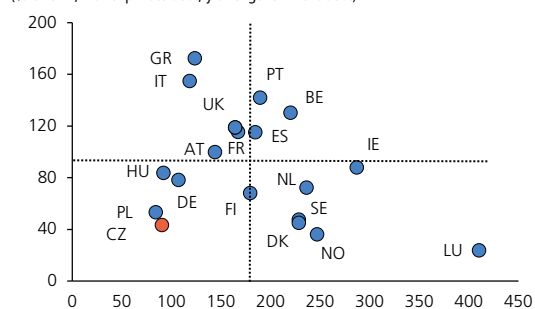
Source: BIS
Note: Data for 2016 Q3. Debt is the sum of all credit provided by domestic banks, non-banks and non-residents. The private sector comprises non-financial corpor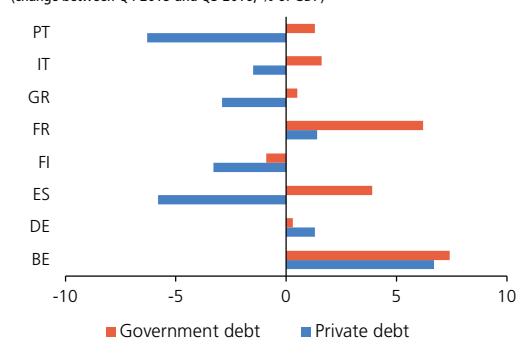ations, households and NPISHs. The BIS debt calculation methodology may differ from methodologies of other institutions. The dashed lines indicate the average in the given year.

Change in private and government debt in selected EA countries
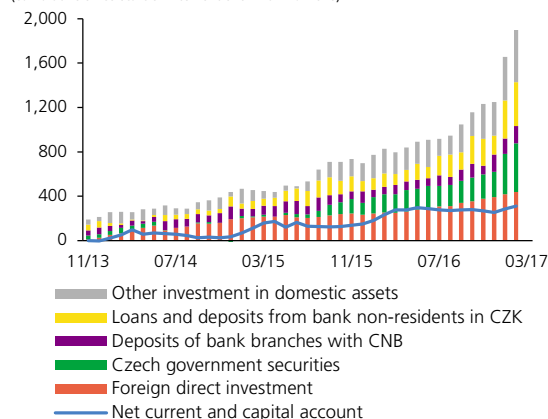(change between Q4 2015 and Q3 2016; % of GDP)

Source: BIS, CNB calculations
Note: The BIS debt calculation methodology may differ from methodologies of other institutions.

Investment by foreign investors in domestic assets
(cumulative since start of interventions in CZK billions)

Source: CNB
Note: Other investment in domestic assets consists mainly of purchases of securities other than Czech government securities, as well as non-resident client koruna deposits, euro deposits in domestic banks and intercompany financing.

markets (see Charts II.5 and II. 6). Euro area government bond yields have been more volatile since the end of 2016. An increase in yields is apparent for longer maturities, as they are more strongly affected by fundamental factors such as sovereign issuer credit risk and inflation expectations.[6] At shorter maturities, however, government bond yields are still being strongly affected by the ECB's asset purchases. In the core euro area countries, yields are still negative, whereas in highly indebted countries they are positive but very low (see Chart II. 6). A rise in yields reflected in higher debt servicing costs represents a potential risk of new credit losses, especially for countries with highly indebted public and private sectors. Although the exceptionally low interest rates in recent years have allowed for a reduction in relative indebtedness, the level of debt remains high in some countries (see Chart II.7). Credit growth is recovering in some countries, while others are experiencing partial deleveraging (see Chart II.8).[7] Some countries have still not finished the process of stabilisation of banks' balance sheets. The need for decisive measures to reduce the current high NPL ratio and prepare for potential new growth in NPLs is therefore being emphasised in discussions between European authorities.[8]

2.1.2 THE DOMESTIC ENVIRONMENT

The economic recovery in the Czech Republic is continuing, but the external environment poses some risks

The real growth of the Czech economy slowed to 2.3% in 2016. According to the CNB's forecast contained in Inflation Report II/2017, the growth rate should increase to almost 3% this year and the next.[9] The favourable evolution of the Czech economy is due to rising domestic and external demand. Growth in domestic economic activity will be driven mainly by robust growth in household consumption, reflecting consumer optimism in an environment of continued growth in employment and wages. A potential deterioration of economic activity abroad (especially in the euro area) could be a source of risk to the Czech economy over the next two years. The results of elections in major euro area countries and the Brexit negotiations can be regarded as uncertainties.

The CNB's monetary policy has taken a step towards a neutral stance

Given sustainable fulfilment of the inflation target, the CNB discontinued the use of the exchange rate as an additional monetary policy instrument in early April 2017.[10] The exit from the commitment represents a shift of monetary policy towards a neutral stance and the use of the standard instrument, namely interest rates. At its monetary policy meeting in May,

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6   The ECB's March macroeconomic forecast increased the euro area inflation estimate for this year from 1.3% to 1.7% and that for 2018 from 1.5% to 1.6%.
7   The year-on-year growth rates of the stock of loans to non-financial corporations ranged from -7% in PT to 7% in BE and SK. As for loans to households, the range was even broader, from -4% in IE (-7% in GR) to 7% in LV and 13% in SK.
8   For example, the speech given by ECB Vice-President Vítor Constâncio: *Resolving Europe's NPL burden: Challenges and benefits* (2017), see:
    https://www.ecb.europa.eu/press/key/date/2017/html/sp170203.en.html.
9   CNB: Inflation Report II/2017, May 2017.
10 For details on the exit from the CNB's exchange rate commitment, see
    http://www.cnb.cz/en/monetary_policy/exit_exchange_rate_commit/index.html.

the Bank Board left interest rates unchanged at technical zero.[11] Consistent with the CNB forecast contained in Inflation Report II/2017 is an increase in market interest rates in 2017 Q3 and later also in 2018. However, the increase in market rates will be strongly dampened until around mid-2018 by the ECB's continuing quantitative easing.

An inflow of foreign capital led to a rise in the banking sector's excess liquidity

The Czech economy saw an increased inflow of foreign capital (see Chart II.9) and a rise in foreign exchange interventions by the CNB (see Chart II.10) between 2016 H2 and the end of March 2017 as the end of the exchange rate commitment neared. Non-residents – especially large international banks and their Czech branches – placed korunas in Czech government bonds (the amount held by non-residents rose by CZK 437 billion between November 2013 and February 2017), in short-term deposits with domestic banks (up by CZK 397 billion over the same period) or with the CNB (up by CZK 156 billion over the same period). As domestic banks gradually left the Czech government bond market and short-term liabilities to non-residents increased, the excess liquidity of domestic banks with the CNB increased (see section 4.2). In April 2017 it exceeded CZK 2.1 trillion (see Chart II.10).

The share of non-residents in holdings of Czech government securities increased again…

The share of non-residents in holdings of Czech government securities increased to 47% (see Chart II.11). Given their speculative motives, non-residents were mostly interested in short maturities. At the end of 2016, they held 55% of the securities with maturities of up to one year (5% in 2012). The increased demand from foreign investors was reflected in a rise in the significance of the portfolio component of the yield, causing the yield on Czech government securities to drop to negative levels.[12] For the one-year maturity, this component first exceeded all the others in 2015 (see Chart II.12). It peaked in late January 2017. The importance of the portfolio component started to decline for this maturity roughly a month and a half before the exit from the exchange rate commitment. Short-term yields began to rise from their historical lows. Yields at longer maturities have also risen since the start of the year and are already starting to reflect market expectations of future interest rate increases (see Chart II.13 and the rise in the risk-neutral yield and term premium).

…so the risk of a sudden repricing remains topical

The presence of non-residents and their relatively high share in holdings of domestic government bonds is causing the risk of spillover of external

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11 The two-week repo rate and the discount rate were set at 0.05% and the Lombard rate at 0.25% with effect from 1 November 2012.

12 The methodology used to decompose the Czech government bond yield is described in detail in the article *Decomposition of the Czech government bond yield curve* in this Report. The yield is decomposed into four components. (1) The risk-neutral yield ("risk-neutral expectations of yields") reflects expectations about future monetary policy and economic developments. (2) The term risk premium relates to the maturity of the bond and is compensation for interest rate risk. (3) The credit risk premium reflects the risk that bond coupons and principal will not be paid on time and/or in full. (4) The portfolio component is the residual (the yield minus the previous three components) and mainly reflects demand for bonds as an investment asset.

CHART II.10

Bank claims on CNB and foreign exchange reserves
(CZK billions)
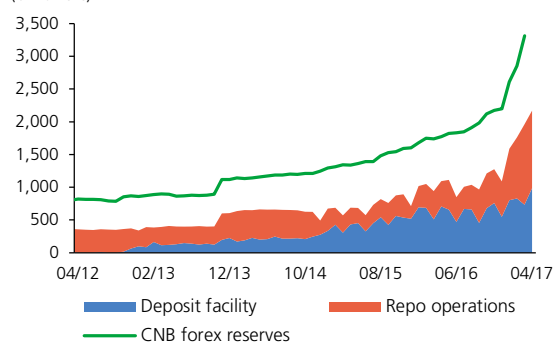
Source: CNB
Note: Repo operations represent the amount of funds deposited with the CNB in liquidity-withdrawing repo operations minus the amount of funds supplied by the CNB to the banking system in liquidity-providing repo operations.

CHART II.11

Holders of Czech government securities
(% of stock of Czech CZK government securities)
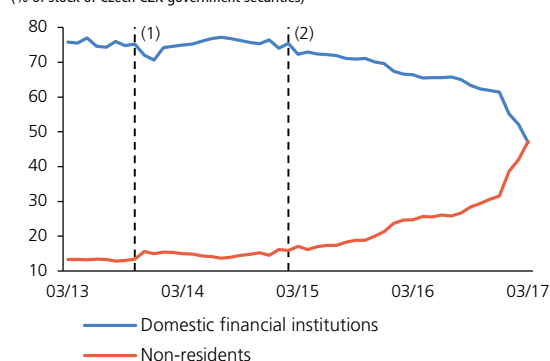
Source: MF CR, CNB calculation
Note: Vertical lines denote the last monthly observation before (1) the announcement of the exchange rate commitment by the CNB on 7 November 2013, (2) the launch of QE by the ECB on 9 March 2015.

CHART II.12

One-year Czech government bond yield decomposition
(%)

Source: CNB

CHART II.13

Five-year Czech government bond yield decomposition
(%)

- Risk-neutral yield
- Term premium
- Credit risk premium
- Portfolio component
- Market yield

Source: CNB

CHART II.14

Koruna-euro spot rate
(year 2017)

— CZK/EUR

Source: Bloomberg
Note: 10-minute data. The vertical line denotes the last observation before the announcement of the exit from the exchange rate commitment.
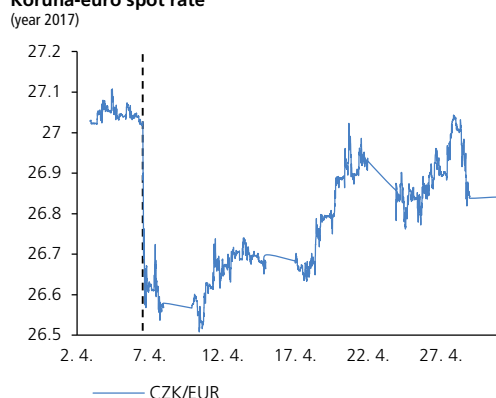
CHART II.15

Interest rate differentials of the koruna against the euro and the dollar
(%)

| — | EUR 3M | — | EUR 12M |
| — | USD 3M | — | USD 12M |

Source: Bloomberg, CNB calculation
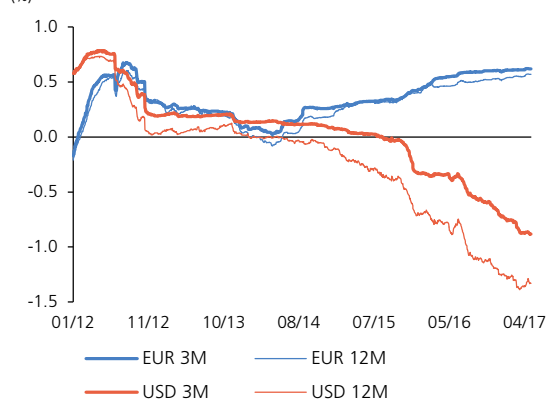
shocks to the domestic financial system to rise. The Czech government bond market is not very liquid and even a small amount of sales can significantly influence the price of bonds. Although trading in these bonds has not shown increased activity since the exchange rate commitment wa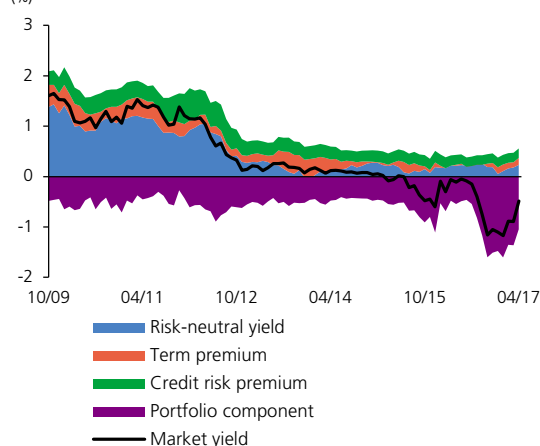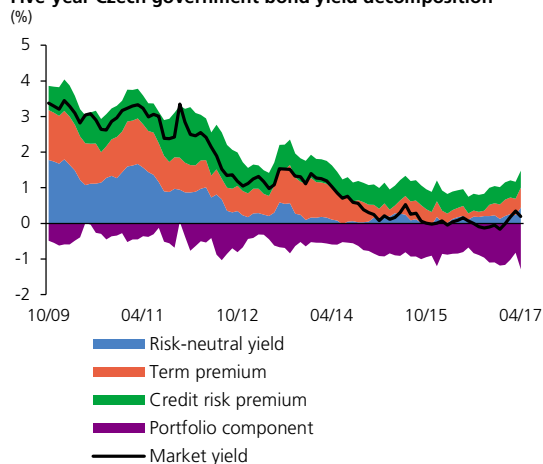s discontinued,[13] the risk of a sudden repricing remains topical. Falling interest in Czech government securities among non-residents can be expected for short maturities on the primary market. Demand from non-residents for securities with longer maturities increased when the ECB adopted its unconventional policies, and has not changed much since (see Chart II.13 and the portfolio component). Within the EU, Czech government bonds remain a relatively profitable and high-quality investment. Non-residents can therefore be expected to lower their holdings only gradually as they restructure their portfolios.

Volatility of the koruna exchange rate may be an elevated uncertainty…

Following the exit from the exchange rate commitment and an initial appreciation to CZK 26.5 to the euro, the koruna started to return gradually to its pre-exit levels (see Chart II.14). A sharper and more sustained appreciation of the koruna is currently being prevented by overboughtness of the koruna market, linked chiefly with speculative behaviour by foreign investors and hedging by domestic exporters before the exchange rate commitment was ended. By contrast, factors fostering appreciation of the koruna have long included the very easy monetary policy of the ECB, which is resulting in a positive short-term interest rate differential of the koruna against the euro (see Chart II.15). The effect of these contrary pressures represents increased uncertainty regarding the extent of exchange rate volatility, especially in the short run. Through their impact on economic activity and employment, large fluctuations of the koruna exchange rate could have an adverse effect on banks' loan portfolio quality and solvency indicators.

…but the importance of exchange rate risk in the domestic banking sector's balance sheet is low

Before the CNB introduced its exchange rate commitment in November 2013, the domestic banking sector had a positive net foreign exchange position (see Chart II.16). This position later started to close as short-term foreign currency loans provided to domestic banks, especially by their foreign parent companies, increased. In 2017 Q1 it turned negative (-3.4% of total assets on aggregate). However, the importance of exchange rate risk remains low compared to credit risk. The capital requirement for exchange rate risk has long been less than 0.5% of the aggregate Pillar 1 capital requirement of the domestic banking sector (see Table III.1 in section 3.1).

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[13] The first quarter of 2017 was characterised by above-average trading in Czech government bonds. The average daily volume of CZK 4.7 billion was twice the average for 2016 (CZK 2.3 billion). In January 2017, the volume of trading was the highest since December 2007. By contrast, the trading volumes after the end of the exchange rate commitment tended to be smaller. The average daily volume on the exit date (6 April 2017) was CZK 1,162 million and did not exceed the 2016 average. The trading volume in the following days was not unusually high either – the average daily volume for the seven days following the exit was CZK 1,970 million.

Financial institutions are regularly stress-tested for market risks

Potential sizeable volatility of the exchange rate or sudden repricing of fixed-income assets could have an adverse effect on the financial results of domestic financial institutions. Once a year, therefore, the CNB conducts stress tests to examine those institutions' sensitivity to market risks (see section 4.1).[14] The amount of government bonds on financial institutions' balance sheets fell in both relative and absolute terms (see Chart II.17), but bonds still account for a large proportion of the portfolios. The amount of foreign currency investments on financial institutions' balance sheets stopped rising in 2016 as the date of exit from the exchange rate commitment neared (see Chart II.18). The systemic importance of foreign currency assets in the domestic financial sector is thus not increasing. Banks' foreign currency investments fell by CZK 8.2 billion in 2016. As for insurance companies, the share of foreign currency investments in total investments fell by 1.3 pp year on year to 23.7% in 2016. A downward trend is also visible for investment funds, where foreign currency investments accounted for 59.2% of investments at the end of 2015 but 57.5% as of 28 February 2017.

The shortening average residual maturity of Czech government debt may imply medium-term risks

Low or even negative yields and demand from non-residents enabled the government to finance itself under exceptionally favourable conditions. Czech government securities totalling CZK 182 billion were issued in 2017 Q1, more than three times the quarterly issuance in 2016 (CZK 56 billion). A total of 46% of the issues had maturities of one year or less (see Chart II.19). This led to a further decline in the average maturity of government debt, which was below five years in March 2017 (see Chart II.20). Although this is not a source of immediate risk for the time being, it would be beneficial from the financial stability perspective if the average residual maturity increased like in other countries. The creditor structure and average maturity are affecting the refinancing risk of Czech government debt and hence also perceptions of Czech sovereign risk. As domestic financial institutions remain major creditors of the Czech government, both indicators are monitored regularly for financial stability purposes (see section 4.4).

2.1.3 ALTERNATIVE ECONOMIC SCENARIOS

The *Baseline Scenario* assumes growth in economic activity…

A *Baseline Scenario* based on the CNB's macroeconomic forecast contained in Inflation Report I/2017[15] was prepared for the stress tests contained in this Report. This forecast expected GDP growth to reach 2.8% this year and stay at similar levels in the next two years. The economy would be supported by continued growth in external demand and renewed growth in investment co-financed from EU funds. Wage growth would increase in line with the continued economic growth. The

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CHART II.16

Foreign currency assets and liabilities in the balance sheet of the Czech banking sector
(% of total assets)
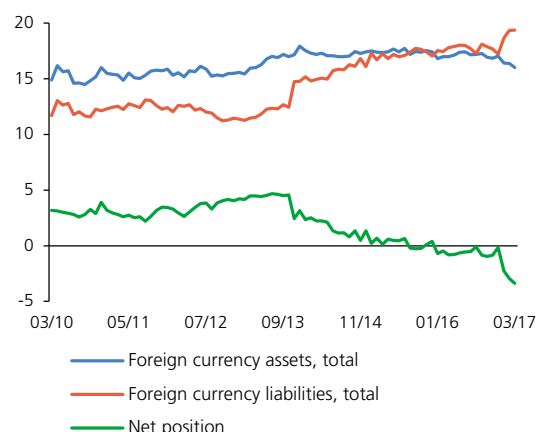
Source: CNB
Note: Excluding the book value of derivatives.

CHART II.17

Investments by type of investment instrument
(%; right-hand scale in CZK billions)
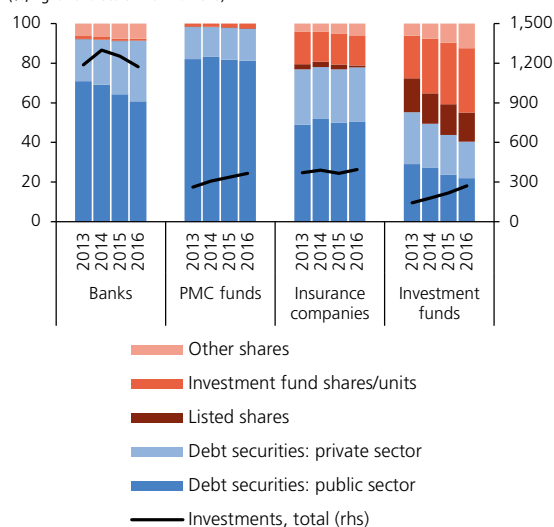
Source: CNB
Note: Debt securities issued by the public sector comprise government and municipal bonds and bonds issued by the European Investment Bank. Debt securities issued by the private sector also include mortgage bonds. As of the end of the year.

CHART II.18

Investments by currency
(%; right-hand scale in CZK billions)

Capital instruments – other currencies
Debt securities – other currencies
Capital instruments – CZK
Debt securities – CZK
Investments, total (rhs)

Source: CNB
Note: As of the end of the year.

CHART II.19

Excess demand in auctions of Czech government debt securities
(x-axis: maturity of issue; y-axis: demand from primary dealers relative to original supply from MF CR in %)

From 2010 until adoption of exchange rate commitment
From adoption of exchange rate commitment until end of 2016
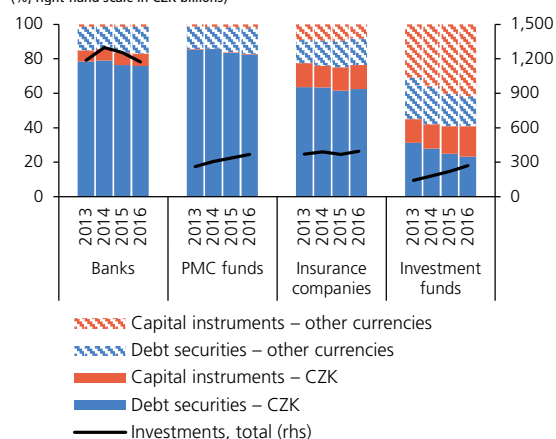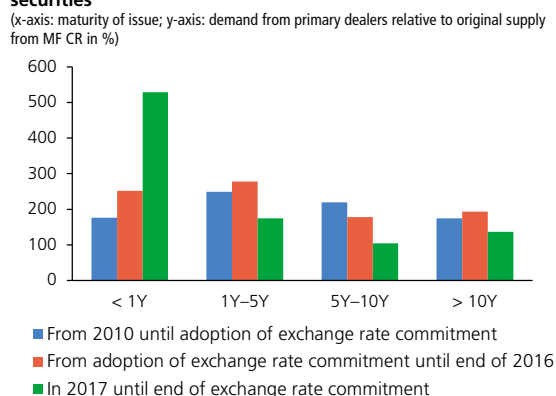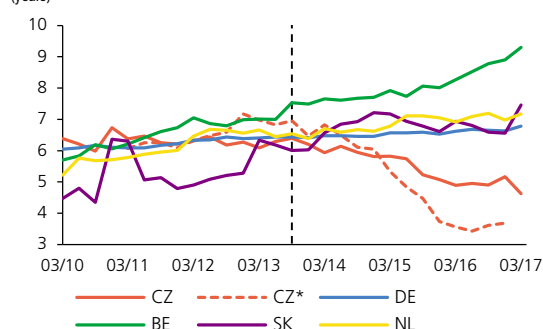In 2017 until end of exchange rate commitment

Source: CNB
Note: Weighted by original supply from MF CZ. Original supply means the centre of the indicative band of the issue size supplied to the auction by MF CZ.

CHART II.20

Average residual maturity of government debt in selected countries
(years)

CZ   CZ*   DE
BE   SK   NL

Source: Bloomberg, CNB, CNB calculation
Note: CZ* stands for the average residual maturity of koruna government bonds held by non-residents. The vertical line denotes the last quarterly observation before the announcement of the exchange rate commitment by the CNB.

general unemployment rate would fall only slightly over the scenario horizon. Headline inflation would rise above the 2% inflation target and return to it at the end of 2017. Consistent with the forecast contained in Inflation Report I/2017 was stability of market interest rates at their current very low level until mid-2017 and an increase in rates from the second half of 2017 onwards.

…while the *Adverse Scenario* assumes a return of the Czech economy to a V-shaped recession

The *Adverse Scenario* assumes a marked drop in economic activity in Europe. The Czech economy falls back into recession owing to a decrease in external demand. This leads to an increase in pessimistic private sector expectations about future economic developments and to deferral of household consumption and corporate investment. The combination of a downturn in external demand and then also in domestic demand cause a sizeable decline in economic activity in the Czech Republic and result in a V-shaped recession. In addition, a debt deflation scenario materialises, with deflationary pressures leading to real growth in private sector debt as a result of declining economic activity, rising unemployment and falling wages. The adverse economic situation causes the funds of households and non-financial corporations gradually to become exhausted. Coupled with a rise in real debt, this causes a significant deterioration in their ability to repay. The problems in the real economy later also affect the financial sector, which records considerable credit losses and a marked decline in profits. Monetary policy remains easy and the three-month PRIBOR stays very low over the entire test horizon. The exchange rate weakens. By contrast, long-term bond yields surge as global risk aversion increases and the quality of some assets is re-assessed. At the same time, banks tighten their view of credit risk and increase their risk mark-ups on interest rates on new loans. Those mark-ups rise to a much higher level also due partly to an increase in long-term interest rates. The related rise in debt service together with the other impacts of the recession increase the default rate on loans to both households and non-financial corporations.

Charts II.21A–D show the evolution of the main macroeconomic indicators of the *Baseline Scenario* and the *Adverse Scenario*. The stress scenario represents very tough but still plausible adverse developments. Its settings are based on a need for stricter scenarios in a period of economic recovery accompanied by rapid growth in loans and rising asset prices, with sources of systemic risk forming invisibly in the background (see Box 2 in section 4.1). This is particularly true of the assumptions regarding property prices, where a risk of increasing overvaluation has been identified (see section 5.3).

CHART II.21A

Alternative scenarios: real GDP growth
(year-on-year change in %)
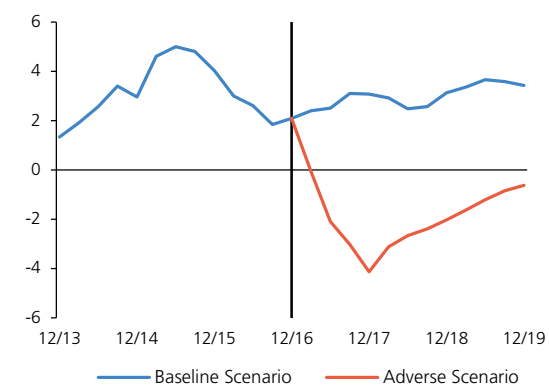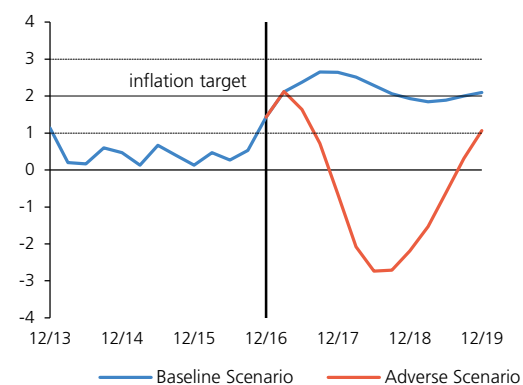

Source: CNB

CHART II.21B
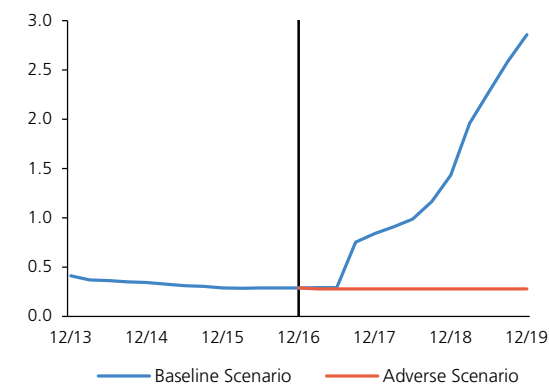
Alternative scenarios: inflation
(%)

Source: CNB

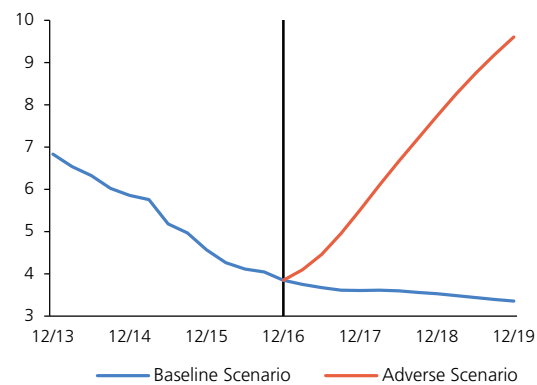**CHART II.21C**

Alternative scenarios: 3M PRIBOR
(%)

Source: CNB

CHART II.21D
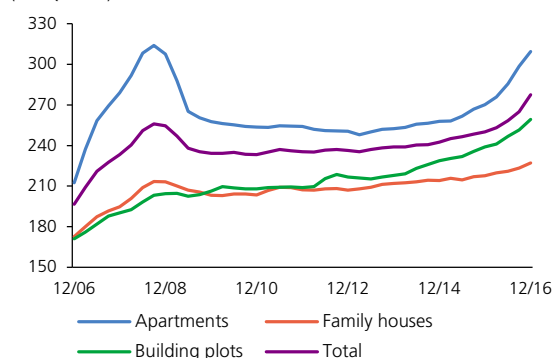
Alternative scenarios: unemployment
(%)

Source: CNB

CHART II.22

Residential property prices – transaction prices
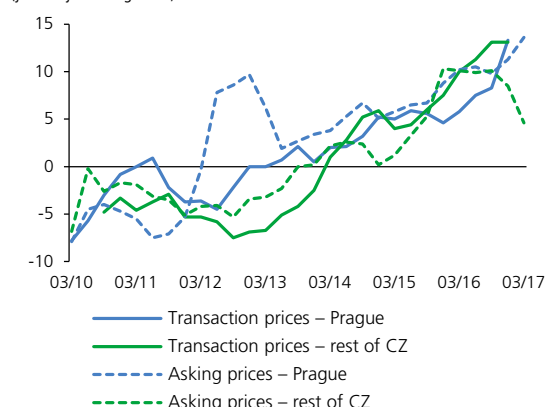(1999 Q1 = 100)

Source: CZSO, HB index, CNB calculation
Note: The data for 2016 are calculated from alternative sources of data on transaction prices (apartment transaction prices from a CZSO survey, the HB index and the CZSO House Price Index).

CHART II.23

Apartment prices – transaction and asking prices
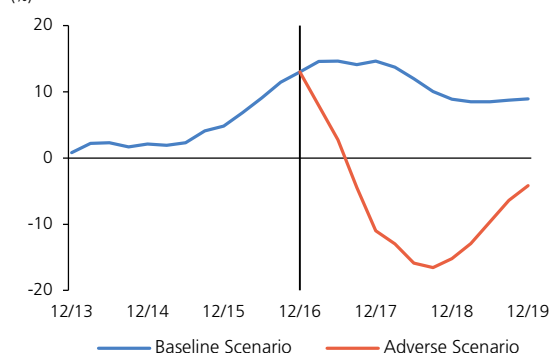(year-on-year change in %)

Source: CZSO, CNB calculation
Note: Transaction prices from tax returns according to CZSO. For 2016 calculated from quarter-on-quarter changes in CZSO survey-based transaction prices.

CHART II.24

Year-on-year property price growth
(%)

Source: CNB

2.2 THE PROPERTY MARKET

Residential property prices accelerated in 2016 and at the start of 2017. Apartment prices considerably outpaced wages, so the affordability of apartments deteriorated. Expectations of further price growth may contribute to the further development of the price spiral between property prices and loans for house purchase. Commercial property saw further growth in transactions and a fall in prime yields.

Residential property prices accelerated…
Residential property prices went up in many European countries in 2016. Residential property prices accelerated further last year in the Czech Republic. Year-on-year house price growth[16] reached 11% in Q4. This was one of the highest figures in the EU. Transaction prices reached, or even exceeded, the previous cyclical high recorded in 2008 in all categories except apartments outside Prague (see Chart II.22). The price acceleration was due mainly to apartment prices, although growth in prices of building plots also surged. The rates of growth of transaction and asking prices of apartments in Prague and the rest of the Czech Republic were similar for most of 2016 (see Chart II.23). In late 2016 and especially in 2017 Q1, prices accelerated in Prague while slowing in the rest of the Czech Republic.

…but the pace of growth should slow in the coming years
Should the economy follow the *Baseline Scenario*, apartment prices would increase further if the historical relations between property prices and their macroeconomic fundamentals remain the same (see Chart II.24). However, the rate of growth of prices would be reduced by macroprudential measures adopted by the CNB and by an assumed tightening of the credit conditions.

The affordability of housing deteriorated
Housing affordability indicators are pointing to a deterioration in affordability but remain well below the highs recorded in 2008 (see Chart II.25). At the end of 2016, the price-to-income (PTI) ratio was up by 13.2% compared to its 2013 lows. The debt service-to-income (DSTI) ratio was up only slightly from its 2014 low, although this was mainly due to extremely low interest rates, which reduced instalments for most borrowers but could create the illusion of easy debt repayment in the future. Combined with expectations of further price growth, this may contribute to the further development of the price spiral between property prices and loans for house purchase (see section 5.3). Apartment rental returns rose slightly in 2016 despite a decline in yields on government bonds as an alternative investment (see Chart II.25).

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16 This refers to transaction prices of apartments and family houses, including connected land, according to CZSO data based on Eurostat methodology. The CNB monitors various price indices, as each provides information about a specific aspect of the market. From the perspective of long-term assessment, apartment transaction prices are key. However, asking prices say a lot about the short- and medium-term dynamics.

The differences in housing affordability across regions are only partly reflected in loan amounts

Data from the *Survey of new loans secured by residential property* conducted by the CNB allow for regional analysis of housing affordability. The PTI and DSTI data confirm that there are differences in housing affordability in Prague and the rest of the Czech Republic (see Chart II.26). The growth in property prices across regions is leading to growth in total loans for house purchase. However, this growth is not proportionate. Households in regions with lower housing affordability compared to other regions pay a larger proportion of the purchase price from their own funds.

Supply-side constraints may push prices up rapidly and also protect the market from excessive construction

One of the factors behind the growth in residential property prices may be restricted supply. This applies especially to Prague, which accounts for about 15% of the residential property market in the Czech Republic as measured by the number of new loans for house purchase. The number of apartment starts in Prague in 2016 was about half of that in 2015. For the first time it was significantly lower than the growth in the number of households and was comparable with regions with substantial lower population growth. In Prague, the number of apartment starts was also significantly lower than the number of completions, while in other regions the numbers were similar (see Chart II.27). However, the cumulative number of completions since 2010 still exceeds the cumulative growth in the number of households[17] (by 35% at the end of 2016; see Chart II.28). The existing barriers to new construction stemming from rigid building regulations in Prague may increase the upward pressure on prices. On the other hand, this factor may in the long term protect the market from excessive construction in reaction to investment or purely speculative demand. In some EU countries (e.g. Ireland and Spain) such demand in the past pushed construction above levels consistent with demographics, resulting in rapid growth in mortgages and overall household indebtedness.[18] During the subsequent recession, the excess housing supply exacerbated the slump in residential property prices and the losses on loans for house purchase.

2016 saw record demand for commercial property…

Prime yields on commercial property declined further during 2016. With rents stable, this implies an increase in commercial property prices (see Chart II.29). Yields were at their lowest level since 2000 in all the categories monitored. The biggest reduction was recorded for office

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[17] Growth in the number of households is estimated as population growth divided by the average size of the Czech household in the relevant year according to Eurostat. The average household size in regions is not available. If, however, the average household was smaller in Prague than in the rest of the Czech Republic, the real growth in the number of households in Prague in 2010–2016 would be bigger.

[18] Maza, L. A., and Juan, M. (2011): *The residential investment adjustment in Spain: The current situation*, Economic Bulletin, Banco de España, January 2011. Kennedy, G., and Stuart, R. (2016): *Housing supply after the crisis*, No. 12/EL/16, Central Bank of Ireland, November 2016. European Systemic Risk Board: *Vulnerabilities in the EU residential real estate sector*, November 2016.

CHART II.25

Housing affordability indicators
(PTI in years; yields in %; right-hand scale: %)

Source: CZSO, CNB calculation
Note: PTI and DSTI are obtained as the ratio of, respectively, the price of and monthly instalment on a 68 m² apartment to the moving average of the annual and monthly wage. A mortgage with an LTV of 77% and a repayment period of 20 years was considered for the DSTI calculation.

CHART II.26

Housing affordability indicators in regions
(x-axis: regions; left-hand scale: years; right-hand scale: %)
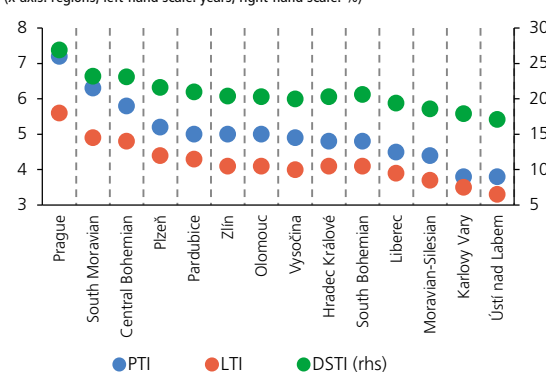
Source: CNB
Note: PTI and LTI obtained from individual data on new loans secured by residential property in 2016 H2. Data calculated on a sample of loans for which the necessary data were available (purchase price data represented the biggest constraint). This sample accounted for around one-third of new loans provided in 2016 H2.

CHART II.27

Apartment construction and population growth in regions
(x-axis: regions; y-axis: thousands)
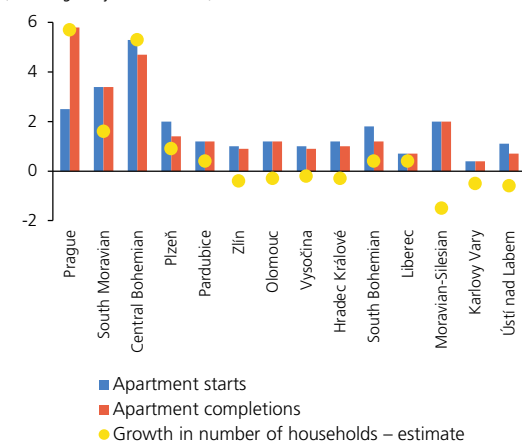
Source: CZSO, Eurostat, CNB calculation
Note: Growth in the number of households estimated as population growth divided by the average household size in the Czech Republic in the relevant year according to Eurostat.

Apartment construction and population growth in Prague
(thousands)
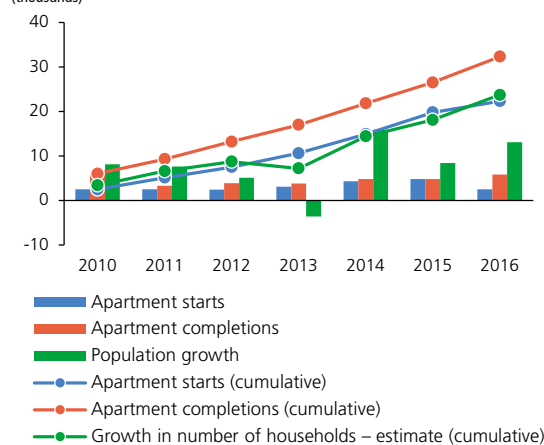
- Apartment starts
- Apartment completions
- Population growth
- Apartment starts (cumulative)
- Apartment completions (cumulative)
- Growth in number of households – estimate (cumulative)
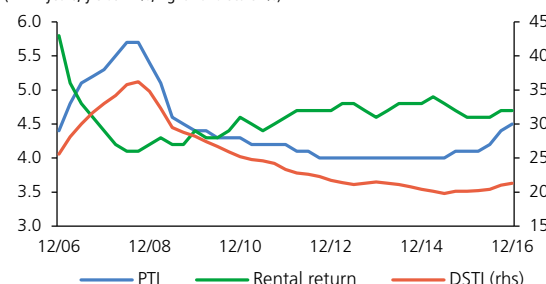
Source: CZSO, Eurostat, CNB calculation
Note: Growth in the number of households estimated as population growth divided by the average household size in the Czech Republic in the relevant year according to Eurostat. The sum since 2010 for cumulative values.

Yields and volumes of commercial property transactions
(%; right-hand scale: 2007 = 100)

- Yields – office
- Yields – industrial
- Yields – retail
- Transaction volumes (rhs)
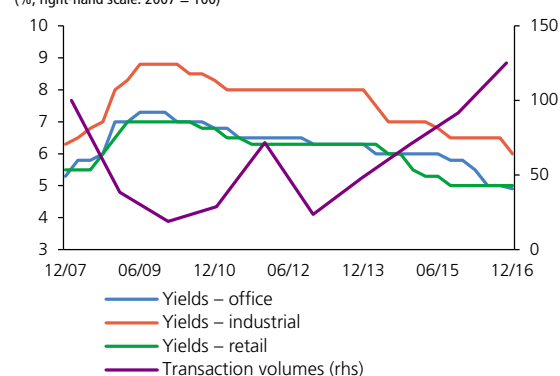
Source: Jones Lang LaSalle
Note: Prime yields. Transaction volumes in annual frequency.

Stock and vacancy rates for commercial property
(%; right-hand scale: thousands of m²)

- Vacancy rate – office
- Vacancy rate – industrial
- Stock – office (rhs)
- Stock – industrial (rhs)
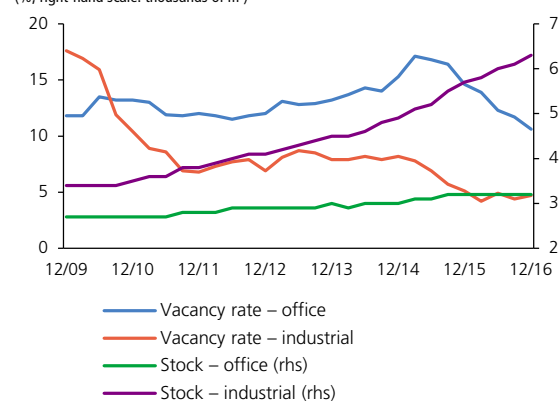
Source: Jones Lang LaSalle

premises, which currently have the lowest yield of all the categories monitored. However, it is still higher than the returns on alternative assets or commercial property in Germany. At the same time, 2016 was a record year in terms of transaction volume, which exceeded the previous high recorded in 2007 by 25% (see Chart II.29). Foreign entities accounted for 75% and Czech entities 25% of the transaction volume.[19] Demand for commercial property in the Czech Republic may also have been supported by political uncertainty in other countries preferred by investors in the past (such as the UK and the USA).

…but the supply of new premises was constrained by rigid building regulations
Despite record investment demand for most types of commercial property, the stock of newly completed premises fell or stayed at low levels in 2016. Office property in particular was negatively impacted by rigid building regulations. The stock of newly completed premises fell to a historical low of about one-fifth of the long-term average in 2016. Demand for new office rentals was high (net take-up rose by 15% in 2016 compared to 2015 and was the second highest in history), so the vacancy rate dropped sharply (see Chart II.30). In the coming year, construction of new office premises should recover to roughly its historical average and the vacancy rate should fall slightly further.

19 Jones Lang LaSalle: *Prague Office Market Pulse*, Q4/2016, 2016.

2.3 NON-FINANCIAL CORPORATIONS

Due to the slowdown of the Czech economy, the non-financial corporations sector recorded a slight fall in profitability. The riskiness of loans provided to non-financial corporations increased, but remains far below the level observed in the crisis years. The NPL ratio remains particularly high in the construction and energy sectors. Despite a modest slowdown, the rate of growth of bank loans to non-financial corporations remains strong and ranks among the highest in Europe. The amount of foreign currency bank loans increased significantly and their share of the total reached a historical high of 30.5% in March 2017. The highest growth was observed in the real estate and manufacturing sectors. This trend is linked mainly with natural hedging of firms against exchange rate risk and is therefore not a source of systemic risk.

The modest economic slowdown was reflected in the sector's overall condition

The overall performance of the non-financial corporations sector was broadly flat in 2016 due to the unwinding of one-off effects observed in the Czech economy in 2015. The sector's aggregate profitability decreased (see Chart II.31), due among other things to growth in firms' personnel costs. A slight decrease in profitability was recorded across all firm sizes with the exception of the smallest companies, which, however, had recorded very low profitability in previous years (see Chart II.32). The economic slowdown was also reflected in an increasing number of loss-making firms – for the first time since the return to economic growth. Although profitability decreased across all branches of activity in 2016, manufacturing (and especially the automotive industry) maintained a high return on equity compared to the rest of the sector (see Chart II.33). Renewed growth in prices of oil and other energy commodities stopped the drop in industrial producer prices in the energy sector and positively affected its profitability, which had been falling since 2013.

In parallel with the drop in the sector's profitability, the investment rate fell in 2016. This was mainly because of a slow start to investment projects co-financed from EU funds in the new programme period. The decline in government investment mainly affected the construction sector, which saw a year-on-year drop in production of 7.6% in 2016. This trend continued at the start of 2017. A survey conducted by the CNB and the Confederation of Industry for 2017 Q1 reveals that non-financial corporations expect only a modest rise in investment expenditure in the quarters to come. In this respect, the key factor is external demand, which has the strongest impact on gross fixed capital formation by non-financial corporations.[20] However, thanks to financial surpluses generated in previous years, even slightly higher investment growth should not represent a major risk to the sector's debt.

20 CNB: Inflation Report I/2017, Box 2, January 2017.

Margin rate and investment rate
(% of gross value added of sector; annual moving totals)

Source: CZSO
Note: Margin rate = gross operating surplus/gross value added of sector. Investment rate = gross fixed capital formation/gross value added of sector.

After-tax RoE by enterprise size and percentage of loss-making corporations
(%)

Source: CZSO, CNB calculation
Note: The results are based on a sample of corporations. The sample contains around 1,500 corporations together accounting for more than 40% of the sector's gross value added.

After-tax RoE in selected branches of activity
(%)

Source: CZSO, CNB calculation
Note: Energy comprises electricity, gas, heat and air-conditioned air. The results are based on a sample of corporations. The property development sector is included under construction.

CHART II.34

12-month default rate on bank loans to non-financial corporations
(%)

Source: CNB

CHART II.35

NPL ratio for bank loans in the non-financial corporations sector
(%)
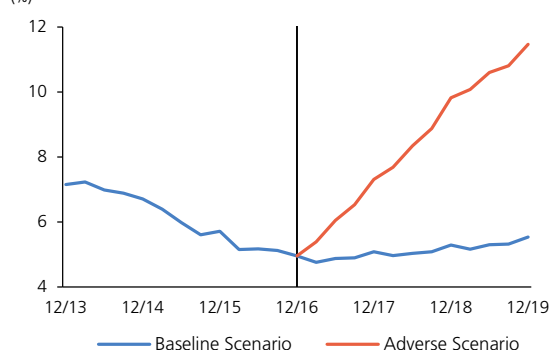
Source: CNB

CHART II.36

Riskiness of loans to non-financial corporations by date of provision
(cumulative default rate in %)
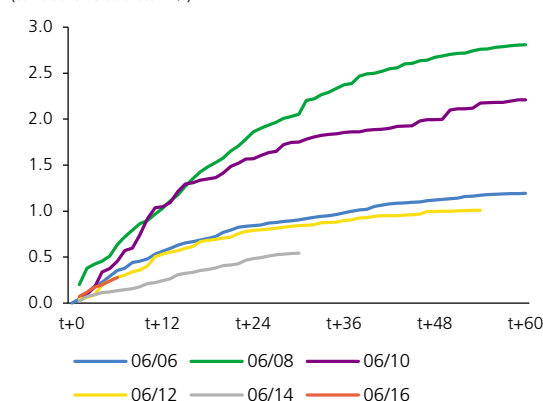
Source: CNB
Note: The initial slope of the curve provides a relatively good signal about the subsequent evolution of the riskiness of loans provided in the given period.

Adverse external developments are the main source of risks to the sector; uncertainty may also be fostered by the koruna exchange rate after the exit from the CNB's commitment

Given the strong dependence of the sector's performance on export-oriented industries, adverse external developments are the main risk scenario for the non-financial corporations sector. The probability of this scenario materialising has risen slightly owing to a significant slowdown in year-on-year growth of goods and services exports in 2016 H2.[21] However, the foreign trade data for January 2017 point to a return to the export growth levels seen in 2016 H1, and the observed slowdown can be viewed as a one-off drop and not as the start of a change in trend.

The exit from the CNB's exchange rate commitment in April also implies some uncertainty. However, non-financial corporations whose finances are sensitive to exchange rate movements have partly hedged themselves against exchange rate risk. This is evidenced by a significant increase in foreign currency borrowing (see subsequent sections). A slight rise in the coverage of exports by imports in 2016 H2 has also reduced the risks.

Credit risk increased slightly and has bottomed out according to the *Baseline Scenario*

Credit risk as measured by the 12-month default rate increased slightly in 2016 (see Chart II.34). As measured by the backward-looking non-performing loan (NPL) ratio, by contrast, it fell slightly further year on year (see Chart II.35). Consistent with the *Baseline Scenario* is stagnation of the NPL ratio in the first year and a slight increase in subsequent years. The slightly higher riskiness of loans to non-financial corporations granted in 2016 compared to previous years suggests that credit risk has bottomed out and could rebound (see Chart II.36). However, compared to the riskiness of loans provided in the crisis years, it remains significantly lower. If the *Adverse Scenario* were to materialise and a return to recession were to happen, the credit risk of the non-financial corporations sector would rise sharply for both monitored indicators (see Charts II.34 and II.35).

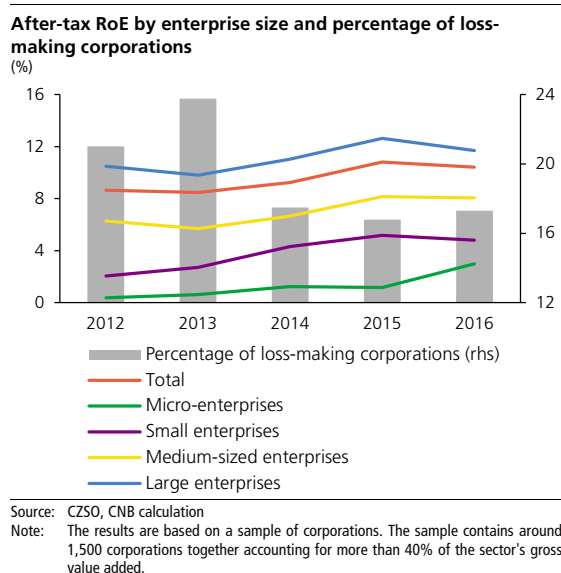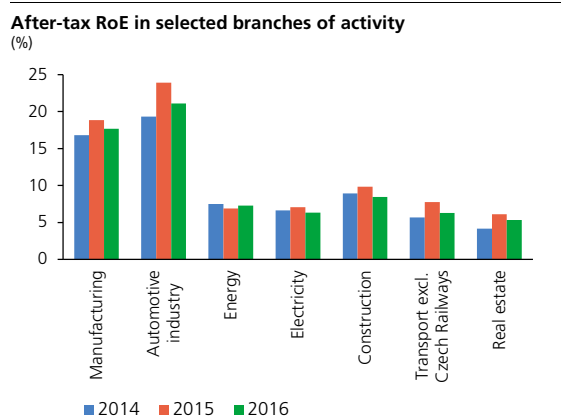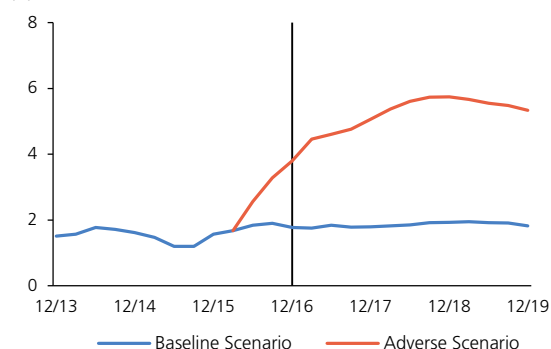**Credit risk remains elevated in construction and energy**

The differences in performance and profitability across branches of activity are reflected in their credit risk (see Chart II.37). The construction sector has long been showing an elevated NPL ratio and its outlook remains negative.[22] Businesses in the energy sector have also been showing an adverse credit risk trend over the last three years. Credit risk in this sector fell slightly in the second half of 2016, but rose again in 2017 Q1 and remains well above the level in the rest of the sector. The

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21 The slowdown is a consequence of developments in the automotive industry, primarily subdued demand for new cars in Western Europe. CNB: Inflation Report I/2017, Box 3, January 2017.
22 This was mainly due to low investment activity in 2016 and shifts in the value of new orders, which fell by 3% year on year in 2016. The CZSO's March 2017 business survey largely confirms these trends. After 2015 and 2016 Q1, when it reached its highest levels since the crisis, the confidence indicator in the construction sector returned to the December 2014 level.

outlook for the sector remains rather negative owing to uncertainty surrounding prices of oil and other energy commodities.[23] The risk profile of the other sectors was little changed. As a result of improved profitability, the credit risk of the smallest firms decreased, whereas that of the largest ones increased slightly.

The credit risk of the 1,000 largest exporters increased considerably. However, this was largely due to the situation of several engineering companies.[24] The NPL ratio more than tripled between May 2016 and January 2017, reaching 5.6% in March 2017.

Despite a slight fall, bank lending growth remains strong
The year-on-year rate of growth in bank loans to non-financial corporations slowed slightly in 2016 and was at 4.7% in March 2017. The growth is relatively strong both from the historical perspective and in the international context (see section 5.2). Loans to corporations are growing fastest in the real estate and manufacturing sectors. According to the *Baseline Scenario* of the current round of stress tests, the growth rate of bank loans will increase in the quarters ahead and year-on-year credit growth should reach around 10% at the three-year test horizon (see Chart II.38). If the *Adverse Scenario* were to materialise, the credit growth rate would be positive only in the first year and there would be a sizeable credit contraction in the following years.

As for other funding sources, growth in debt securities issuance has been falling since 2015 Q3. This type of funding represented 11.9% of total external funds in 2016 Q4. The remainder consisted of loans from non-bank financial institutions and intercompany loans, the growth rate of which is comparable to that of bank loans.

The decline in new loans slowed in late 2016 and early 2017
Although the amount of new koruna loans to the non-financial corporations sector as a whole has been falling year on year since 2015 Q3, the decline slowed in late 2016 and early 2017. Genuinely new loans followed a similar pattern. Lending to real estate firms is moving in the opposite direction. According to CCR data, the growth rate of new loans in this category is rising sharply. Genuinely new loans to these firms account on average for more than a quarter of all new loans in the sector.[25] In addition to strong growth in loans to households for house

NPL ratios for bank loans in selected branches of activity
(% of total stock of loans in given category)

- Manufacturing
- Energy
- Construction
- Developers and real estate
- Trade
- Agriculture
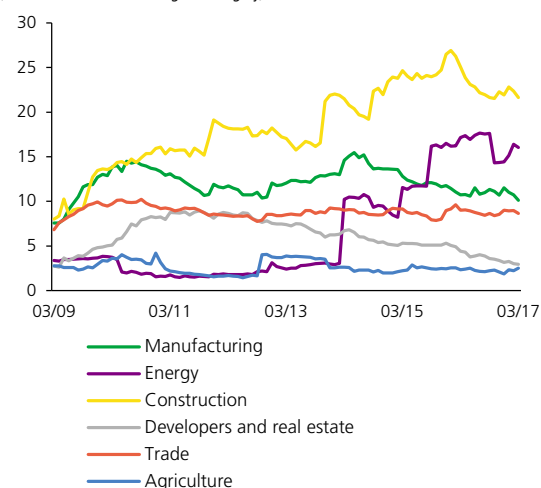
Source: CNB
Note: The developers category comprises NACE 411 (Development of building projects) and NACE 68 (Real estate activities).

Year-on-year growth in bank loans to non-financial corporations
(%)

Baseline Scenario — Adverse Scenario
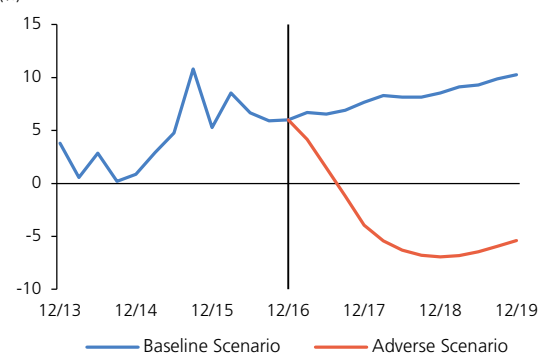
Source: CNB

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23 In November 2016, OPEC agreed to cap oil production. The Brent crude oil price reacted by recording its highest growth since early 2009. However, the limits only apply to 2017 H1. Oil price growth was fostered in 2017 Q1 by disruptions to production in Libya and by signals that OPEC might extend the output cap agreement into the second half of the year. However, growth in drilling activity and subsequently in shale oil production in the USA is expected to rise if the price significantly exceeds the current level. Market reports meanwhile suggest there is a significant oil surplus.
24 As of March 2017, four subsidiaries of the Vítkovice Machinery Group had gone bankrupt – Vítkovice Power Engineering, Vítkovice Gearworks, Vítkovice Envi and Vítkovice Revmont. The Czech banking sector is exposed to risks relating to loans to these companies. *Report of the Insolvency Trustee on the State of the Insolvency Proceedings in Vítkovice Power Engineering* of 9 November 2016.
25 A similar percentage share is observed for the stock of credit. In February 2017, loans to real estate firms accounted for roughly 29% of total loans to non-financial corporations.

CHART II.39

Year-on-year growth in foreign currency loans and their share in total bank loans of sector
(%)
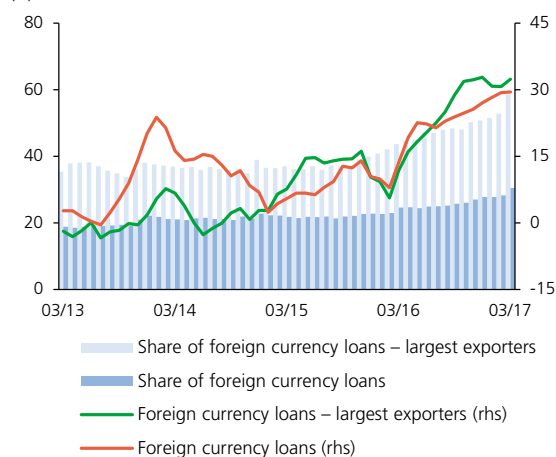
Source: CNB
Note: Foreign currency loans are smoothed by the 3-month moving average. The largest exporters category comprises the 1,000 largest exporters in the Czech Republic in 2016.

CHART II.40

Absolute year-on-year changes in foreign currency loans in selected branches of activity
(CZK billions)
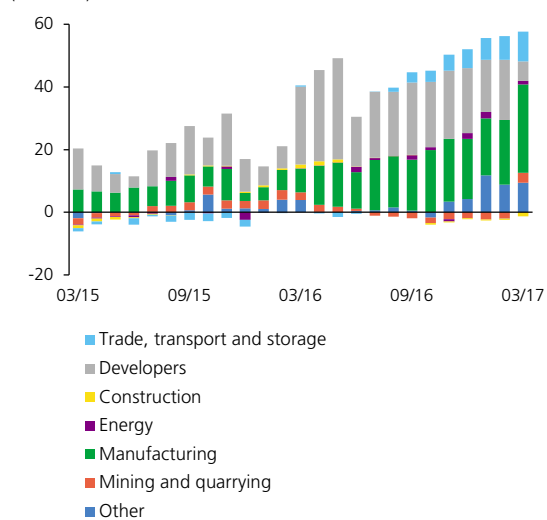
Source: CNB

purchase (see section 2.4), the concentration of loans to the real estate sector is rising substantially. This is increasing the Czech banking sector's vulnerability to adverse developments in this market. From the perspective of the purpose of lending, financial and investment loans rose year on year, whereas shorter-term operating loans declined (see Chart V.15 in section 5.2).

The amount of foreign currency bank loans rose significantly

Year-on-year growth in foreign currency loans rose significantly during 2016, reaching 29.6% in March 2017 (see Chart II.39). Between January 2016 and March 2017, the share of foreign currency loans in total bank loans in the sector rose by 7.8 pp to a historical high of 30.5%. An even larger change in the currency structure of loans is apparent in the category of the largest exporters, where foreign currency loans make up more than half of all loans obtained. Exporters traditionally use foreign currency loans as a means of hedging against exchange rate risk. A CNB analysis based on a sample of the largest exporters reveals that exporting firms are quite well hedged in this respect. The highest growth was observed in the manufacturing and real estate sectors (see Chart II.40). The observed growth in foreign currency borrowing was thus linked mainly with natural hedging of firms against exchange rate risk before the expected exit from the CNB's exchange rate commitment.[26]

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26 Developers report most prices in euro, so foreign currency borrowing in this segment may also involve natural hedging of sales.

2.4 HOUSEHOLDS

The income situation of households, including low-income households, improved. Positive perceptions of income growth and the favourable economic outlook are boosting consumption and investment and leading to growth in the sector's indebtedness. Bank loans for house purchase are accelerating, and, after several years of stagnation, consumer credit is rising sharply, too. Thanks to the low interest rate environment and favourable income trend, debt servicing costs are staying at a sustainable level. However, the expected interest rate growth may increase households' sensitivity to income shocks and cause repayment problems to rise. Credit risk fell slightly across all loan categories and is expected to rise modestly in the period ahead.

An improvement in the labour market situation was reflected in faster income growth…
The economic growth in 2016 and early 2017 helped further improve the overall labour market situation. At the end of February 2017, the general unemployment rate fell to 3.5%, the lowest level in the EU. The growing labour demand led to an increase in vacancies and positively affected wage growth (see Chart II.41). The growth rate of the median wage is higher than that of the average wage, indicating a shift to higher wages, especially in low-income households. The CNB's macroeconomic forecast contained in Inflation Report II/2017 suggests that the labour market is now close to the situation seen at the peak of the business cycle in 2009, so only a marginal decline in unemployment can be expected going forward. However, as excess labour demand can be observed in many sectors, the forecast assumes continued buoyant growth in income.

…and positive economic perceptions are leading to growth in indebtedness
The growing consumer confidence and optimistic income outlook led to a renewed upswing in debt growth, which considerably outpaced growth in disposable income in 2016 (see Chart II.42). This was reflected in a further increase in the debt ratio. By international comparison, however, the total indebtedness of Czech households is still relatively low. Moreover, its rate of growth has not been as dramatic as in countries that did not undergo deleveraging in previous years (see Chart II.43). However, in certain segments, especially bank loans, the growth rate of loans remains above the EU average. Loans for house purchase recorded the highest growth. In year-on-year comparison, around 15% more genuinely new loans for house purchase (including increases) were granted in 2016, and the growth accelerated further in early 2017 (see also Chart V.15 in section 5.2). In the case of new loans for house purchase, the share of genuinely new loans is flat at around 60%. Likewise, the shares of loans refinanced by banks and loans with new fixation periods were also stable (at just above 10% and just under 30% respectively). According to the *Baseline Scenario*, the rate of growth of bank loans to households should stay close to 8% (see Chart II.44). The main factor counteracting credit growth will be the stricter LTV ratio set in the *Recommendation on the management of risks associated with the provision of retail loans secured by residential property* as from April

CHART II.41

Labour market indicators
(%)

- Year-on-year average nominal wage growth
- Unemployment rate (ILO)

Source: CNB
Note: The unemployment rate is seasonally adjusted. The vertical line divides the observed values and the CNB's official predictions in Inflation Report I/2017.

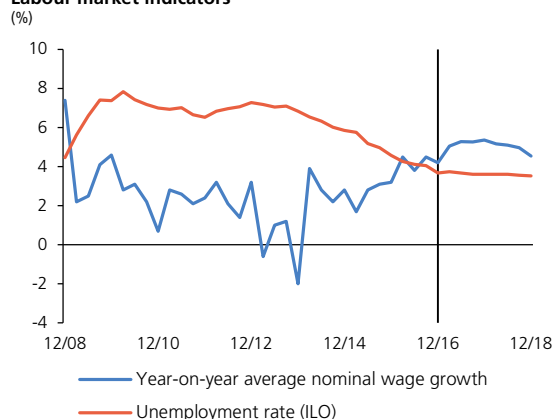**CHART II.42**

Household indebtedness and income indicators
(year-on-year change in %; right-hand scale: ratios in %)

- Non-bank loans/GDI (rhs)
- Other bank loans/GDI (rhs)
- Consumer credit/GDI (rhs)
- Loans for house purchase/GDI (rhs)
- Rate of growth of loans, total
- Rate of growth of nominal GDI

Source: CNB
Note: Non-bank loans are loans provided to other financial institutions.
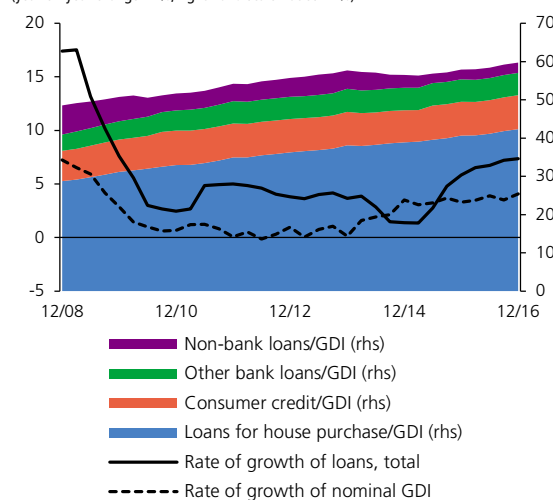
Household debt in relation to gross disposable income in international comparison
(%)
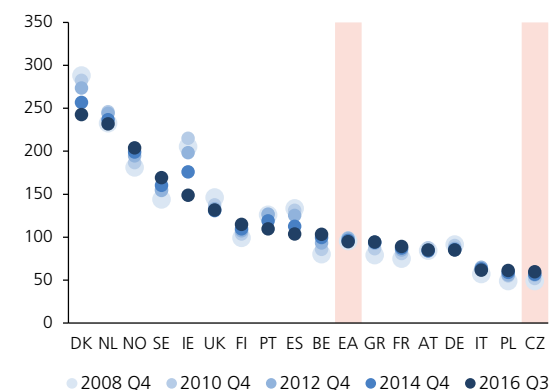
Source: CNB

Year-on-year growth in bank loans to households
(%)
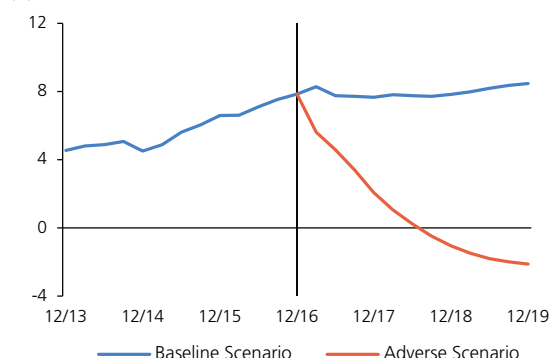
Source: CNB

2017. However, if the macroeconomic conditions of the *Adverse Scenario* were to materialise, credit growth would start declining sharply and would be negative at the three-year horizon.

Low interest rates and rising income are having a favourable effect on debt servicing

Despite the rising level of total household debt, the ratio of net interest costs to disposable income stayed just under 2% (see Chart II.45). This was due to both growing income and very low interest rates, which, however, are likely to have reached a trough at the end of 2016 (see Chart II.46). The effects of a reversal of the interest rate trend could be partly neutralised by increasing fixation periods (see Chart II.45). The growth in debt servicing costs will therefore impact first on loans with fixation periods that are coming to an end[27] and on consumer credit with short maturity. In an environment of higher loan funding costs, debt servicing will be more sensitive to changes in the income situation of households (see section 4.3). However, data from the Household Budget Statistics show that loans were granted mainly to higher-income households, which are less sensitive to rises in rates and drops in income (see Chart II.47, left-hand panel). In a less favourable scenario, debt servicing costs should therefore stay at a sustainable level for most households. Nevertheless, in the event of a significant increase in interest rates, some low-income households could be exposed to increased risk. Loans provided to households in the lowest income quartile account for a relatively small share of total loans, but they consist mainly of higher-risk consumer credit. This is evidenced by greater problems with regular repayments and an increased risk of such problems occurring in periods prone to drops in income (see Chart II.47, right-hand panel).

The credit risk of households decreased

Thanks to the observed macroeconomic developments, credit risk indicators fell across all loan categories during 2016. The 12-month default rate on bank loans to households fell to 2.2% (see Chart II.48). A downward trend was seen for both loans for house purchase (1.6%) and consumer credit (4.7%). The 12-month default rate on non-bank loans was higher but falling slightly. The favourable credit risk trend is confirmed by a falling ratio of non-performing bank loans to total loans, which amounted to 3.1% in February 2017 (loans for house purchase 1.9%, consumer credit 8.8%). According to the *Baseline Scenario*, the credit risk of households should rise slightly in 2017, mainly on the back of a slight deterioration in the consumer credit portfolio. If the *Adverse Scenario* were to materialise, the 12-month default rate on loans to households would start to rise sharply, reaching 6% at the end of the three-year horizon. This is more than double the expected rate.

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27 However, in the case of some loans with longer rate fixation periods which will be refixed in the coming years, interest rates will probably continue to decline compared to when the rates on such loans were last fixed.

CHART II.45

Debt servicing costs and average loan fixation period
(%; right-hand scale: average fixation period in years)

- Net interest paid/GDI
- Genuinely new loans: fixation period (rhs)
- Refinanced loans: fixation period (rhs)
- Refixed loans: fixation period (rhs)
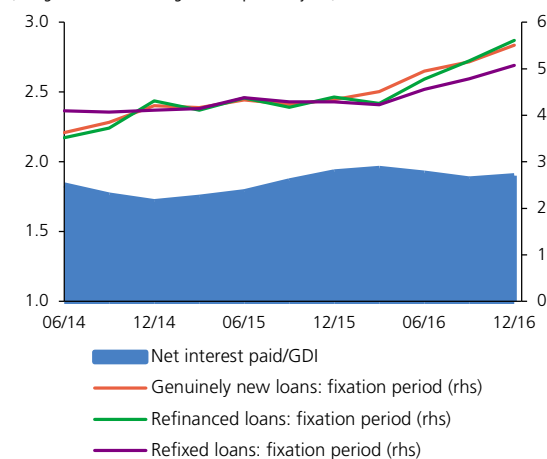
Source: CNB
Note: Net interest paid is the difference between households' loan interest costs and their interest income on bank deposits. GDI stands for gross disposable income of households.

CHART II.46

Interest rates on new koruna loans to households
(%)

- Property purchase loans (fixation < 1Y)
- Property purchase loans (fixation 1Y–5Y)
- Property purchase loans (fixation 5Y–10Y)
- Property purchase loans (fixation > 10Y)
- Loans for consumption (rhs)
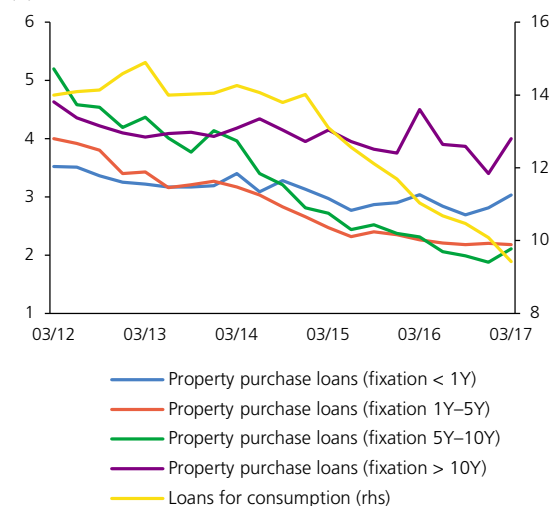
Source: CNB

CHART II.47

Selected characteristics broken down by income quartile
(%)

Share of households with loans

Share of households having problems paying on time

- 2008
- 2010
- 2012
- 2015
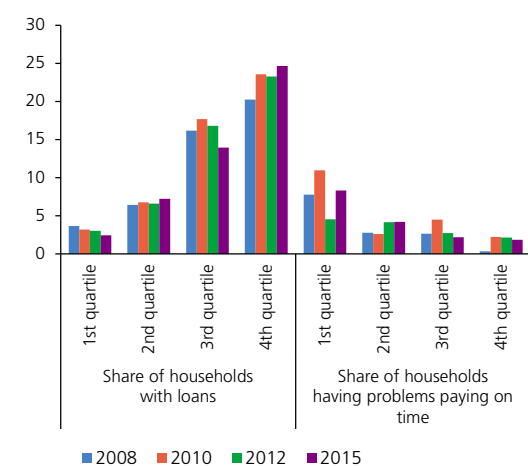
Source: CZSO, CNB calculation
Note: Income quartiles are determined according to households' total net income for the year.

CHART II.48

12-month default rate on bank loans to households
(%)

- Baseline Scenario
- Adverse Scenario
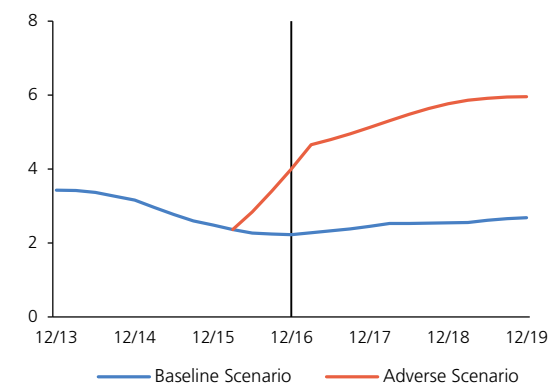
Source: CNB

Rates of growth of segments of the financial sector
(%)
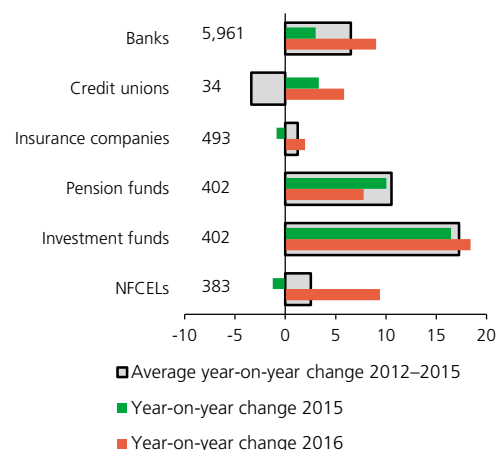
Source: CNB
Note: NFCELs = non-bank financial corporations engaged in lending. The figure next to the segment name denotes total assets as of the end of 2016 in CZK billions.

TABLE III.1

Capital surpluses against various capital requirements as of the end of 2016
(CZK billions; pp in parenthesis)

	Banks, total (excl. CEB + CMGDB)	Systemically important banks	Banks that are not systemically important	CEB + CMGDB
Pillar 1 requirements	241.6 (10.3)	169.1 (9.8)	72.5 (11.4)	8.1 (24.2)
Pillar 1 + 2 requirements	203.3 (8.6)	138.2 (8.0)	65.2 (10.3)	8.1 (24.2)
Pillar 1 + 2 + Systemic risk buffer	164.9 (7.0)	99.7 (5.8)	65.2 (10.3)	8.1 (24.2)
Pillar 1 + 2 requirements + systemic risk buffer + capital conservation buffer	106.0 (4.5)	56.7 (3.3)	49.3 (7.8)	7.2 (21.7)
Number of banks	20	5	15	2

Source: CNB
Note: Institutions that had a systemic risk buffer set as of 1 January 2017 are deemed systemically important banks. The Czech Export Bank and the Czech-Moravian Guarantee and Development Bank were excluded from the set of banks that are not systemically important.

3 THE FINANCIAL SECTOR

3.1 DEVELOPMENTS IN THE FINANCIAL SECTOR

The favourable trends seen in the Czech financial sector in past years continued into 2016. The banking sector maintains high capitalisation, profitability and liquidity, and has further increased its credit portfolio quality. The insurance sector returned to growth and strengthened its profitability. The dynamic expansion of the investment and pension fund segments is being driven by growth in real incomes and rising household savings.

The main risk scenario for the financial sector is still a contraction in economic activity accompanied by growth in credit and market risk. Decreasing risk weights for mortgage loans set using internal models may in the future amplify the risks associated with the current trend in the markets for residential property and property financing loans, which are becoming the dominant component of banks' credit portfolios. The environment of exceptionally low interest rates still poses a risk to profitability of all financial market segments. However, stress test results demonstrate that the current capitalisation, liquidity and profitability levels of the most important segments of the financial sector guarantee a high degree of resilience to the assumed shocks.[1]

The financial sector's assets continue to rise, with investment funds recording the fastest growth

All segments of the financial market saw year-on-year growth in total assets at the end of 2016 (see Chart III.1). The banking sector, which accounts for almost 80% of the financial sector's assets, recorded the largest year-on-year growth in absolute terms (9.0%, or CZK 492.9 billion), due mainly to year-on-year growth in exposures to the CNB (of 46.2%) and client loans (of 7.1%). As in the last three years, investment funds recorded the fastest growth in total assets (18.4%, or CZK 62.4 billion). Non-bank financial corporations engaged in lending also recorded a significant increase (9.4%, or CZK 32.9 billion), as traditionally did pension funds (7.8%, or CZK 29.1 billion). Insurance companies also showed growth (2,0%, or CZK 9.4 billion). The total assets of the minority segment of credit unions were higher at the end of 2016 (by 5.8%, or CZK 1.9 billion). However, they have fallen significantly since January 2017 due to the conversion of the largest credit union into a bank.

3.2 THE BANKING SECTOR AND CREDIT UNIONS

Banks' capitalisation was flat in 2016…

The total regulatory capital in the Czech banking sector rose by CZK 19.3 billion in 2016, reaching CZK 430 billion at the year-end.[2]

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1 The assumed shocks are described in sections 2.1 and 4.1.
2 The Czech Export Bank and the Czech-Moravian Guarantee and Development Bank were excluded from the analysis of capital and credit risk of the banking sector as a whole. This is because these banks are wholly owned by the Czech state (providing implicit state

However, the overall capital ratio decreased slightly, by 0.07 pp to 18.3% (see Chart III.2) and the Tier 1 capital ratio fell by 0.16 pp to 17.7%. The drop was due mainly to strong credit growth (-1.69 pp; see sections 2.3 and 2.4). It was offset by a rise in capital from profit[3] (+0.84 pp) and a drop in aggregate risk weights (+0.78 pp). For the Czech banking sector, Tier 1 is almost identical to Common Equity Tier 1, i.e. the highest-quality component of capital.

…but its level still allows banks' balance sheets to grow…
The overall capital requirement consists of the minimum level of regulatory capital in Pillar 1 (8%),[4] a requirement based on the supervisory review and evaluation process in Pillar 2[5] (an average of 1.7% on aggregate) and capital buffers (see section 5.2). Most banks meet the overall capital requirement by a sufficient margin. The capital surplus of systemically important banks amounts to CZK 57 billion (3.3 pp) and that of other banks to CZK 49 billion (7.8 pp; see Table III.1). Together with the profitability achieved, it creates good conditions for lending to the real economy. The capital surplus of two banks was lower than 2 pp at the end of 2016 (see Chart III.3).

…although this space may decrease…
Under the conservative assumption of a constant level of capital, risk weights and the Pillar 2 requirements, together with banks' plans for future loan amounts[6] (average credit growth of 7% a year), the capital surplus would decline from CZK 106 billion (4.5 pp) at the end of 2016 to around CZK 67 billion (2.7 pp) at the end of 2017 (see Chart III.2). Systemically important banks would record a drop from CZK 57 billion (3.3 pp) to CZK 34 billion (1.9 pp) and other banks from CZK 49 billion (7.8 pp) to CZK 33 billion (5.0 pp). Even in this model situation, banks should have sufficient space overall for any increase in the countercyclical buffer (see section 5.2.2) and credit growth, assuming reasonable dividend policies. However, this space would decrease if profitability were to fall. It will also be impacted by the implementation of IFRS 9, which may, according to a CNB survey, lower the capital ratio of domestic banks by up to 50 bp (see section 5.4.2). The intensity of the impact will be influenced by the EC's decision on the approach to its pass-through to capital over time.[7]

…and may not be sufficient for some banks in an adverse phase of the financial cycle
The overall impact of the *Adverse Scenario* of the CNB's stress tests (see section 4.1) on the banking sector reveals that the capital ratio does

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3 Of the overall 2015 after-tax profit of CZK 66.5 billion, CZK 13.7 billion was transferred to retained earnings and CZK 52.8 billion was paid out as dividends.
4 The main component of the Pillar 1 capital requirement is the requirement for credit risk (6.9%).
5 They cover other risks that Pillar 1 does not fully take into account for the given bank. The number of banks with additional Pillar 2 capital requirements will increase from 7 to 17 as of 2017.
6 The data are from the statement "Bank financing plans" (FPSIFE10).
7 The EC is discussing a proposal to spread the impact on the capital ratio over four to five years.

guarantees for their liabilities) and have different business models and volatile credit portfolios. ERB bank was excluded from the entire section 3.1 due to insolvency.

Structure of capital requirements in the Czech banking sector
(%)

Capital surplus
Pillar 2 Guidance (capital planning buffer)
Countercyclical buffer
Capital conservation buffer
Systemic risk buffer
Additional Pillar 2 capital requirements
Pillar 1 requirements

Systemically important banks

Banks that are not systemically important
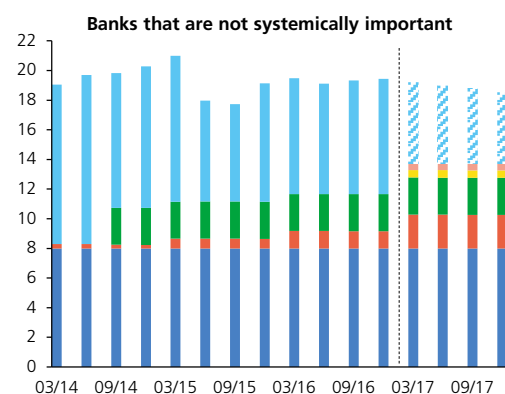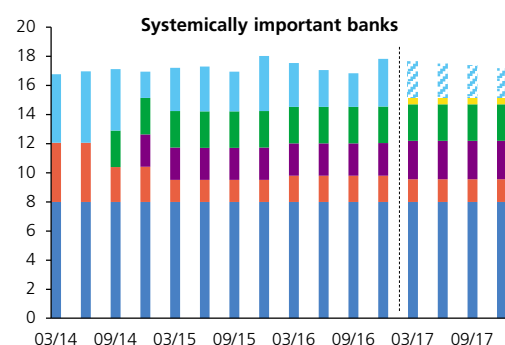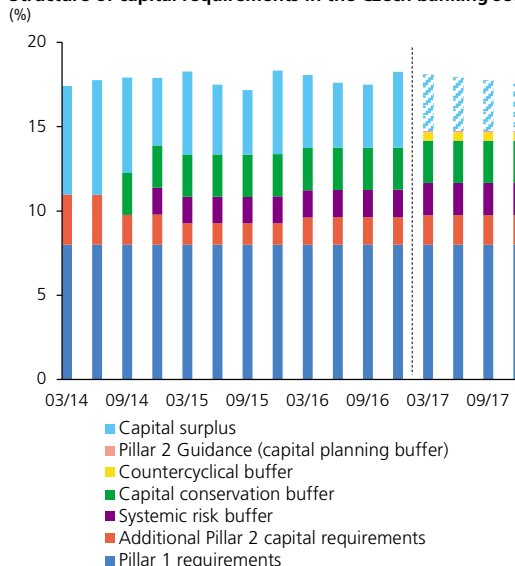
Source: CNB
Note: Due to partial overlap of the capital conservation buffer requirements with the Pillar 2 requirement, the Pillar 2 requirements have since July 2014 been adjusted for the requirements arising from the stress tests conducted for supervisory purposes. The capital surplus prediction (patterned fill) assumes constant capital and risk weights. Risky exposures are calculated on the basis of banks' assumptions about future loans, which banks report in the statement "Bank financing plans" (FPSIFE10).

Deviations from the minimum capital and leverage ratios
(x-axis: deviation of total capital ratio in pp; y-axis: deviation of leverage ratio in pp)
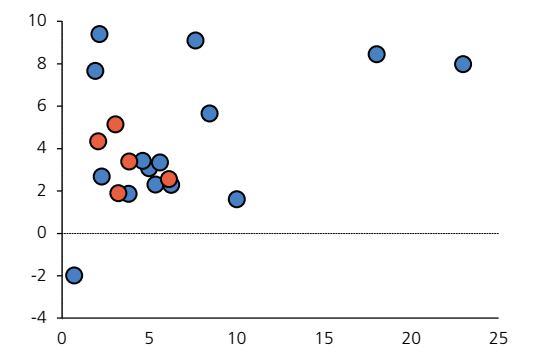
Source: CNB
Note: Systemically important banks are marked in red. Institutions that had a systemic risk buffer set as of 1 January 2017 are deemed systemically important banks. The minimum capital ratio is given by the sum of the Pillar 1, Pillar 2 and capital buffer requirements applicable to the bank as of the end of 2016 Q4. A limit of 3% is assumed for the minimum leverage ratio.

CHART III.4

Leverage ratios and risk weights for domestic banks as of the end of 2016
(y-axis: leverage ratio in %)
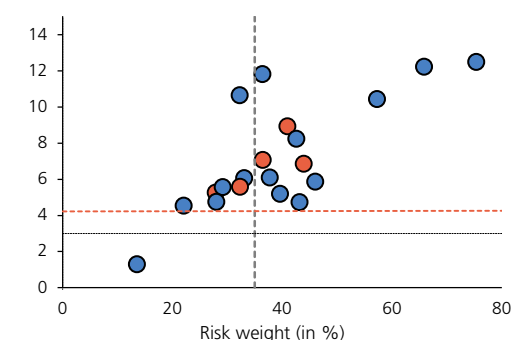
Source: CNB
Note: The black horizontal line depicts the minimum leverage ratio of 3%. The red horizontal line depicts the macroprudential leverage ratio linked to the maximum systemic risk buffer applying to systemically important banks (red dots) as of the end of 2016. The vertical line depicts the critical risk weight, which determines the interconnectedness of the capital buffers and the macroprudential leverage ratio.

not fall below the Pillar 1 and Pillar 2 capital requirements (the total capital requirement). In individual cases, however, it implies that some banks might not be able to satisfy the total capital requirement in the scenario. A total of 12 banks would fall below its threshold, three of which are systemically important. The CNB takes stress test results into account in the assessment of capital adequacy in the SREP.

Bank capital regulation will be complemented by a leverage ratio requirement in 2018…
The leverage ratio sets a minimum ratio of capital to total exposures, regardless of their risk level. It thus reduces the model-based risks of the IRB approach to setting the capital requirement for credit risks and leverage. The relationship between the capital and leverage ratios is complementary. The capital requirement will be determined by either the capital ratio requirement or the leverage ratio requirement depending on which is higher in absolute terms. The proposed minimum limit for the leverage ratio as from 2018 is 3% of Tier 1 capital.[8] Institutions have already started to calculate, report and publish the leverage ratio. All but one were compliant with the limit at the end of 2016, although there was significant heterogeneity among them (see Chart III.3). Following a moderate increase in 2014 and 2015, the sector's leverage ratio fell by 0.5 pp to 7.1% in 2016 (see Chart III.5). The decline was due to growth in total exposures (-0.8 pp), while growth in the sector's capital had a favourable effect (+0.3 pp).

…to which a macroprudential component can be added
According to the ESRB handbook, the minimum leverage ratio requirement, which is analogous to the Pillar 1 capital requirement, can be complemented by a macroprudential component[9] and thus also take capital buffers into account (see Chart III.4). Within the EU, however, this is only applied in the UK.[10] The use of a macroprudential component of the leverage ratio ensures that the role of the leverage ratio as a complementary tool to risk-weighted capital requirements is not weakened when capital buffers are applied.[11]

The aggregate risk weights for exposures under the IRB approach fell, due in part to changes in the composition of bank assets
The aggregate risk weights[12] set by means of internal models (IRB) for CZK 4.1 trillion worth of exposures[13] (i.e. 73% of the sector) fell by

8 According to the EBA proposal (2016): *EBA Report on the Leverage Ratio Requirements under Article 511 of the CRR*.
9 For details see ESRB (2015): *The ESRB Handbook on Operationalising Macro-prudential Policy in the Banking Sector*.
10 For details see BoE (2014) *The Financial Policy Committee's review of the leverage ratio*, http://www.bankofengland.co.uk/financialstability/Documents/fpc/fs_lrr.pdf. Outside the EU, a form of the macroprudential leverage ratio is used in the USA and Switzerland.
11 For details about the role of the leverage ratio, its macroprudential component and its relationship to the capital ratio, see Pfeifer et al. (2016): *The Role of the Leverage Ratio in Capital Regulation of the Banking Sector*, Financial Stability Report 2015/2016.
12 The analysis of risk weights uses data on implicit risk weights. These are calculated as the weighted value of the exposure divided by the initial value of the exposure according to the COREP single European reporting framework.
13 Including CZK 0.8 trillion worth of exposures to the CNB.

1.4 pp to 34.7% in 2016 (see Chart III.5).[14] Roughly one-half of this fall was due to a change in the ratios of the individual exposure categories in banks' assets. In terms of exposure categories, a year-on-year decline in average risk weights was observed for retail exposures (non-SME) secured by property[15] (of 1.5 pp), other non-SME retail exposures (of 0.5 pp) and exposures to institutions (of 3.7 pp) (see Chart III.6). By contrast, the average risk weights for corporate exposures and exposures to central governments and central banks rose slightly (by 0.2 pp in both cases).

In good times, the IRB approach may not capture the level of exposure risk accurately

For exposures under the IRB approach, a long-term favourable economic development may make banks' internal models insufficiently robust due to a low default frequency. It may thus lead to underestimation of banks' actual exposure risk.[16] This effect may currently be occurring in some domestic banks, particularly in the case of retail exposures secured by property. The average and median risks weights for this category of exposures dropped between 2014 Q1 and 2016 Q4 and the difference between the individual banks simultaneously increased (see Chart III.7). Heterogeneity across banks is significant mainly with regard to the fact that the risk level in mortgage portfolios under the IRB approach should be similar.[17] Potentially insufficient creation of capital for mortgage loans may amplify the risks associated with the current developments in the residential property market (see sections 2.2 and 5.3).

The STA approach implies constant risk weights for the individual exposure categories

The aggregate risk weights for exposures worth CZK 1.5 trillion[18] (27% of the sector's exposures) under the standardised approach to setting risk weights (STA) dropped by 4.1 pp to 36.9% in 2016 (see Chart III.5). The risk weights of the individual exposure categories are laid down in a regulation and show hardly any changes.[19] The long-term decline in aggregate risk weights is thus due to growth in the share of exposures to central governments and central banks, whose risk weights are close to zero, and exposures secured by property, whose risk weights are relatively low. The share of corporate and retail exposures, whose risk weights are higher, is conversely falling.

The NPL ratio dropped further and NPL quality improved in 2016

The ratio of non-performing loans (NPLs) to total loans, expressing the quality of banks' loan portfolios, went down by another 0.7 pp in 2016,

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14 In the long term, however, the aggregate risk weights for exposures under the IRB approach remains relatively stable. They have been between 33% and 36% since 2013.
15 These consist almost exclusively of mortgage loans.
16 The risk weights for exposures under the IRB approach should be set so as to reflect the actual level of credit portfolio risk. The aforementioned underestimation of risk is thus reflected in an insufficient risk weight level.
17 The banks and building societies using the IRB approach to set risk weights for retail exposures secured by property are all large and universal mortgage loan providers operating at the national level.
18 Including CZK 0.3 trillion worth of exposures to the CNB.
19 A change may be brought in this area in the future by the introduction of a BIS proposal (*Revisions to the Standardised Approach for credit risk – second consultative document*, December 2015), which should lead to some variability of risk weights in one exposure category under this approach as well.

Aggregate risk weights, the leverage ratio and the size of banks' credit exposures
(%; right-hand scale: CZK trillions)
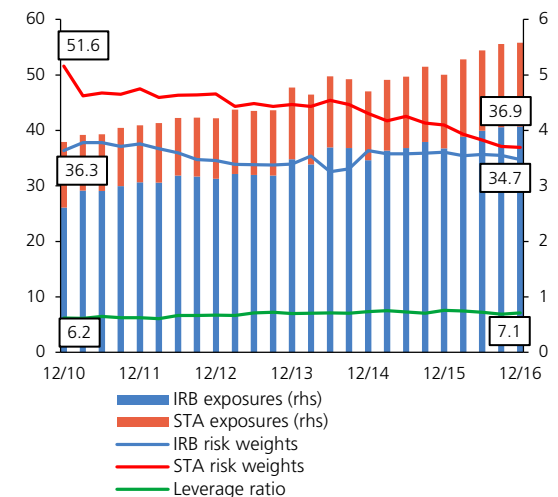
Source: CNB
Note: Data are not available for the Basel III leverage ratio until the start of 2014. Until 2013 (inclusive), the leverage ratio is proxied by a simplified leverage ratio calculated as Tier 1 capital/total assets. In contrast to the Basel III leverage ratio, the simplified leverage ratio does not take into account off-balance-sheet items.

CHART III.6

Average risk weights and the size of the main categories of exposures under the IRB approach
(%; right-hand scale: CZK trillions)
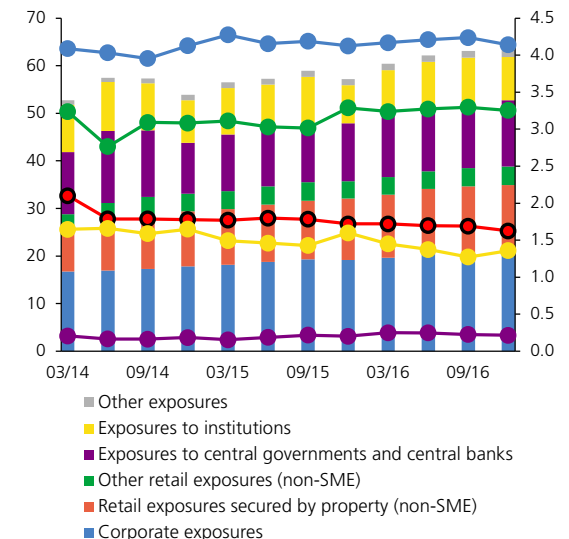
Source: CNB
Note: The points connected by lines denote the size of the risk weights for individual categories of exposures (left-hand scale). The height of the columns denotes the size of the exposure (right-hand scale). The colour coding of the points corresponds to the colour coding of the columns.

CHART III.7

Risk weights by exposure category for banks applying the IRB approach
(%)
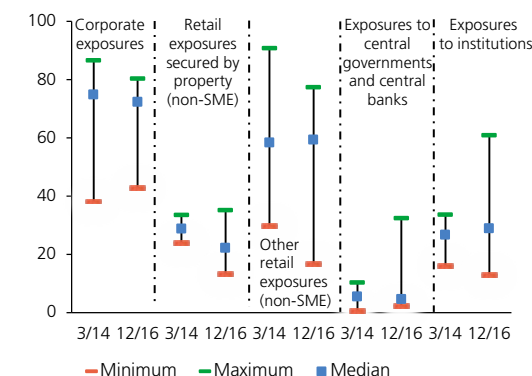
Source: CNB
Note: Nine banks and building societies applying the IRB approach to set risk weights for at least part of their credit portfolios were included in the analysis. Banks that have exposures of less than CZK 1 billion in the given category were excluded.

CHART III.8

NPLs in the Czech banking sector
(client loans; CZK billions; right-hand scale: %)
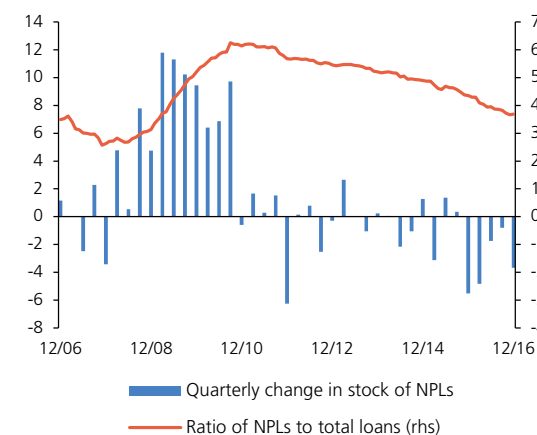
Source: CNB

TABLE III.2

Structure of NPLs
(%)

	NPLs by categorisation		
	Non-standard	Doubtful	Loss
2006	38.0	17.0	45.1
2007	30.6	16.9	52.5
2008	30.9	14.5	54.6
2009	38.5	20.0	41.5
2010	38.0	13.2	48.8
2011	32.3	13.9	53.8
2012	29.4	12.2	58.5
2013	27.5	12.1	60.3
2014	29.0	10.5	60.5
2015	32.9	9.3	57.8
2016	34.6	9.1	56.3

Source: CNB

reaching 3.7% at the year-end (see Chart III.8).[20] Thanks to a positive trend lasting since 2010, the NPL ratio neared the historical low recorded in 2007. The decrease in the ratio was again achieved through a combination of growth in total loans and an absolute decline in NPLs.[21] In the case of resident loans, the NPL ratio dropped by 0.9 pp to 3.2% for households and by 0.5 pp to 4.9% for non-financial corporations. As regards non-resident loans, the NPL ratio decreased by 0.4 pp to 5.5%. The NPL structure also improved again. The ratio of loans in the non-standard category rose at the expense of the ratios in the two worse categories (see Table III.2).

NPL coverage by provisions increased and currently seems sufficient

The overall coverage of NPLs by provisions stood at 56.5% at the end of 2016, up by 1.7 pp year on year (see Chart III.9). As part of a prudent approach to credit risk management, banks should set aside sufficient NPL provisions to cover future total losses on current NPLs. From the financial stability perspective, the amount of provisions should also be sufficient in the event of a substantial worsening of the economic situation. For this reason, a sectoral analysis was conducted to compare the NPL coverage ratio with the current NPL loss rate[22] and the NPL losses expected in the *Adverse Scenario* of the macroprudential stress tests (LGD, see section 4.1). The average NPL coverage ratio was 53% for loans to non-financial corporations and 64% for loans to households at the end of 2016. In both cases, the ratio is sufficient for the current NPL loss rate, which is 28% for loans to non-financial corporations and 38% for loans to households. If the *Adverse Scenario* of the macroprudential stress tests were to materialise, the coverage ratio for loans to households would be sufficient, with the average NPL loss rate rising to 58%. It would only narrowly fail to cover losses on loans to non-financial corporations, where the average NPL loss rate would reach 56%. The switch to the new IFRS 9 standard will probably lead to a one-off increase in provisions (of up to 20% compared to the current situation according to the CNB survey; see section 5.4.2), which may also positively affect the NPL coverage ratio.[23]

The risk of concentration of credit exposures associated with the property market is rising

Loans provided to households for house purchase and loans provided to non-financial corporations engaged in real estate activities[24] rose by CZK 116 billion to CZK 1,344 billion in 2016 (see Chart III.10). Their share

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20 The figure includes both resident and non-resident loans.
21 The drop in NPLs in 2016 was also partly due to write-offs of such loans from banks' balance sheets. However, the supply of new NPLs in 2016, calculated by adjusting for the write-off effect, was lower than in 2015 and 2013 and only slightly higher than in 2014.
22 The NPL loss rate is calculated from the results of a recovery rate survey conducted among the nine systemically most important banks and building societies in March 2017. In this survey, banks state their actual and expected NPL recovery rates broken down into several categories of loans to corporations and households. For the purposes of the sectoral analysis of NPL coverage by provisions, the NPL loss level is calculated as (1 - the recovery rate).
23 Depending on how the one-off increase is distributed between provisions for performing and non-performing loans.
24 This category also includes developers, but excludes the construction industry.

in total loans to the private non-financial sector has increased by 13.4 pp to 58% since the end of 2008. The banking sector's vulnerability given adverse developments in the property market has thus long been rising.[25] The risks associated with the property market and house purchase loans are described in detail in sections 2.2, 2.4, and 5.3.

The profitability of the banking sector remains high
The banking sector turned in a profit of CZK 74.7 billion in 2016, a rise of 12.4% on a year earlier. It was significantly affected by a one-off profit from the sale of a stake in VISA Europe. Adjusted for this transaction[26] the growth amounted to 4.0%.[27] The Czech banking sector has long been profitable and its profitability significantly exceeds the euro area average.[28] RoA was 1.3%, up by 0.1 pp on a year earlier. Despite the broadly positive profitability trend, large differences persist across the groups of banks[29] (see Chart III.11). The profitability of large banks and foreign bank branches was flat. The largest growth in profitability was re-ported by medium-sized banks (of 0.3 pp to 1.7%), followed by small banks (of 0.2 pp to 0.4%). Building societies recorded an increase in RoA, the first in seven years, although this was partly due to an absolute drop in their total assets of 3.2%. The current situation in the building societies sector and its potential risks to financial stability are analysed in Box 1.

BOX 1: THE CURRENT SITUATION IN THE BUILDING SOCIETY SECTOR AND POTENTIAL RISKS TO FINANCIAL STABILITY

In the current market conditions, building societies are becoming less competitive than banks and their market share is shrinking (see Chart III.1 Box). In an environment of very low interest rates, they are unable to respond flexibly to market developments, mainly because of legal restrictions.[30] Low bank mortgage rates

25 In addition, the default rate of non-financial corporations engaged in real estate activities is highly sensitive to the financial cycle (for details see the article *Credit Portfolio Sector Concentration and its Implications for Capital Requirements* in FSR 2014/2015).
26 We expect the gains on realised financial assets to be at the 2015 level.
27 Domestic banks' profit also includes dividends paid by subsidiaries. They totalled CZK 7.7 billion in 2015 and rose markedly to CZK 11.9 billion in 2016. If we also excluded dividend profit from the calculation in addition to the sale of the stake in VISA Europe, the banking sector's profitability would be flat in year-on-year terms.
28 See CNB (2016): *Analyses of the Czech Republic's Current Economic Alignment with the Euro Area*, p. 100.
29 According to the current CNB methodology, banks having total assets of over 10% of the banking sector's total assets are regarded as large banks, banks having total assets of 2%–10% of the banking sector's total assets are regarded as medium-sized banks and banks having total assets of less than 2% of the banking sector's total assets are regarded as small banks.
30 These include a guaranteed deposit rate for six years, a guaranteed interest rate on any future regular loan at the time the building savings contract is signed, and a requirement to invest free (unlent) funds only in mortgage bonds, government bonds, bonds guaranteed by the state and bonds issued by OECD financial institutions or to deposit them at banks.

CHART III.9
Provisions and coverage of NPLs by provisions
(%)
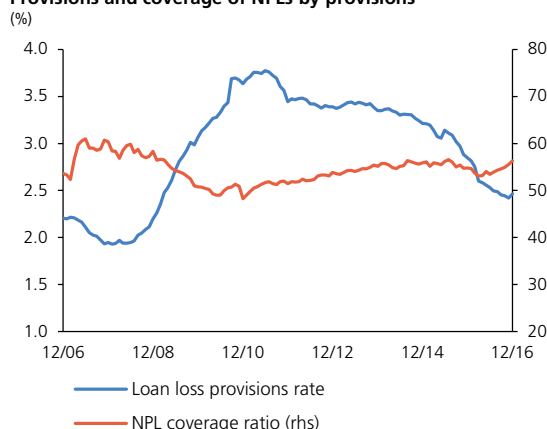
Source: CNB

CHART III.10
Concentration of loan exposures in the real estate sector
(CZK billions; right-hand scale: %)
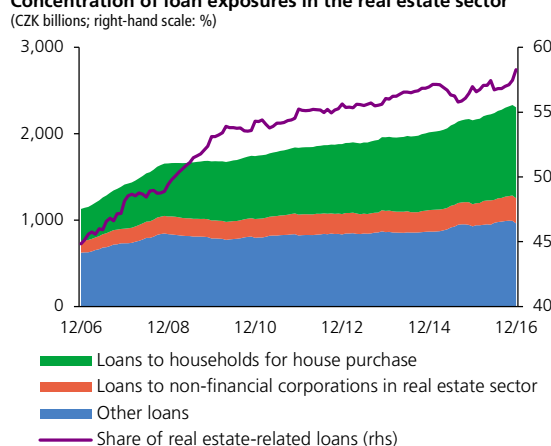
Source: CNB

CHART III.11
Return on assets (RoA)
(%)
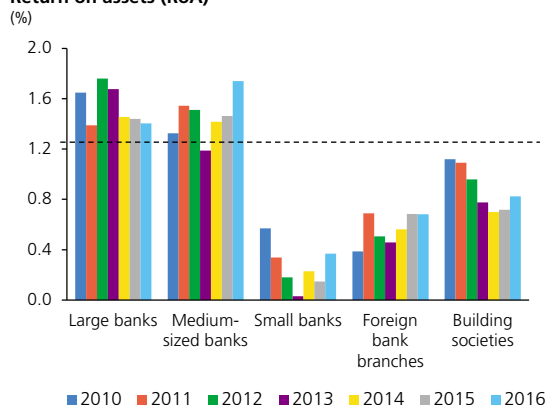
Source: CNB
Note: The classification of banks by asset size relates to the year for which the RoA value is reported. The horizontal line depicts the RoA value for the banking sector as a whole for 2016.

CHART III.1 BOX

Share of building societies in the banking sector
(%)

— BSoc loans and claims/total BS loans and claims
— BSoc assets/total BS assets

Source: CNB
Note: BSoc = building societies, BS = banking sector.
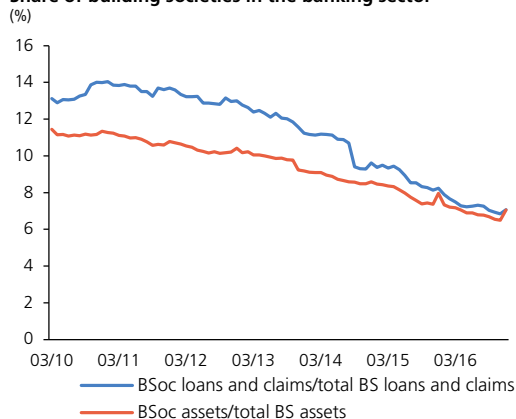
CHART III.2 BOX

Client loans and deposits of building societies
(CZK billions)

■ Other client loans
■ Unsecured regular loans
■ Unsecured bridging loans
■ Mortgage loans (secured by property)
— Deposits

Source: CNB
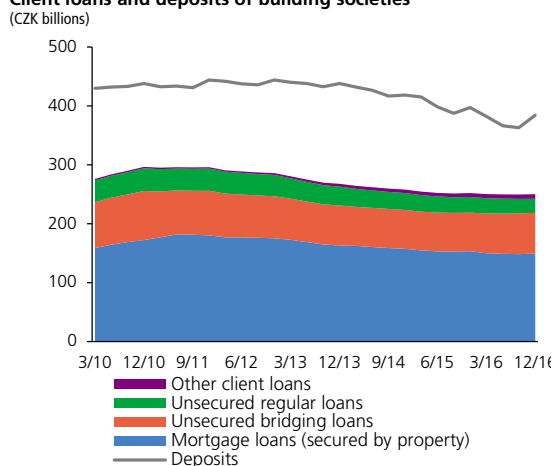
CHART III.3 BOX

Maximum bridging loan provided without property security according to building societies
(CZK thousands)

■ BSoc 1 ■ BSoc 2 ■ BSoc 3 ■ BSoc 4 ■ BSoc 5

Source: Building societies, public sources
Note: BSoc = building society. The solid part depicts the maximum loan amount without a guarantor and property security. The patterned part depicts the maximum loan amount with 1–2 guarantors without property security.
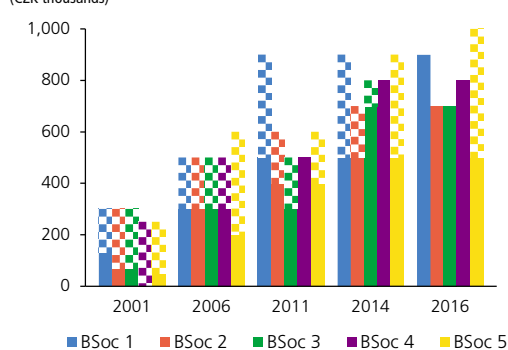
are fostering a drop in demand for regular building society loans and loans secured by property (see Chart III.2 Box). High deposit rates[31] are limiting building societies' ability to compete with banks in rates on secured loans and also reducing their profitability (see Chart III.11).

Building societies are responding to the current market conditions by changing their business strategy towards the provision of loans not secured by property (unsecured loans). These are a credit product with potential for higher interest rate profit but at the same time higher credit risk. The maximum individual unsecured loan amount set in building societies' internal rules has been gradually rising (see Chart III.3 Box). At the same time, the requirements applying to the provision of security by guarantors have been relaxed compared to the past. The predominant form of credit provided is a bridging loan, for which clients are not obliged to prove their ability to save a corresponding amount in the long term before the loan is provided.[32] The risks pertaining to unsecured or bridging loans are not acute. However, this clearly represents a shift towards taking on greater risks.

The rising unsecured loans limits are a potential risk to financial stability. The use of these loans to finance part of the property purchase price in cases where banks do not provide a loan for the entire purchase price due to LTV limits is a source of additional risk. The CNB will therefore closely watch practices in this area and expects building societies' internal credit risk management systems to take sufficient account of the shift towards unsecured loans.

Interest profit and fee and commission profit continue to fall…
Interest profit remains the main component of profit (see Chart III.13). It declined by 0.8% year on year, with interest income falling more than interest costs in absolute terms (see Chart III.12). The ratio of interest profit to total assets is at its lowest level since 2007 (see Chart III.14) despite the positive effect of growth in new loans. The downward trend in fee and commission profit (of 6.5%) is also continuing, reflecting persisting competitive pressure in the loan, deposit and other banking services markets.

…but this fall is being offset by a drop in costs
Banks are maintaining their profit levels with relative cuts in operating costs, aided by low asset impairment expenses. Administrative expenses are increasing over time, but relative to total assets they are at their lowest level since 2007 (see Chart III.14). The cost-to-income ratio

31 The average deposit rate of building societies was 1.53% in December 2016, while that of banks was 0.13%.
32 Long-term saving is one of the characteristic features of the concept of building savings.

dropped by 0.8 pp year on year to 43.5%. The declining asset impairment losses are linked with the favourable phase of the business cycle and a falling NPL ratio (see Chart III.8). At the end of 2009, when they peaked, impairment losses plus provisions accounted for 0.7% of assets, whereas in the same period of 2016 they represented only 0.2% of assets (see Chart III.14).

Risks to profitability are linked with a drop in interest margins…

Interest profit is being adversely affected by a decline in interest margins on new loans observed since 2009 (see Chart III.15). The margin on new loans to households for house purchase was 2.2 pp at the end of 2017 Q1, having risen by 0.1 pp in the first three months of 2017. The margin on new loans to non-financial corporations has stabilised in recent years and stood at 2.2 pp at the end of 2017 Q1. Interest income can be expected to be adversely affected for some time to come by gradual refixation and refinancing of mortgage loans, which will cause the average interest margin on the stock of such loans to move closer to that on new loans, which is significantly lower. The intensity of this effect will depend on the future path of interest rates.[33]

…particularly on consumer credit…

The ratio of interest income from consumer credit to total client interest income rose from 25.1% to 35.7% between 2008 and 2016 (see Chart III.16). This was due to a high margin (10.0 pp) compared to other types of credit and a stable share in the total client loans of slightly above 10% (see Chart III.16). The continuing downward trend in interest margin on consumer credit, which started in 2014 (see Chart III.15), may have an adverse effect on interest income, particularly if it were accompanied by stagnation or only a slight rise in consumer loans.

…and a change in the phase of the business and financial cycle

Risks to profitability are also linked with the business and financial cycle. Any drop in growth of new loans and deterioration in asset quality, coupled with growth in impairment losses in a downward phase of the cycle, could lead to a decrease in profitability and simultaneously in the capital ratio.[34] For this reason, it is appropriate to use the current period of favourable developments associated with high profitability to raise banks' capitalisation.

The liquidity position of banks remains good, but maturity mismatch is widening

The banking sector has long had a good liquidity position. The ratio of quick assets to total assets rose by 2.4 pp year on year to 34.4% at the end of 2016. The ratio of client deposits and loans also remains high, having risen by 1.1 pp to 127.7% year on year. Client deposits and loans continue to be denominated mostly in Czech koruna (88.6% and 80.4% respectively), but the slight upward trend in the share of foreign currency loans continues (0.9 pp year on year, see section 2.3). The Czech banking

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[33] The average refixation period for mortgage rates was five years at the end of 2016 (see Chart II.45). The difference in the average margin on house purchase loans between mid-2012 and the end of 2016 was 1.3 pp.

[34] Due to an increase in the risk weights for NPLs of IRB banks.

CHART III.12

Decomposition of interest profit
(quarterly contributions in CZK billions)

- Interest profit
- Interest income
- Interest costs (rhs)
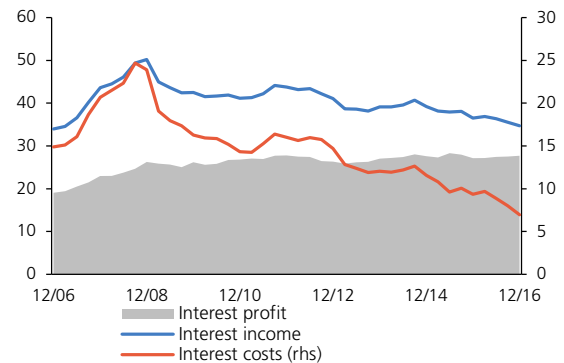
Source: CNB

CHART III.13

Decomposition of return on assets
(%)
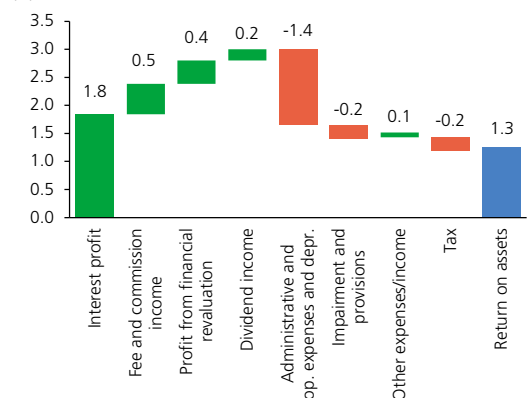
Source: CNB
Note: The given value represents the ratio of the given type of income/expense to the level of assets.

CHART III.14

Volatility of ratios of income and expense items to assets 2007–2016
(%)

— Minimum (2007–2016) — Maximum (2007–2016) ● 2016

Source: CNB
Note: The given value represents the ratio of the given type of income/expense to the level of assets.

Czech banks' interest margins on new loans
(pp)
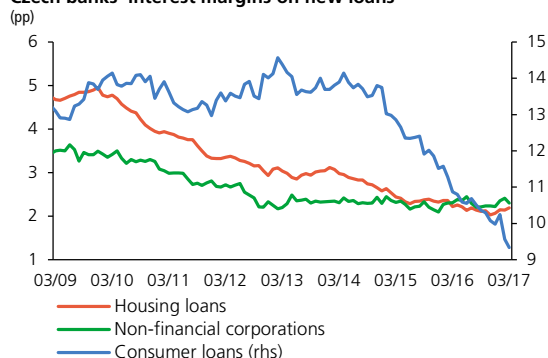
Source: CNB
Note: The margin is calculated as the difference between the average client loan rate for the sector and the average client deposit rate. The non-financial corporations item excludes revolving loans and credit cards.

Shares of individual loan types in total amounts and total interest income
(%; right-hand scale: % in accumulated terms)
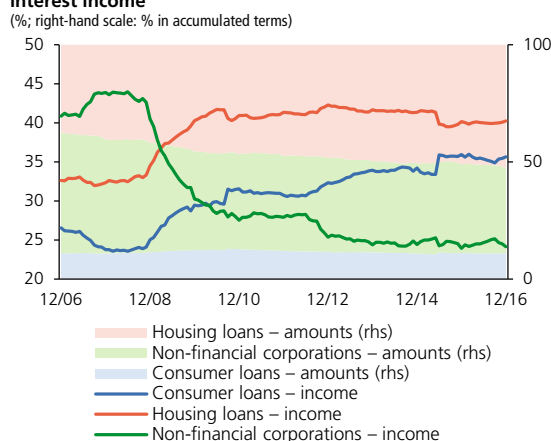
Source: CNB

Developments in the insurance sector
(CZK billions)
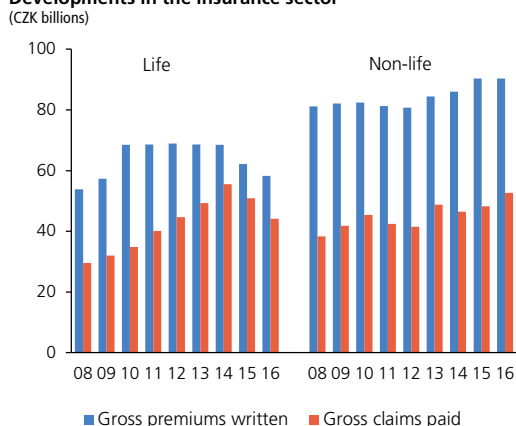
Source: CNB

sector also has a high liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) – see section 4.2 The high ratio of quick assets to total assets is increasing both these indicators. The NSFR is being favourably affected by a high share of retail deposits in liabilities, which are regarded as a stable funding source. Despite the good liquidity position of the domestic banking sector, the ratio of liabilities payable on demand to total liabilities kept rising (by 3.1 pp to 78.6%), as did the ratio of long-term loans with maturity of over five years to total loans (by 0.5 pp year on year to 74.9%).

Tighter prudential rules are leading to changes in the credit union segment.
Act No. 333/2014 Coll. restricts the activities of credit unions with total assets exceeding CZK 5 billion from 1 January 2018. Structural changes are occurring as the date of effect of the relevant section of the law approaches. Creditas, the largest credit union, with total assets representing one-third of the segment, was converted into a bank on 1 January 2017. The rest of the segment is showing significantly riskier credit characteristics (see Table III.3). The CNB has therefore been paying increased attention to credit unions, the risks pertaining to them, and the conversion process.

3.3 INSURANCE COMPANIES

The business structure of the domestic insurance sector was broadly unchanged
The developments seen in 2016 were in line with the trends observed in previous years. Premiums written and claim settlement costs in life insurance declined year on year (by CZK 3.9 billion and CZK 6.8 billion respectively). Gross premiums written in non-life insurance were unchanged from a year earlier, while claim settlement costs rose by CZK 4.5 billion year on year (see Chart III.17). The profitability of the insurance sector went up in year-on-year terms, mainly as a result of an improvement in the technical account for non-life insurance.[35] Life insurance is still insurance companies' main source of profit (see Chart III.18). The structure of insurance companies' investments remains conservative, although the share of Czech government bonds declined in 2016 due to their negative yields.[36] A continuing low-yield environment is leading to a fall in clients' interest in life insurance products with an investment component. Products with guaranteed returns are currently only offered in a variant guaranteeing non-negative returns. Interest in unit-linked life insurance is also falling, albeit at a slower pace than in the case of guaranteed products. Its share in technical provisions for life insurance is thus increasing (see Chart III.18, right-hand scale). By contrast, clients' interest in term life insurance without an investment component is rising.

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35 The improvement in the technical account for non-life insurance, achieved despite flat gross premiums written, was due to the difference between written and earned premiums as well as other factors, such as a decline in the loss ratio (there were no major catastrophic events in 2016), a drop in administrative expenses in non-life insurance and a change in the amount of partial reserves.
36 At the end of 2016, Czech government bond yields were negative for maturities of up to six years (see section 2.1).

The insurance sector remains stable, as confirmed by stress test results

The contribution of the domestic insurance sector to systemic risk in not significant at present.[37] The main sources of risk in non-life insurance include the risk of insufficient premiums due to increased competition (particularly in motor vehicle third party liability insurance) and the risk of growth in damage (as a result of natural disasters, for example). In life insurance, risks associated with the asset side of the balance sheet predominate: the risk of an adverse shock in the form of a fall in investment value and the risk of sustained low investment yields, which would not cover liabilities arising from life insurance. The CNB evaluates domestic insurers' resilience to all these risks in regular stress tests. A joint stress test was conducted by EIOPA, the CNB and the largest domestic insurance companies in 2016. The results[38] showed that the domestic insurance sector has sufficient capital in aggregate terms. Its solvency ratio remained sufficiently high above the 100% regulatory minimum even after the application of shocks in all the stress scenarios considered in the test (see Chart III.19). In 2017, the CNB in partnership with domestic insurance companies is conducting its own stress test based on the *Adverse Scenario* (see section 2.1). The aggregate results will be published on the CNB website in 2017 H2.

3.4 THE NON-BANK FINANCIAL SECTOR EXCLUDING INSURANCE COMPANIES

The importance of institutional investors in households' balance sheets is increasing

The relative share of investment and pension funds in Czech households' balance sheets increased in 2016 (see Chart III.20). On the one hand, this reflects structural changes (general growth in the wealth of Czech households). At the same time, it is due in part to households' efforts to achieve higher returns than those on bank deposits. The aggregate return on investment in collective investment funds was 2.4% in 2016 and the average remuneration of time deposits at banks was 1.2%. However, the above trend is simultaneously associated with increased sensitivity of the value of households' financial assets to financial market developments. Households' investments in domestic investment funds rose by 18.2% year on year to CZK 239 billion and those in foreign investment funds by 4.5% to CZK 136 billion. Households' investments in pension funds also recorded significant growth of CZK 29.7 billion (8.5%) to CZK 381 billion. Households' deposits in the domestic banking sector rose by 8.4%, or CZK 172 billion in absolute terms, to CZK 2,200 billion. Their bank deposits abroad fell by CZK 0.8 billion year on year to CZK 151.7 billion and may have been partly affected by the expected appreciation of the Czech koruna after the exit from the exchange rate commitment. Investments in insurance products returned to absolute growth (of 2.2% to CZK 322 billion) following two years of decline.

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37 See the article Dvořák, Hausenblas, Gronychová and Komárková (2016): *Could the Czech Insurance Sector Be a Source of Systemic Risk?* in FSR 2015/2016.
38 Detailed results are published on the CNB website:
http://www.cnb.cz/en/financial_stability/stress_testing/stress_testing_insurance_sector.html

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Selected structural indicators of the credit union segment
(%; credit unions active as of 31 December 2016)

	4Q 2015		4Q 2016			
	CU	Banks	CUs with assets < CZK 5 billion	CUs with assets > CZK 5 billion	Convert ed CUs as of 1 Jan. 2017	Banks
Assets (CZK billions)	32.3	5,461	11.8	10.6	11.7	5,961
Client NPL ratio	27.5	5.9	30.2	30.6	12.3	4.9
Quick assets/total assets	16.9	29.3	21.9	6.0	16.0	25.8
Coverage of NPLs by provisions i	18.2	46.3	15.4	14.2	28.3	49.5
Tier 1 capital ratio	15.1	17.9	21.4	14.9	13.3	17.9
RoE	-0.4	16.2	-2.5	1.6	-1.2	17.5

Source: CNB
Note: The accounting period is not unified across the credit union segment, so the relevant data were annualised for some institutions. Liquid assets are assets pursuant to Article 416. Any inconsistency with figures in other parts of this section is linked with different approaches to the inclusion of the figures for Czech Export Bank and the Czech-Moravian Guarantee and Development Bank.

Profitability of insurance companies
(% of assets; right-hand scale: % of total LI TPs)
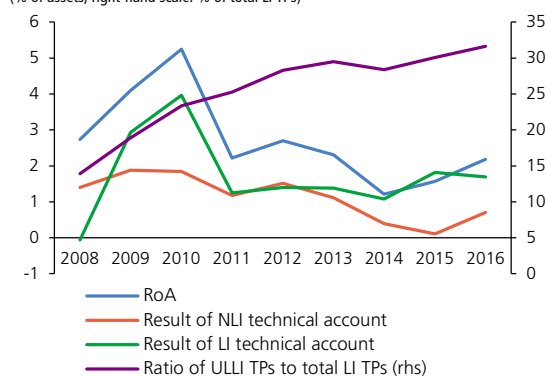
Source: CNB
Note: LI = life insurance, NLI = non-life insurance, ULLI = unit-linked life insurance, TPs = technical provisions.

Solvency ratio for the adverse development scenarios
(%)
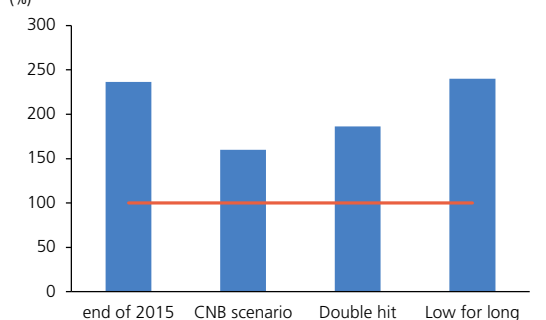
Source: CNB
Note: The 100% value represents regulatory minimum.

CHART III.20

Structure of the main financial products in households' assets
(%)

- Funds invested in domestic insurance products
- Shares in domestic pension funds
- Shares in foreign IFs
- Shares in domestic IFs
- Bank deposits – foreign banks
- Bank deposits – domestic banks (rhs)
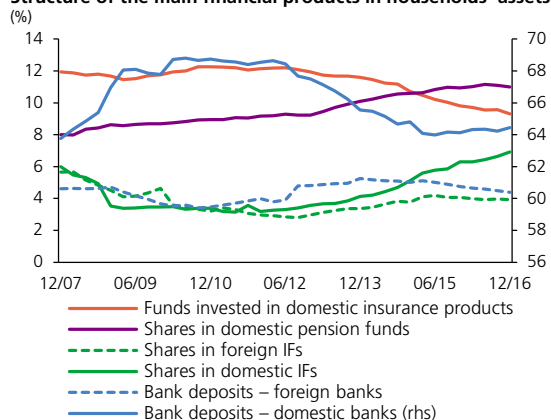
Source: CNB
Note: Holdings of financial products of foreign insurance companies and pension funds were negligible and are therefore not depicted. The main financial products comprise bank deposits, shares in investment and pension funds and life and non-life insurance claims on insurance companies.

CHART III.21

Comparison of the ratio of investment fund financial assets to bank financial assets
(% of banking sector financial assets)

- Interquartile range
- Median
- CZ
- DE
- SK
- PL
- AT
- HU
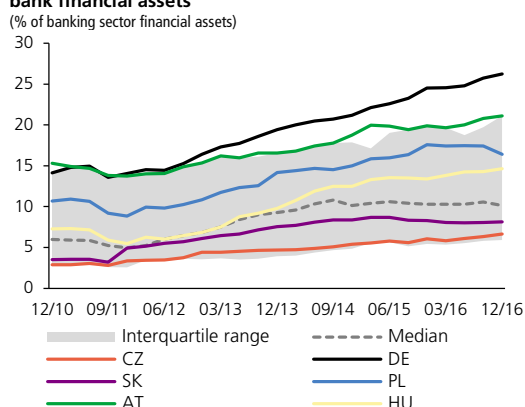
Source: ECB, CNB calculation
Note: The grey area represents the interquartile range from a sample of 23 EU countries; EU; BG, DK, HR, SE and UK are excluded due to data unavailability.

CHART III.22

Liquidity mismatch and share of credit sources of investment funds
(% of assets)

- Share of quick assets
- Share of credit sources (rhs)
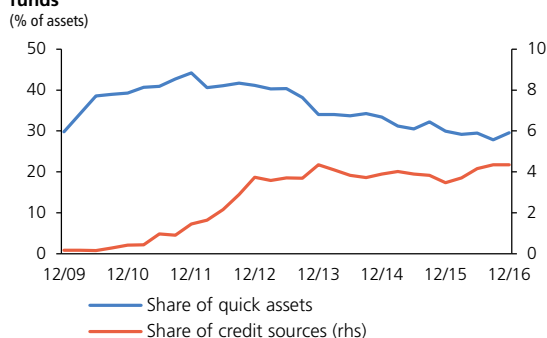
Source: CNB
Note: Quick assets comprise cash, claims (including bank deposits) payable on demand and government bonds. The share of quick assets relates to collective investment funds while the share of credit sources relates to all investment funds

Assets managed by domestic investment funds are increasing

The assets of domestic investment funds rose by 18.4% in 2016, to CZK 401.7 billion. This is in line with the growth rate recorded in the previous years (16.5% in 2015 and 18.8% in 2014). Investment funds were thus the fastest growing segment of the domestic financial sector in 2016 (see Chart III.1). Despite the strong growth, however, domestic investment funds remain a less significant segment compared to other countries (see Chart III.21). New purchases of investment fund units (particularly by households and non-residents) accounted for 92% of the year-on-year growth in assets, and growth in the value of the existing units for about 8%. As regards the structure of assets, the relative share of domestic and foreign shares, equity and other investment fund shares increased (see Chart II.17). Some change in trend was observed in the first two months of 2017, when bank deposits in investment funds' assets rose by CZK 17.5 billion, while foreign currency investments dropped by CZK 6 billion. This partially reflected the expected appreciation of the Czech koruna after the exit from the exchange rate commitment.

Investment funds are not increasing liquidity mismatch or the share of external resources

Investment funds are exposed to liquidity mismatch, whereby less liquid assets are financed by highly liquid investor shares.[39] In the event of growth in requests by investors to exit funds, this generates a risk of sell-offs of less liquid assets and a drop in their prices, which would potentially have systemic consequences. Fund exit risk is not material for financial stability in the Czech Republic at present. However, the share of quick assets of investment funds is falling steadily and in 2016 dropped below 30% for the first time since 2008. This is due mainly to efforts to achieve higher returns on assets in a low yield environment even at the cost of lower asset liquidity. The possible liquidity mismatch risks may be exacerbated by credit financing of investment funds (and thus growth in funds' leverage). However, the share of these resources does not exceed 5% of assets in the Czech Republic (see Chart III.22).

The importance of pension funds continues to grow

The total assets administered by pension management companies (PMCs) continue to grow (see Chart III.23) despite a year-on-year drop in the number of planholders of 2.3% to 4.5 million. The upward trend in the share of clients with employer contributions continued. This share stood at 28.8% at the end of 2016, compared to 22.8% in March 2013. Average contributions from planholders and employers also increased (see Chart III.24). However, they are still relatively low given the ratio of the pension from the first pillar to the net average wage (64% in 2014). The upward trend in deposits and assets in the sector is therefore likely to continue.

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39 Investors' shares are liquid in open-end investment funds, where the fund is obliged to pay the investor an amount equal to the current value of his share on request. Assets in open-end investment funds account for more than 80% of the segment's assets in the Czech Republic.

The market risks for PMCs are increasing as savings in transformed funds[40] guaranteeing non-negative returns rise. Any adverse market developments may give rise to a need to cover larger losses amount.

The sensitivity of pension companies to Czech government bond yields is increasing
Transformed funds naturally focus on bonds with low credit and exchange rate risk. The concentration of koruna government bonds in their portfolios rose further in 2016 (to CZK 278.7 billion at the year-end, which represents 72.6% of total assets) and their average duration also lengthened (from 4.3 to 4.7 years). In the event of a jump in yields, revaluation of this portfolio could lead to substantial market losses and require a top-up of PMCs' capital. The impact and the probability of materialisation of this scenario increased year on year (see the stress tests in section 4.1). The scenario of a sharp decline in the prices of Czech government bonds could materialise in the event of a mass outflow of non-residents from the koruna asset market (see section 2.1). The amount and share of Czech government bonds in participation funds' balance sheets are considerably lower and their duration is markedly shorter (1.8 years for obligatory conservative participation funds and 2.0 years for other participation funds). Other participation funds are more exposed to exchange rate risk, as they already hold more than 24% of their assets in non-resident foreign-currency units and shares.

In addition to higher risk of asset revaluation, the year-on-year drop in resilience of PMCs is due to relatively lower capitalisation
While PMCs' capital grew by 1.2% year on year in 2016 (from CZK 8.8 billion to CZK 8.9 billion), the value of the assets in their transformed funds rose by 6.8%. The growing amount of assets and slightly riskier asset structure in terms of capital were reflected in an 8.1% rise in PMCs' capital requirement. PMCs' capital surplus thus declined year on year given the amount of assets in transformed funds, for which the companies guarantee non-zero returns. This is reducing PMCs' resilience to adverse financial market developments, as reflected by higher capital injections in this year's round of stress tests.

Growth in yields is favourable from the long-term perspective
In the event of highly adverse market developments, the obligation to top up transformed funds' resources represents a substantial burden on PMCs and their owners. When the value of the transformed funds' assets rises again, the PMC may withdraw the injected funds. In the longer run, growth in yields would benefit both fund clients and PMCs, as it would enable them to achieve higher returns on new investments.

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40 Transformed funds account for 95.5% of the total assets of funds administered by PMCs. Participation funds, which account for the remaining 4.5% of the sector, do not offer a statutory guarantee of non-negative returns, but a number of companies provide such a guarantee at their own initiative if certain conditions are met.

CHART III.23

Placement of pension fund assets
(CZK billions)
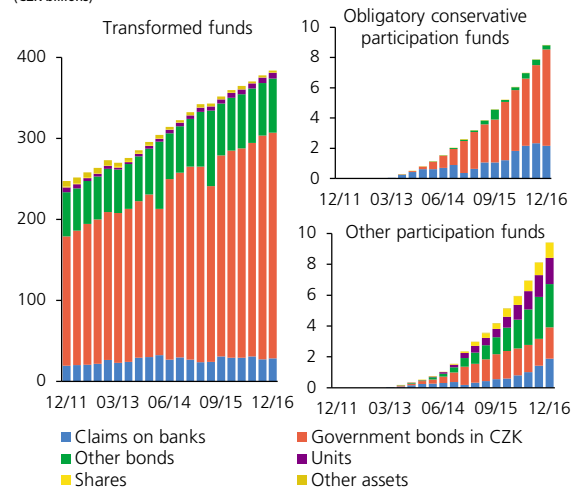
Source: CNB
Note: 3.98 million (4.26 million) transformed fund participants, 0.22 million (0.15 million) obligatory conservative participation fund participants and 0.32 million (0.22 million) other participation fund participants were registered as of the end of 2016 (2015).

CHART III.24

Average contributions and rates of return on assets in pension funds
(CZK monthly)
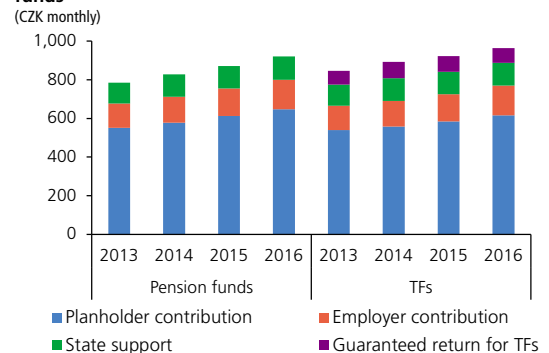
Source: CNB
Note: Guaranteed return is the amount credited to transformed funds planholders. The actual rate of return may be higher. The figure for the entire sector does not contain this item, because participation funds do not provide guarantees by law.

CHART III.25

3M default rate on loans provided by credit institutions
(%)
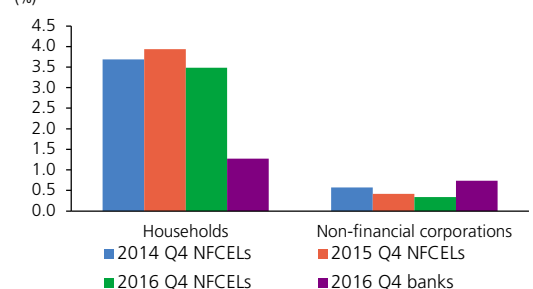
Source: CBCB, CNCB, SOLUS, CNB
Note: The default rate on loans provided to households by NFCELs is calculated as the average of the data from the NRCI and SOLUS. Only the NRCI is used for loans to non-financial corporations. Loans for consumption in the case of households.

CHART III.26

Loans provided by non-bank financial corporations engaged in lending
(CZK billions; right-hand scale in %)

Other loans
Consumer loans to households
Loans to non-financial corporations
Market share of NFCELs – consumer loans (rhs)
Market share of NFCELs – loans to NFCs (rhs)
NFCELs independent of bank group – market share (rhs)
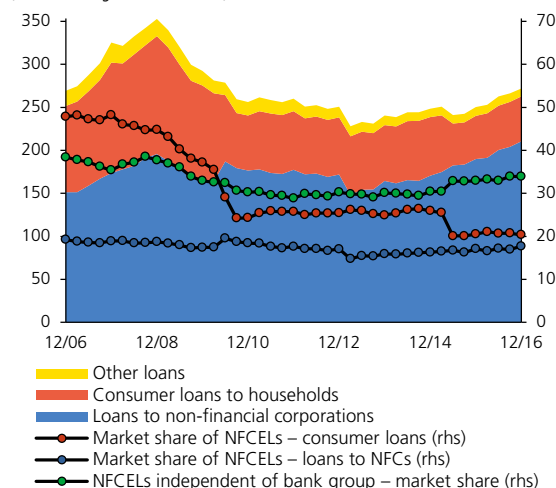
Source: CNB
Note: Market share of NFCELs in total loans provided to residents by banks and NFCELs combined. The market share of independent NFCELs relates solely to loans to residents provided by all NFCELs.

CHART III.27

Share of exposures to domestic financial counterparties
(% financial assets and liabilities of segments)

Exposures to OFIs
Exposures to IPFCs
Exposures to insurance comp.
Exposures to banks
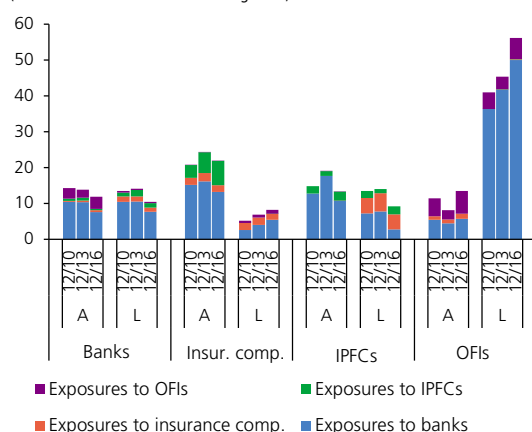
Source: CNB
Note: A = assets, L = liabilities. IPFCs = investment and pension funds and companies. The segment of other financial intermediaries (OFIs) comprises NFCELs and non-bank security dealers. Year-end values.

The market share of non-bank intermediaries is stable and non-bank credit to non-financial corporations continues to rise

The share of non-bank financial corporations engaged in lending (NFCELs) in the credit market has been relatively stable since 2010.[41] It was 17.7% for loans to non-financial corporations and around 20% for loans to households for consumption at the end of 2016 (see Chart III.26). The favourable economic developments in 2016 were reflected in year-on-year growth in loans provided to non-financial corporations of 10.8% (CZK 20.6 billion), which is above the growth rate of comparable bank loans (6% growth). Most of the non-bank loans to non-financial corporations were loans from leasing and factoring companies (87% and 8% of loans respectively). Loans to households for consumption amounted to CZK 52.2 billion (year-on-year growth of CZK 2 billion or 4.1%). Here too, leasing loans predominate (58%). NFCELs' credit risk for household loans remains similar as in previous years, but the default rate is higher at the aggregate level than in the case of banks (see Chart III.25). The default rate of loans to non-financial corporations is lower than in the case of banks, partly due to the secured nature of leasing contracts.

3.5 INTERCONNECTEDNESS OF THE FINANCIAL SECTOR

Common exposures of financial market segments could enhance the systemic impact of adverse shocks

The existence of common exposures is giving rise to a risk of potential adverse shocks having a simultaneous impact on multiple segments of the financial sector. This is resulting in growth of the systemic impacts of such shocks. Czech government bonds in the Czech Republic constitute a common exposure. Their interest rate risk is further increased by the significant share of Czech government bonds held by non-residents (see section 2.1). In the event of a sudden exodus of non-residents, a fall in government bond prices might have an adverse impact on the balance sheets of all domestic institutional investors, which could temporarily weaken the domestic financial system as a whole. In the medium term, however, growth in yields would positively affect institutional investors' profitability. Nevertheless, the relative importance of Czech government bonds in domestic financial institutions' balance sheets is decreasing (see Chart II.17).

The interconnectedness of domestic financial institutions' balance sheets is not increasing…

As regards balance-sheet interconnectedness, the segments of the financial sector[42] are interconnected through mutual exposures in the form of deposits, loans, ownership interests and other instruments. A strengthening of balance-sheet interconnectedness in the financial sector

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41 The drop in the market share of loans to households for consumption in 2015 was due to the conversion of one provider into a foreign bank branch.

42 The analysis of interconnectedness covers banks, insurance companies, pension funds investment companies, investment funds, pension management companies and other financial intermediaries (mainly NFCELs and non-bank security dealers). Other segments of the domestic financial sector (the central bank, captive financial institutions and financial auxiliaries) are not included, as by nature they are not entities through which a financial shock could be transmitted.

could intensify the structural component of systemic risk and lead to an increased risk of the emergence and spread of financial distress across segments. However, the balance-sheet interconnectedness of the main segments of the domestic financial sector has not been increasing in recent years (see Chart III.27).

…with domestic banks being the main component of balance-sheet interconnectedness

Domestic banks are the main domestic financial counterparties for most segments of the Czech financial sector. From the asset perspective, this corresponds to the natural need of financial institutions to hold a certain amount of assets in liquid form. On the liability side, it reflects the position of domestic banks as an important source of both debt and equity financing of other financial entities within banking groups. Banks are an important source of financing for other financial intermediaries (OFIs, mostly NFCELs) mainly through long-term loans (32% of all OFIs' financial liabilities). However, the relative importance of these exposures to OFIs in banks' assets is small (only 2% of banks' financial assets). Besides interconnectedness through banks, insurance companies' holdings in domestic investment funds are important. However, with the exception of OFIs, the share of domestic financial counterparties in the total financial assets and liabilities of the individual segments does not exceed 25% (see Chart III.27). This reduces the risk of adverse shocks spreading across the financial sector.

The interconnectedness of domestic banking groups was unchanged…

The structure of the interconnectedness of domestic banking groups continued to follow the same trend as in previous years. Banks strengthened their position of net creditor of their domestic groups (see Chart III.28). Claims on controlled entities rose by CZK 17 billion to CZK 135 billion at the end of 2016. Within their banking groups, the largest banks are in a creditor position vis-à-vis NFCELs in particular. Claims on NFCELs increased by about CZK 4 billion year on year, accounting for 72.9% of total claims on controlled entities. Liabilities, consisting mainly of excess liquidity from building society subsidiaries, dropped by CZK 22 billion to CZK 66 billion.

…and the net debtor position of the banking sector vis-à-vis non-residents strengthened further

The overall debtor position of the largest domestic banks vis-à-vis foreign parent companies grew by CZK 33 billion year on year to CZK 100 billion (see Chart III.29). It thus contributed to a strengthening of the net debtor position of the banking sector as a whole, which reached CZK 372 billion. However, this was due mostly to growth in deposits of non-residents outside banking groups in domestic banks connected with expectations of appreciation of the koruna after the exit from the exchange rate commitment (see section 2.1). Domestic banks placed these deposits (excess liquidity) with the CNB, so the observed developments do not give rise to systemic risks.

CHART III.28

Credit interconnectedness in domestic bank groups
(% of regulatory capital of domestic parent banks)
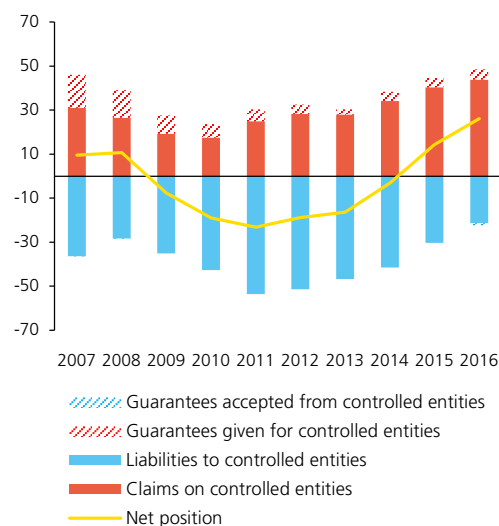
Guarantees accepted from controlled entities
Guarantees given for controlled entities
Liabilities to controlled entities
Claims on controlled entities
Net position

Source: Obligatory information to be disclosed pursuant to Decree No. 123/2007 and Decree No. 163/2014
Note: The chart depicts the aggregate credit interconnectedness of the largest domestic banks, i.e. Česká spořitelna, ČSOB, Komerční banka and Raiffeisenbank. UniCredit Bank is included only in the periods when it controlled entities.

CHART III.29

Credit interconnectedness vis-à-vis non-residents
(CZK billions)
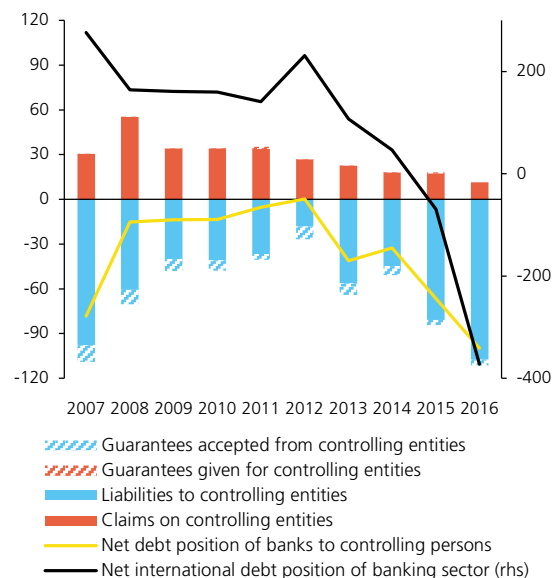
Guarantees accepted from controlling entities
Guarantees given for controlling entities
Liabilities to controlling entities
Claims on controlling entities
Net debt position of banks to controlling persons
Net international debt position of banking sector (rhs)

Source: Obligatory information to be disclosed pursuant to Decree No. 123/2007 and Decree No. 163/2014; banks' annual reports; CNB
Note: The chart depicts the aggregate credit interconnectedness of the five largest domestic banks vis-à-vis their parent companies. The net debt position of the banking sector represents the overall net position of all banks vis-à-vis all non-residents excluding shares and other equity.

CHART IV.1 BOX

Adverse scenarios in Financial Stability Reports 2010–2017
(change in real GDP; year-on-year in %)

Past GDP growth	2010Q1
2011Q1	2012Q1
2013Q1	2014Q1
2015Q1	2016Q1
2016Q4	
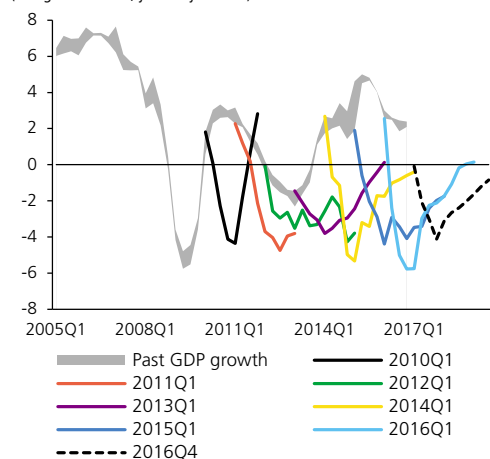
Source: CNB
Note: The 2010 and 2011 tests had a two-year horizon. Since 2012 the tests have had a three-year horizon. The grey area indicates the range of data revisions.

CHART IV.2 BOX

GDP growth during banking crises
(%)

Interquartile range (banking crises in OECD countries)

Banking crises in OECD countries (median 1980–2012)

Adverse Scenario (median FSR 2010–2017)
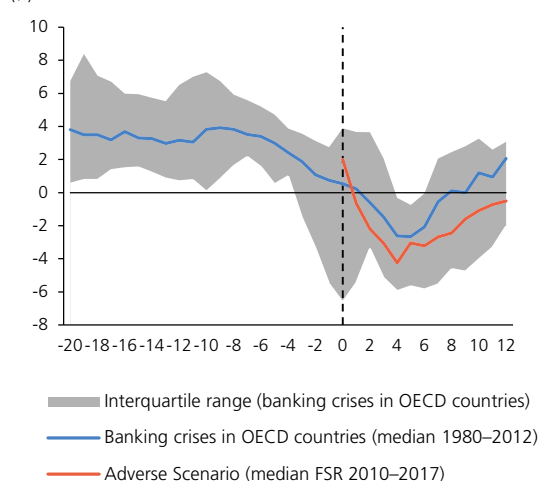
Source: CNB
Note: The vertical line separates the pre-crisis period and shows the start of the simulation of the *Adverse Scenario*. The figures on the horizontal axis represent the quarters before (-) and after (+) the onset of the crisis or since the start of the simulation. The data for OECD countries are taken from Drehman, M. and Juselius, K. (2013): *Evaluating early warning indicators of banking crises: Satisfying policy requirements*, BIS Working Papers 421.

4 STRESS TESTS

4.1 SOLVENCY STRESS TESTS OF BANKS AND PENSION MANAGEMENT COMPANIES

The stress tests demonstrate that the banking sector is highly resilient to the chosen adverse scenarios. Banks have a large enough capital buffer to absorb adverse shocks and maintain their overall capital ratio sufficiently above the regulatory threshold of 8% even under a very adverse scenario. The pension management company sector has long been sensitive to interest rate volatility. A decline in prices of Czech government bonds could adversely affect its solvency.

The stress tests are based on the *Adverse Scenario*, which has been extended to include other sensitivity analyses

The resilience of banks and pension management companies was tested in macro stress tests using a *Baseline Scenario* for the most probable future developments and a hypothetical *Adverse Scenario* (see Box 2 for the approach to setting it). The latter assumes a strong and long-lasting decline in economic activity in the Czech Republic accompanied by a fall of the economy into deflation (see section 2.1). The development represented by the *Adverse Scenario* is extended to include other sensitivity analyses that amplify its impacts and thus enable the sectors' resilience to relevant risks to be assessed.

BOX 2: WHEN SETTING UP ADVERSE SCENARIOS, THE CNB TAKES INTO ACCOUNT HISTORICAL EXPERIENCE AND THE BUSINESS CYCLE

The stress test scenarios are designed using the CNB's official prediction model supplemented with an estimate of the evolution of some additional variables not directly generated by the model (satellite models). An *Adverse Scenario* is constructed on the basis of the identification of risks to the Czech economy in the near future. This scenario should be severe but plausible.[1]

The CNB does not set the strength of the shocks at unrealistically high levels. It uses historical experience, especially the GDP data for 2008–2009 (see Chart IV.1 Box) and developments during banking crises in other OECD countries (see Chart IV.2 Box). The CNB does not intend to set the severity of the scenario mechanically according to the distribution quantile of the historical values of the variables used. Such an approach would

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1 Breuer, T., Jandacka, M., Rheinberger, K., and Summer, M. (2009): *How to Find Plausible, Severe and Useful Stress Scenarios*, International Journal of Central Banking 5(3), pp. 205–224.

ignore the CNB's forward-looking approach, the nature of the individual risks and the fact that it is difficult to estimate the quantiles of the distribution with sufficient accuracy. When setting the severity of adverse scenarios, the CNB respects the need for a countercyclical approach. It takes into account the extent of the risks identified (such as the estimated degree of property price overvaluation) and the current cyclical position of the economy. The CNB uses more severe scenarios at times of economic growth than in periods of recession.[2] The estimated phase of the financial cycle is reflected in the degree of stress in the same way. This approach results in a stress scenario in which GDP growth falls towards the lows historically observed in the Czech Republic and other relevant economies (see Charts IV.1 Box and IV.2 Box).

The need to take the cycle into account is due to the fact that when the economy has been showing favourable developments for a time, optimistic expectations grow and banks and their clients consequently start to be willing to take on greater risks. This can be reflected in excessive loan growth, overvaluation of some assets and the creation of macroeconomic imbalances. Some firms and households may increase their debt to a level that is inconsistent with their incomes and their ability to create buffers for worse times. Against this background, risks to financial stability may, after a while, build up unobserved in the system.

The stress test methodology was refined by extending the model simulating Czech yields

The yields entering the stress tests are now based on an extended methodological framework presented in a thematic article[3] in this Report. The new method[4] decomposes the Czech government bond yield curve and the koruna interest rate swap rate curve into its components. These reflect various factors determining the shape of the yield curve: (i) expectations about future macroeconomic developments, (ii) the related uncertainty, (iii) the risk of sovereign default and (iv) investors' portfolio allocation decisions. The components corresponding to these factors are called the risk-neutral yield, the term premium, the credit risk

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2 A countercyclical aspect is used, for example, by the Federal Reserve, whose unemployment scenario assumes an increase of 4 pp, but at least to 10% (see Edge, R. and Lehnert, A. (2016): *Recent Experience with Supervisory Stress Testing in the United States*, Stress Testing and Macroprudential Regulation: A Transatlantic Assessment, CEPR Press). The ECB uses a similar procedure where a stricter baseline scenario results in a more moderate adverse scenario.

3 See the thematic article Decomposition of the Czech Government Bond Yield Curve in this Report.

4 The affine model and a comparison of Czech government bond yields, interest rate swap rates and credit default swap rates are used to decompose the yield curve. The Nelson-Siegel function and a dynamic factor model are used to simulate the evolution of the components. For details see the thematic article Decomposition of the Czech Government Bond Yield Curve in this Report.

CHART IV.1

5Y yields in the *Baseline Scenario*
(%)
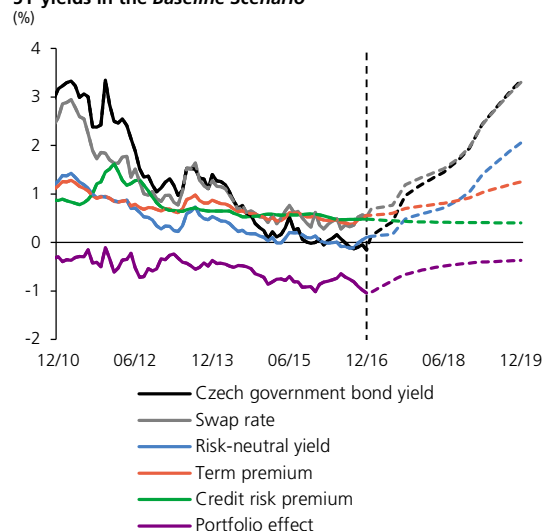
Source: CNB
Note: The vertical line separates the historical (solid line) and simulated (dashed line) values.

CHART IV.2

5Y yields in the *Adverse Scenario*
(%)

Source: CNB
Note: The vertical line separates the historical (solid line) and simulated (dashed line) values.

TABLE IV.1

Key variables in the individual scenarios
(averages for given years)

	Actual value	Baseline Scenario			Adverse Scenario		
	2016	2017	2018	2019	2017	2018	2019
Macroeconomic variables							
GDP (y-o-y %)	2.4	2.8	2.8	3.5	-2.3	-2.5	-1.1
Inflation (%)	0.7	2.4	2.2	2.0	1.0	-2.4	-0.2
Unemployment (%)	4.1	3.7	3.6	3.4	4.8	6.9	9.0
Nominal wage growth (%)	4.3	5.3	5.1	4.9	-2.1	-7.2	-0.6
Effective GDP growth in euro area (%)	2.1	1.6	1.9	1.9	0.0	-1.2	-0.7
Credit growth (%)							
Total	6.3	7.1	7.4	8.3	2.2	-2.6	-3.4
Non-financial corp.	6.8	6.9	8.3	9.6	0.1	-6.4	-6.1
Households	7.3	7.9	7.8	8.2	3.9	-0.1	-1.9
Default rate (PD, %)							
Non-financial corp.	1.8	1.8	1.9	1.9	4.7	5.6	5.5
Loans for house purchase	1.7	1.6	1.7	1.8	3.7	4.2	4.6
Consumer credit	4.9	5.5	6.0	6.5	9.8	11.1	11.5
Loss given default (LGD, %)							
Non-financial corp.	45	45	45	45	55	56	54
Loans for house purchase	22	22	22	22	28	44	53
Consumer credit	55	55	55	55	59	67	75
Asset markets (%)							
3M PRIBOR	0.3	0.5	1.1	2.4	0.3	0.3	0.3
5Y yield	-0.1	0.7	1.6	2.9	1.6	2.9	3.3
3M EURIBOR	-0.3	-0.3	-0.2	0.0	-0.3	-0.2	0.0
5Y EUR yield	-0.6	-0.5	-0.4	-0.2	-0.3	0.2	0.2
Change in residential property prices	10.1	14.5	11.1	8.7	-1.2	-15.2	-8.3
Change in share prices	-3.6		-5.0			-34.0	
Banks' earnings							
Adjusted operating profit (y-o-y %)	-0.2	-1.8	0.7	0.4	-11.7	-20.5	-27.3

Source: CNB, BRCI

premium and the portfolio effect (see Charts IV.1 and IV.2). An estimate of the historical relationship between these components and the variables entering the CNB's scenarios is then modelled. On the basis of this estimate and some expert inputs, the paths of the individual components consistent with the *Baseline Scenario* and the *Adverse Scenario* are simulated. Finally, the simulation of the components is used to back-derive the scenario for Czech government bond yields (the sum of all four components) and swap rates (the sum of the risk-neutral yield and the term premium).

The *Baseline Scenario* assumes a rise in yields…
This year's *Baseline Scenario* involves an increase in the risk-neutral yield in line with the rise in PRIBOR rates (see section 2.1). The exit from a narrow band of low yields also results in greater uncertainty about the fut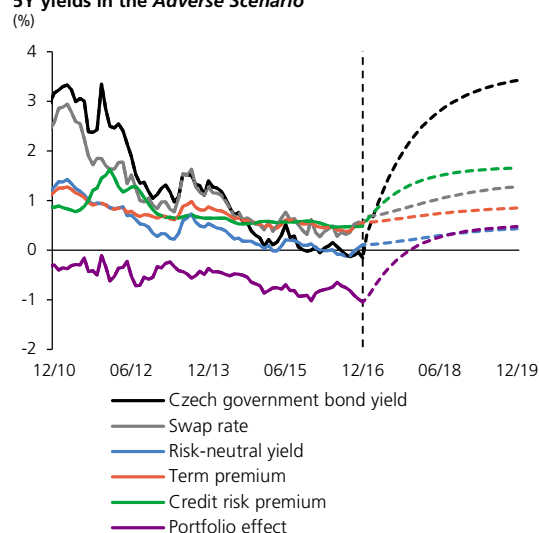ure interest rate path. This is reflected in an increase in the term premium. These two components cause Czech government bond yields and swap rates to rise (see Chart IV.1). Czech government bond yields continue to be affected by the credit risk premium, which remains low in the *Baseline Scenario*. They are also affected by the portfolio effect, which increases (becomes less negative) in the scenario. This is consistent with a gradual decrease in the amount of Czech government bonds held by non-residents following the exit from the exchange rate commitment. The negative gap between government bond yields and the swap rate thus closes gradually over the scenario horizon.

…the *Adverse Scenario* also assumes a rise in yields, but for different reasons
In the *Adverse Scenario*, the return to recession results in a smaller increase in the risk-neutral yield and the term premium than in the *Baseline Scenario* (see Chart IV.2). The swap rate, which is the sum of these two components, thus rises only slightly. By contrast, the Czech government bond yield rises more sharply in the *Adverse Scenario*. This is due to a concurrent rise in the credit risk premium (connected with a renewed escalation of the EU debt crisis) and the portfolio effect, which reflects a mass outflow of foreign investors from the Czech government bond market as a result of a general increase in financial market uncertainty.[5] At the three-year horizon, the five-year Czech government bond yield thus exceeds 3% in both scenarios. However, the scenarios differ in both the speed and the causes of the increase.

The bank stress test methodology was otherwise unchanged
The bank stress tests saw no other major methodological changes. As usual, the test parameters were refined using satellite models, which were re-estimated using the most recent time series. Unlike in the

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5 In the *Baseline Scenario*, foreign investors reduce their holdings of Czech government bonds gradually, in line with the maturity of the bonds held. A substantial proportion of investors thus wait for the principal to be repaid instead of selling the bonds. The *Adverse Scenario*, by contrast, assumes that foreign investors are unwilling to wait to make speculative profit. This leads to a sell-off of bonds, which can lead to a potentially significant drop in their value on a market with limited liquidity.

previous Report, the banking sector tests were performed on data as of the end of 2016 Q4.[6]

In the *Baseline Scenario* credit risks stagnate and the sector's profitability continues to decline

Stress tests are traditionally one of the most important tools for assessing the resilience of the banking sector to potential risks to the stability of the Czech financial sector. Particular attention is paid to credit risk, which has long been the most important risk in the Czech banking sector. The evolution of credit risk is closely linked with developments in the corporate and household sectors. The continuing economic recovery is reflected in the *Baseline Scenario* in a greater ability of corporations and households to repay their debts, i.e. a lower level of credit risk (see sections 2.2 and 2.3). The default rate – a key indicator of credit risk – remains low in both the non-financial corporations and household sectors (see Table IV.1). The persisting environment of low interest rates reduces banks' traditional interest income. Given the expected developments, RoA is expected to fall from 1.2% to 1.1% in 2019 in the *Baseline Scenario*.[7]

The banking sector remains very well capitalised in the *Baseline Scenario*

Despite the worse profitability outlook,[8] the banking sector remains resilient over the entire three-year test horizon and has sufficient capital reserves (see Table IV.2). The sector's aggregate capital ratio is around 16.9%, i.e. well above the regulatory minimum of 8%. The Tier 1 capital ratio is only about 0.4 pp below the total capital ratio, illustrating the high quality of the capital structure. Nevertheless, one bank (which, however, accounts for only a marginal share of the sector's assets) gets into a situation of insufficient capital adequacy in the *Baseline Scenario*. This could imply a need to adjust its business model or top up its capital.[9]

The *Adverse Scenario* would imply significant accounting losses for the banking sector...

The *Adverse Scenario* assumes that seriously negative developments in the EU would result in a sizeable decline in economic activity in the Czech Republic, a surge in unemployment and financial market turbulence, leading to a significant jump in EU government bond yields. Since this negative shock would result in a contraction of the domestic economy

TABLE IV.2

Impact of the alternative scenarios on the banking sector

	Baseline Scenario			Adverse Scenario		
	2017	2018	2019	2017	2018	2019
Expected credit losses						
CZK billions	-25.3	-29.3	-33.7	-67.1	-85.3	-91.2
% of assets	-0.4	-0.5	-0.5	-1.1	-1.5	-1.6
Profit/loss from market risks						
CZK billions	-9.0	-5.3	-9.3	-16.3	-5.0	-1.6
% of assets	-0.1	-0.1	-0.1	-0.3	-0.1	0.0
Earnings for covering losses (adjusted operating profit)						
CZK billions	73.9	74.4	74.7	66.4	52.8	38.4
% of assets	1.2	1.2	1.1	1.1	0.9	0.7
Pre-tax profit/loss						
CZK billions	39.6	39.8	31.7	-16.9	-37.6	-54.4
% of assets	0.6	0.6	0.5	-0.3	-0.6	-1.0
Capital ratio at end of period in %						
Total	**18.1**	**17.6**	**16.9**	**16.2**	**13.4**	**11.8**
Tier 1	**17.6**	**17.1**	**16.5**	**15.7**	**13.0**	**11.4**
Capital injections						
CZK billions		0.2			12.5	
% of GDP		0.01			0.3	
No. of banks below 8% capital ratio		1			8	

Source: CNB
Note: Losses are expressed with a minus (-) sign.

Capital ratios of the banking sector depending on scenarios
(%)

Source: CNB

Decomposition of the change in the capital ratio of the banking sector in the _Baseline Scenario_
(%)
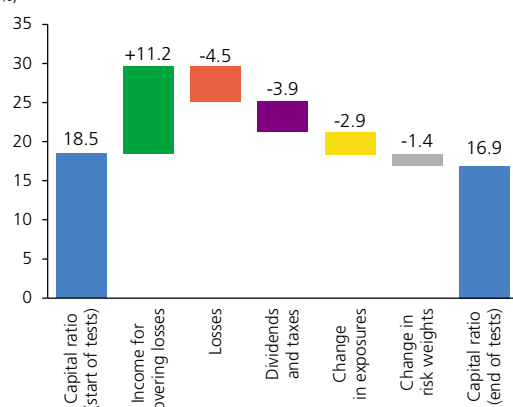
Source: CNB

Decomposition of the change in the capital ratio of the banking sector in the _Adverse Scenario_
(%)
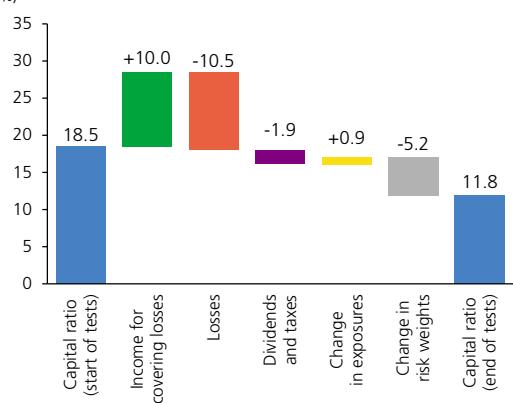
Source: CNB

over the entire test horizon, the financial reserves of some corporations and households would be exhausted and debt repayment by the real sector would deteriorate. This would be reflected in a sizeable rise in the default rate in both the non-financial corporations and household sectors. The banking sector's overall credit losses would be roughly three times larger than in the _Baseline Scenario_ at the three-year horizon. Given the expected rise in government bond yields in the Czech Republic and other EU countries, banks would also record market losses due to a decline in the value of these debt instruments (see Table IV.2). These credit and market losses in the sector, combined with a decline in its operating profit, result in an accounting loss of the sector and a sizeable fall in its capital ratio.

…but the sector's overall capital ratio would remain sufficiently above the regulatory threshold
Despite these adverse developments, the capital ratio of the banking sector does not drop below 11% in the _Adverse Scenario_ (see Chart IV.3). Although the aggregate capital ratio stays sufficiently above 8%, eight banks – representing about 14% of the sector's assets – record a fall in capital adequacy below the regulatory minimum and have to top up their capital. The necessary capital injections total around CZK 12.5 billion, i.e. about 0.3% of GDP (see Table IV.2). Relative to the size of the banking sector, this figure is not significant enough to jeopardise its stability. The banking sector's stability is based on its high capital ratio, which went up by a further 0.1 pp compared to 2015, and on its ability to generate income to cover losses even in the event of highly adverse developments.

The capital ratio falls in the _Adverse Scenario_ mainly because of high losses and a sharp rise in risk weights
A decomposition of the change in the capital ratio clearly illustrates the impacts of the main factors underlying the evolution of the capital ratio in the stress tests. In the _Baseline Scenario_, the Czech banking sector's income increases the capital ratio by as much as 11.2 pp over the test horizon[10] (see Chart IV.4). Part of this income is used to cover expected credit and market losses (-4.5 pp) and to pay dividends and taxes (-3.9 pp). The growth in economic activity leads to a rise in banks' exposures, lowering the capital ratio by 2.9 pp. A change in risk weights due to a change in the structure of lending reduces the capital ratio by a further 1.4 pp to 16.9% at the end of the three-year test horizon.[11]

Even in the _Adverse Scenario_, banks are able to generate income to cover their losses (+10 pp, see Chart IV.5). However, this income is not sufficient to cover all the expected losses over the test horizon (-10.5 pp). Dividends and taxes, paid mainly from profits for 2016, make a negative

10 The income used to cover losses includes profits for 2016 and expected income in 2017, 2018 and 2019.
11 Stronger growth in loans to households than in loans to corporations is expected in the _Baseline Scenario_. Loans to households, especially consumer credit, are riskier (have higher default rates), which leads to an increase in the average risk weights.

contribution to the capital ratio of 1.9 pp. Banks then react to the worse situation by lowering the amount of loans, which reduces the fall in the capital ratio by 0.9 pp. The deterioration of the economic environment and the materialisation of credit risk increase the risk weights, fostering a marked drop in the banking sector's capital ratio of 5.2 pp to 11.8% in the final period of the test.

A combination of the baseline and stress scenarios was used to model the impacts of the stress test over a five-year horizon
Loan growth in a favourable phase of the business and financial cycles, where the Czech Republic now finds itself, can lead to an accumulation of risks. Materialisation of those risks will reduce banks' capital ratio by more than assumed in the current *Adverse Scenario* with a three-year horizon. To assess this possibility, we present in Box 3 the results of a macro stress test with a five-year horizon. In the first two years, the economy continues to grow as assumed in the *Baseline Scenario*, and then a contraction occurs in the following three years according to the *Adverse Scenario*. The results suggest that under certain assumptions the capital ratio could drop closer to 8%, underscoring the need for prudent forward-looking macroprudential and microprudential policies in the area of capital buffers.

BOX 3: TAKING INTO ACCOUNT THE GROWTH PHASE OF THE FINANCIAL AND BUSINESS CYCLE IN A STRESS TEST MODEL WITH AN EXTENDED HORIZON

The traditional macro stress tests of banks used by the CNB have a three-year horizon,[12] during which the adverse scenario passes through to the financial results and subsequently the capital ratio of banks. The pass-through of the scenario immediately follows the latest known facts about their capital, balance sheets and profit and loss accounts. In some situations, this stress-testing framework may lead to a more favourable assessment of the banking sector's resilience, as it may not fully capture the accumulation of risks emerging in periods when further growth in the financial and business cycle is expected. This phase of the cycle is usually characterised by rapid loan growth, an easing of credit standards, rising debt of non-financial corporations and households, and the formation of asset price bubbles (not only in the real estate sector – see section 5.3.1). In the current conditions of easy monetary policies worldwide, it is also being accompanied by low interest rates and a lack of investment opportunities, resulting in search for yield and underestimation of risks assumed. These factors create sources of systemic risk which may not materialise until a few years later.

Alternative scenarios: real GDP growth
(year-on-year change in %)
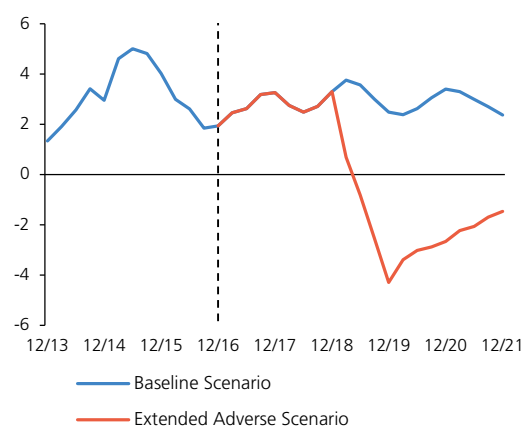
Source: CNB

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12 Like most central banks in other countries. The UK central bank has started to apply a five-year horizon. See Bank of England *Stress testing the UK banking system: 2015 results*.

Selected variables in the *Adverse Scenario*
(averages for given years)

	Actual value	Extended *Adverse Scenario*				
	2016	2017	2018	2019	2020	2021
Default rate (PD, %)						
Non-financial corp.	1.8	1.8	2.7	4.9	5.6	6.2
Loans for house purchase	1.7	1.6	2.7	4.4	4.6	4.8
Consumer credit	4.9	5.5	7.4	10.5	11.5	12.2
Loss given default (LGD, %)						
Non-financial corp.	45	45	45	56	59	59
Loans for house purchase	22	22	22	34	48	57
Consumer credit	55	54	54	58	67	77

Source: CNB, BRCI

CHART IV.4 BOX

Decomposition of the change in the capital ratio of the banking sector in the extended *Adverse Scenario* 2017–2018
(%)
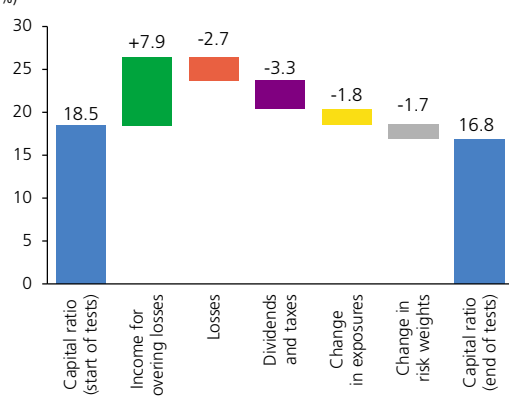
Source: CNB

CHART IV.5 BOX

Decomposition of the change in the capital ratio of the banking sector in the extended *Adverse Scenario* 2019–2021
(%)
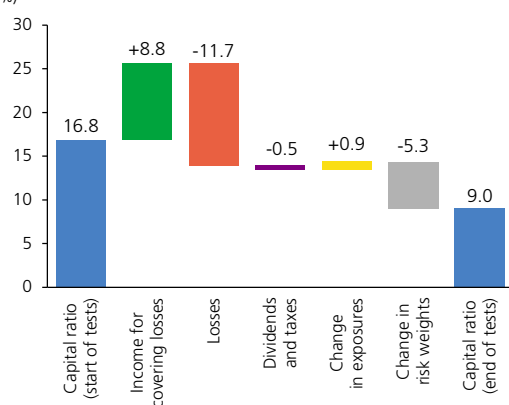
Source: CNB

This Box presents the result of a macro stress test with an extended horizon of five years. It aims to illustrate the extent of the possible underestimation of the adverse impacts of risks accumulating over a sustained period of favourable economic developments. In the first two years, the favourable economic developments are mostly in line with the *Baseline Scenario* (see Chart IV.3 Box). The economy grows in real terms and some imbalances increase. Later in the second half of the second year, the first signs of rising credit risks begin to appear as PD rises. However, GDP is still in line with the *Baseline Scenario*. In the following three years, a turnaround occurs and the *Adverse Scenario* materialises, amplified by the risks accumulated in 2017–2018. Compared to the *Adverse Scenario*, PD and LGD thus record slightly higher growth (see Table IV.1 Box).[13]

Banks' loan portfolios rise by 15% in the first two years of the growth phase compared to the end of 2016. Banks' dividend policy is a key element leading to a decrease in the capital ratio at the end of the growth phase (see Chart IV.4 Box). This policy takes advantage of the space created by the persisting high profitability of banks (RoA of 1.2% in both 2017 and 2018). Despite a slight increase in PD at the end of the period, the degree of risk as expressed by PD and LGD remains relatively low. The change in risk weights therefore has a smaller impact on the capital ratio. At the end of 2018, the banking sector records a decline in its total capital ratio of 1.7 pp to 16.8% compared to the end of 2016. Property prices continue to rise at double-digit rates in this period, and their overvaluation also increases. The debt of non-financial corporations and households relative to GDP rises by 1.8 pp and 2.4 pp respectively.

In the third year, the economy starts to contract and credit losses start to increase due to the pass-through of shocks from the real economy (a decline in economic activity, a rise in unemployment, flat or falling income and a drop in property prices) to the quality of banks' loan portfolios (see Table IV.1 Box). Credit losses begin to significantly outweigh the income used to cover them (see Chart IV.5 Box). A limited ability to top up capital from profits is accompanied by a marked rise in capital requirements owing to an increase in risk weights as a result of a larger amount of NPLs. Together, this leads to a drop in banks' total capital ratio at the five-year test horizon of 9.5 pp to 9.0%, i.e. 2.8 pp more than in the three-year macro stress test (see Chart IV.6 Box). The stronger impact at the five-year horizon is due mainly to a decline in the capital surplus in the growth phase caused by an increase in

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13 To prepare the stress test scenarios for the longer horizon, the CNB uses the official prediction model supplemented with satellite models (see Box 2).

banks' loan portfolios and dividend payments. The higher risks accumulated during the growth phase also have an effect. The weight of the shock impacts in the area of market risks is relatively low.

The test results illustrate that a prolonged growth phase of the financial and business cycle may become a source of increased risks. In such case, the banking sector's high resilience from the perspective of the standard macro stress test approach may actually be lower under certain circumstances. When applying capital macroprudential instruments in the future, the CNB intends to take into account the indications of stress tests with an extended horizon, and plans to further develop the modelling system for such tests. Extending the test horizon involves a number of challenges but supports the forward-lookingness of macroprudential policy. Such forward-lookingness is essential for reducing cyclical risks as well as structural risks accumulating over a longer time horizon.

Capital ratios of the banking sector depending on scenarios
(%)

— Baseline Scenario
— Extended Adverse Scenario
— Adverse Scenario
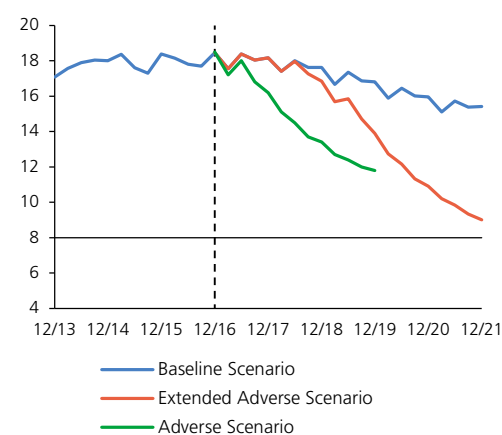
Source: CNB

An additional sensitivity analysis in the *Adverse Scenario* analyses the impacts of losses arising from operational risk
Owing to an increase in risks in the areas of information security and compliance with legislative rules ("conduct risk"), an assessment of banks' operational risk is added to the stress test. For the end of the second year of the tests in the *Adverse Scenario*, banks are assumed to have incurred losses equivalent to double the average of the three historically highest losses arising from operational risk in 2005–2015.[14] The sector's capital ratio remains above 11.3% over the test horizon (see Chart IV.3, *Adverse Scenario* amplified by arising losses from operational risk), while two more banks fall below the 8% threshold and the capital injections increase to CZK 16.3 billion (around 0.3% of GDP).

The portfolio concentration test represents a strong shock…
The final sensitivity analysis in the *Adverse Scenario* focuses on testing concentration risk and assumes default by the largest debtors of each bank. Although the concentration of client loan exposures (as measured by the share of the three largest exposures in the portfolio of loans to legal entities) has long been relatively constant at around 17%, the largest loans may not be sufficiently collateralised in some cases. This is evidenced by the fact that the share of uncollateralised loans in loans to

14 The historical data on losses arising from operational risk are obtained from the banks participating in the joint stress tests, which accounted for almost 90% of the sector's assets at the end of 2016 Q4. An alternative approach was used for the other banks. It assumes that the losses are equal to the capital requirement for operational risk (see the fall-back option in the methodology of the 2016 EU-wide stress tests).

CHART IV.6

Impact of the collapse of the top three debtors of each bank in the *Adverse Scenario*
(%; LGD = 50 %)

- Loan losses in 2017 (% of assets)
- End-2017 capital ratio (%, right-hand scale)
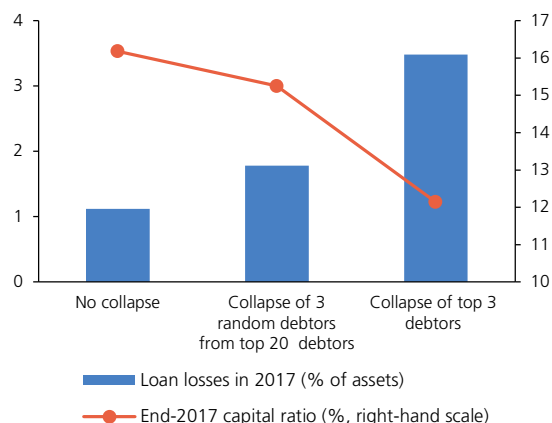
Source: CNB

CHART IV.7

Structure of bank capital requirements in the Czech Republic and impact of macro stress tests
(average for sector as of end of 2016)

- Impact of macro-stress tests

- Capital surplus
- Capital conservation buffer
- Systemic risk buffer
- Additional Pillar 2 requirements
- Pillar 1 requirements
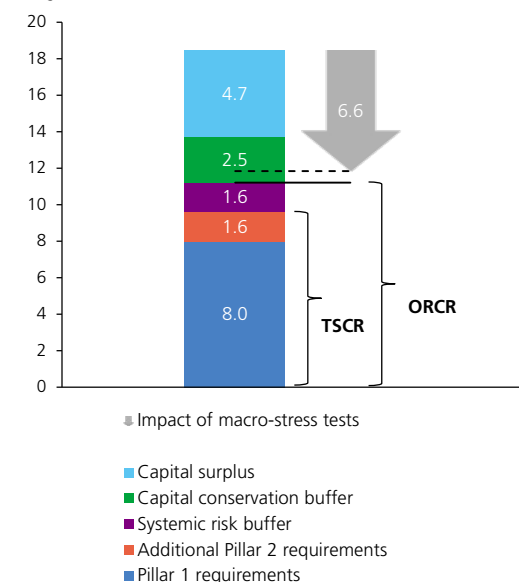
Source: CNB
Note: The illustration assumes a zero countercyclical capital buffer.

the top three debtors was 60% at the end of 2016.[15] If these debtors default, banks' credit losses could reach high levels.

…but the banking sector is resilient to this major shock, too

The concentration test is performed in two variants. The first assumes the collapse of three random debtors from the top 20 debtors of each bank. The other, stricter one assumes the collapse of the top three debtors of each bank. Given the above share of uncollateralised loans in loans to the largest clients, a 50% haircut on these exposures is considered in both cases. This shock has a big effect on the banking sector's credit losses and capital ratio. The capital ratio falls to 15% at the end of 2017 for the collapse of three random large debtors. The collapse of the top three debtors of each bank would cause an even sharper fall in the capital ratio, to 12.1% (see Chart IV.6). The concentration test represents a very strong stress scenario, and the resulting banking sector capital ratio based on such a large shock can therefore be assessed as positive.

The effect of the stress test results on the capital requirements

Banks must meet the total capital requirement (TSCR) given by the sum of the Pillar 1 requirements and the Pillar 2 requirements at all times. If the supervisory authority decides that a bank cannot use one of the capital buffers to absorb a stress test shock, its total requirement is increased by the amount of that buffer. In this form it is referred to as the other relevant capital requirement (ORCR). The CNB defines the ORCR as the sum of the TSCR and the systemic risk buffer. This is because the purpose of the systemic risk buffer is to prevent long-term non-cyclical systemic risks, not to absorb the losses of individual banks in adverse phases of the economic cycle.

Chart IV.7 shows how fulfilment of the relevant capital requirement would look if the impact of the *Adverse Scenario* of the macro-stress test on the banking sector as a whole were to be factored in. The capital surplus and the capital conservation buffer would together be sufficient to cover the decrease in capital in the *Adverse Scenario*. Supervisory stress testing in the SREP process is used to evaluate whether a bank has sufficient capital to meet the relevant capital requirement (see Box 4: *Joint stress testing by the CNB and selected banks*).

BOX 4: JOINT STRESS TESTING BY THE CNB AND SELECTED BANKS

In addition to top-down macro stress tests of the banking sector, the CNB has been performing bottom-up micro stress tests in partnership with selected Czech banks since 2009. Such testing was also performed by the ECB in 2016 for the largest EU banks.

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15 The share of uncollateralised claims on non-financial corporations in loans to the three largest borrowers was 55% at the end of 2015.

The micro stress tests differ from the macro stress tests mainly in that the impacts of shocks on banks' capital ratios are calculated by the banks themselves based on their credit portfolios at the one-year horizon. They thus use much more detailed information on individual portfolios than that available to the CNB for its macro stress tests. However, the most probable scenario (*Baseline Scenario*) and the adverse scenario (*Adverse Scenario*) for the macroeconomic environment are the same as in the macro stress tests (for details see section 2.1).

Since the horizon of the micro stress tests is only one year, the results of the two types of test are not fully comparable. As in the macro stress tests, the assumed macroeconomic developments in the *Baseline* and *Adverse* scenarios are reflected in the credit risk parameters. However, faster transmission of credit risks to banks' balance sheets is assumed in the micro stress tests. Ten domestic banks and building societies, representing 77% of the assets of the Czech banking sector, took part in the thirteenth round of micro stress tests using end-2016 data. As usual, the focus was on testing credit risk, which is the largest risk for the Czech banking sector. Since 2014 the micro stress tests have also included a sensitivity analysis of interest rate risk for the banks' entire balance sheets and specific interest rate risk for domestic government bonds.

In the *Baseline Scenario*, a constant level of credit risk in the case of corporate exposures and a marginal increase in credit risk in the case of retail portfolios can be observed (see Table IV.2 Box). In the *Adverse Scenario*, considerably higher credit risk is visible, reflecting the hypothetical adverse evolution of economic activity. This is expressed by a broad rise in both the probability of default (PD) and the loss given default (LGD) in all the credit portfolios tested except central government, for which the PD remains at zero.

The results of the micro stress tests for the *Baseline Scenario* point to a year-on-year fall in profit of 18% and a rise in the capital requirements of banks (see Table IV.3 Box). The aggregate Tier 1 capital ratio of the banks tested would increase slightly to 18.8%. In the *Adverse Scenario*, profit declines by 44% and the capital requirements rise by 40%. Despite these adverse developments, the aggregate Tier 1 capital ratio of the banks tested remains well above the 8% threshold at the one-year horizon, dropping to 13.5%.

The micro stress test results confirm that the banks tested are highly resilient to the *Adverse Scenario*, in line with the results of the macro stress tests of the banking sector. The results and individual parameters, however, are not fully comparable because

TABLE IV.2 BOX

Risk parameters for the credit segments and scenarios tested
(%; weighted by EAD)

	Actual value 31. 12. 2016		*Baseline Scenario* 31. 12. 2017		*Adverse Scenario* 31. 12. 2017	
	PD	LGD	PD	LGD	PD	LGD
Corporate exposures	1.3	35.4	1.3	35.4	2.2	43.0
- large enterprises	1.0	36.6	1.0	36.1	1.6	44.3
- small and medium-sized enterprises	2.0	33.6	1.9	33.4	3.2	40.8
- specialised credit exposures	1.5	36.8	1.5	36.7	2.5	45.1
Retail exposures	1.9	29.7	2.0	29.8	2.9	37.4
- real estate SMEs	5.4	34.3	5.4	34.3	9.1	44.0
- loans for house purchase	1.3	22.8	1.3	22.8	1.9	29.3
- revolving loans	2.6	58.2	2.8	58.4	4.0	70.8
- other loans to individuals	3.1	51.1	3.5	51.6	4.6	62.1
- other loans to SMEs	4.7	40.4	4.7	40.2	7.8	50.2
Institutions	0.2	21.2	0.2	21.2	0.3	24.4
Central governments	0.0	9.9	0.0	9.9	0.0	14.8

Source: CNB

TABLE IV.3 BOX

Banks' capital requirements and capital ratios
(%)

	Actual value 31. 12. 2016	*Baseline Scenario* 31. 12. 2017	*Adverse Scenario* 31. 12. 2017
Net profit after tax (year-on-year change)	-	-18.0	-43.7
Capital requirements (year-on-year change)	-	2.5	40.2
Regulatory capital (year-on-year change)	-	5.0	2.5
Tier 1 capital ratio	18.5	18.8	13.5
Capital ratio, total	18.9	19.4	13.8

Source: CNB

Interest rate risk sensitivity analysis
(% of regulatory capital)
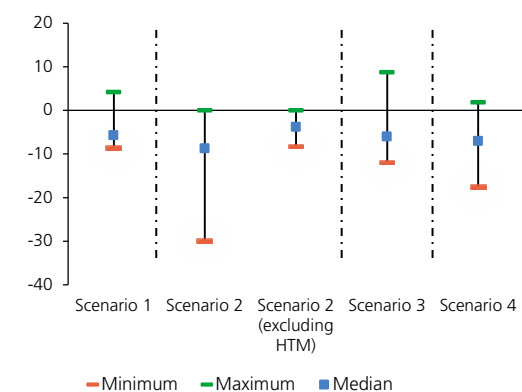
Source: CNB
Note: Banks included in micro stress tests, excluding building societies. In Scenario 2
          (excluding HTM), accounting principles are taken into consideration and so CZK
          government bonds held to maturity are not marked to market. HTM = held to
          maturity.

of the different samples of institutions tested, different calculation methods and different test horizons, which lead to different assumptions about the speed of transmission of risks to banks' balance sheets.

In addition to the *Baseline* and *Adverse* scenarios, a sensitivity analysis of general interest rate risk and the specific interest rate risk for koruna government bonds was performed. The economic logic of the test was applied in the interest rate risk testing and the effect of accounting categories on the revaluation of assets and liabilities was suppressed. The sensitivity analysis thus covered the entire portfolio (the banking and trading books) and used four scenarios. *Scenario 1* assumed a 3 pp parallel shift of the yield curve, *Scenario 2* assumed a 3 pp widening of the koruna government bond spread vis-à-vis the IRS yield curve,[16] *Scenario 3* assumed a larger increase in the slope of the yield curve[17] and *Scenario 4* contained a combination of a more moderate increase in the slope of the yield curve and a 2 pp widening of the koruna government bond spread vis-à-vis the IRS yield curve.[18]

The results of the sensitivity analysis show that a rise in interest rates would have mixed impacts across the banks tested (see Chart IV.7 Box). In *Scenario 1*, the impact of a parallel shift of the yield curve would be between -8.7% and 4.1% of capital. In *Scenario 3*, banks' sensitivity to rotation of the yield curve increases further, with the impact on the banks' capital ranging from -12.0% to 8.7%. *Scenario 2* assumes a widening of the koruna government bond spread because of a rise in the yield demanded by investors. The strongly negative impact of this scenario (between -30.0% and 0.0%) is due to the significant exposure of domestic banks to koruna government bonds. However, if we move away from a purely economic perspective and take accounting principles into consideration, the impact of the test is significantly smaller (-8.3% to 0.0%), since domestic banks hold a significant proportion of their koruna government bonds in the "held to maturity" accounting category and do not mark debt securities included in that category to market. In *Scenario 4*, the impact is between -17.6% and 1.8%. If the

16 A variant of *Scenario 2* in which accounting principles are taken into consideration and so koruna government bonds held to maturity are not marked to market was also considered for comparison.
17 A 5 pp shift was assumed for maturities of over 5 years, the curve was left unchanged for maturities of up to 3 months, and linear interpolation was used for the shift for maturities of over 3 months and up to 5 years.
18 *Increase in the yield curve slope*: a 3 pp shift was assumed for maturities of over 5 years, the curve was left unchanged for maturities of up to 3 months, and linear interpolation was used for the shift for maturities of over 3 months and up to 5 years. *Widening of the koruna government bond spread*: a 2 pp shift was assumed for maturities of over 5 years, and linear interpolation was used for the shift for maturities of over 3 months and up to 5 years.

Adverse Scenario and the interest rate risk sensitivity scenarios were to materialise together, the aggregate capital ratio of the banks tested would fall by a further 0.3–2.1 pp.[19]

The stress tests of pension management companies assess the sector's resilience at the one-year horizon

The stress tests of pension management companies (PMCs) focus on assessing the risks to transformed funds (TFs) managed by PMCs at the one-year horizon. Besides the *Baseline Scenario*, the sector's resilience to the *Adverse Scenario* was also tested; this variant captures adverse economic developments coupled with a drop in asset prices in financial markets (see section 2.1).

The PMC stress-testing methodology underwent further changes

The PMC stress-testing methodology was further refined in this year's tests. The scenario for general interest rate risk (evolution of swap curves) and the credit spread risk for Czech koruna government bonds is now prepared using forecasts for the yield curve components.[20] The scenarios for credit spread risk for other bonds in the *Adverse Scenario*, which are derived from the historical volatility of yields on government or corporate bonds with the relevant credit rating and maturity, have also changed.[21] In general, stronger shocks are applied to bonds with lower ratings and longer maturities.

Transformed funds are mainly sensitive to interest rate risk…

The effect of the risks considered on the results of transformed funds (TFs) is summarised in Table IV.3 and Charts IV.8 and IV.9. As TFs mostly invest in high-quality government bonds, general interest rate risk and credit spread risk for government bonds have the most significant effect. A rise in swap curves leads to a decline in total assets of 0.6% in the *Baseline Scenario* and 1.4% in the *Adverse Scenario*. An increase in the credit spread for government bonds results in a drop in assets of 1.9% in the *Baseline Scenario* and 3.9% in the *Adverse Scenario*. Credit spread risk for corporate bonds leads to a decrease in assets of less than 1.0% in both scenarios. TFs holding a large proportion of their assets in fixed-rate koruna bonds with longer residual maturities are hit hardest by the materialisation of all three types of interest rate risk. TFs reduce the impact of a potential interest rate shock by holding bonds to maturity (28% of the portfolio) and investing in floating-rate bonds (a further 27% of the portfolio[22]). By contrast, derivative hedging of interest rate risk is applied by TFs to only a limited extent and would reduce the total

TABLE IV.3

Results of the stress tests of PMCs

		Baseline Scenario	Adverse Scenario
PMC Equity (start of test)	CZK billions	8.9	8.9
Capital ratio (start of test)	%	126.8	126.8
Change in TF asset value - general interest rate risk	CZK billions	-2.4	-5.3
	% of TF assets	-0.6	-1.4
Change in TF asset value - credit spread risk for corporate securities	CZK billions	-0.4	-3.8
	% of TF assets	-0.1	-1.0
Change in TF asset value - credit spread risk for government securities	CZK billions	-7.2	-15.2
	% of TF assets	-1.9	-3.9
Change in TF asset value - exchange rate risk	CZK billions	-0.4	0.5
	% of TF assets	-0.1	0.1
Change in TF asset value - equity risk	CZK billions	-0.4	-3.1
	% of TF assets	-0.1	-0.8
Change in TF asset value -property risk	CZK billions	0.3	-0.4
	% of TF assets	0.1	-0.1
Total impact of risks on TF assets	CZK billions	-10.6	-27.2
	% of TF assets	-2.8	-7.1
Profit of transformed funds	CZK billions	1.9	-0.6
PMC Equity (end of test)	CZK billions	8.1	-2.6
Capital ratio (end of test)	%	112.3	-35.4
Capital injection	CZK billions	0.6	9.9

Source: CNB
Note: Start of test: end of 2016; end of test: end of 2017. TF stands for transformed funds.

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19 *Scenario 2* would have the biggest impact (-2.1 pp).
20 The decomposition methodology is described in detail in the thematic article *Decomposition of the Czech Government Bond Yield Curve* in this Report.
21 For details see *Macro-stress tests of the pension management companies sector* on the CNB website.
22 Floating-rate bonds held to maturity are not included in this 27%.

Change in the value of assets of transformed funds due to the individual types of risk in the *Baseline Scenario*
(CZK billions)
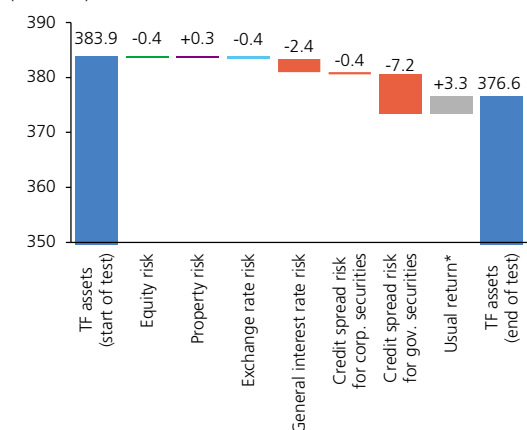
Source: CNB
Note: * The assumed rise in value that would occur even without market revaluation of assets in the *Baseline Scenario*. It represents dividend income, bond coupons and the return on the HTM portfolio. A usual return of 0.9% of the book value of assets at the start of the test is considered for all TFs. This equals the average return (net profit/assets of TFs) in recent years.

Change in the value of assets of transformed funds due to the individual types of risk in the *Adverse Scenario*
(CZK billions)
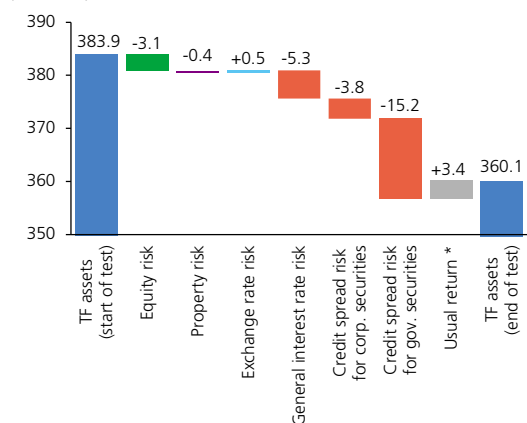
Source: CNB
Note: * The assumed rise in value that would occur even without market revaluation of assets in the *Adverse Scenario*. It represents dividend income, bond coupons and the return on the HTM portfolio. A usual return of 0.9% of the book value of assets at the start of the test is considered for all TFs. This equals the average return (net profit/assets of TFs) in recent years.

losses caused by a rise in swap rates by just 10.1% on average across both scenarios.

…and other types of risk have a limited impact
Losses due to equity and real estate risk increased slightly compared to the previous stress test. This was due to a rising share of these investments in TFs' portfolios and a more severe calibration of these shocks. In terms of amount, however, the losses due to these two risks are insignificant. In the *Baseline Scenario*, TFs suffer exchange rate losses due to expected appreciation of the koruna. In the *Adverse Scenario*, by contrast, depreciation of the koruna leads to exchange rate gains. Despite a considerable amount of foreign currency investment and slight year-on-year growth in such investment (to 16.1% of assets), the effect of the exchange rate on TFs' results is limited due to currency hedging. However, the degree of exchange rate risk hedging fell in most TFs compared to the previous stress test.

In the *Adverse Scenario*, risk also affects pension fund clients
The change in the value of TFs' assets has only a limited impact on their accounting profit, as only some investments are realised in the relevant period. Therefore, assuming realisation of 15% of potential profit, even the 2.8% decrease in asset value in the *Baseline Scenario* results in the generation of an accounting profit by all TFs and non-zero returns for their clients. If the *Adverse Scenario* were to materialise, however, the drop in asset value would be so sharp that most TFs would post a loss and their clients would receive zero returns.

In both the *Baseline Scenario* and the *Adverse Scenario*, the capital adequacy of some PMCs would fall below the required minimum
PMCs guarantee non-negative returns for the clients of their TFs by law. If a TF's assets decline below its liabilities, the relevant PMC has to top up the TF's assets. This is the case for three PMCs in the *Baseline Scenario*. As a result of topping up the TFs' assets, the capital adequacy of these PMCs falls below the required level. The PMC owners would have to inject capital of CZK 0.6 billion in order for their PMCs to meet the capital adequacy requirement. In the *Adverse Scenario*, all eight PMC have to top up the assets of their TFs. All of them see their capital adequacy decline below the required level, and four of them end up with negative capital. The owners would have to inject capital of CZK 9.9 billion in order for their PMCs to satisfy the capital adequacy requirement.

4.2 BANK LIQUIDITY STRESS TESTS AND LIQUIDITY REGULATION

Banks having their registered offices in the Czech Republic passed the liquidity tests. Both the CNB's macro-stress test and the liquidity coverage and net stable funding ratios indicate that domestic banks are highly resilient to liquidity shocks. This is due to their strong client deposit base and high capitalisation on the liabilities side and to a significant proportion of high-quality government bonds and exposures to the CNB on the asset side.

The liquidity coverage ratios confirmed the domestic banking sector's resilience to a short-term liquidity shock…

Resilience to a short-term liquidity shock is regularly tested using the liquidity coverage ratio (LCR[23]). The aggregate LCR for the entire sector was 188%[24] at the end of 2016, well above the regulatory requirement of 80% (see Chart IV.10). Although it dropped by 4 pp year on year, all domestic banks were also compliant with the regulatory limit of 100% required as from 2018. Domestic banks continued to hold almost all their assets from the LCR liquidity buffer in the form of claims on the CNB and government bonds (around 95% of the buffer), to which no haircuts are applied. Given the one-month horizon of the stress considered, the highest aggregate LCR was achieved as usual by building societies, which, compared to the other groups of banks, had a significantly lower share of deposits included in the expected outflows (see Table IV.4).

…and the net stable funding ratios confirmed sufficient stable funding

The aggregate Basel III net stable funding ratio (NSFR[25]) for the banking sector as a whole was 124% at the end of 2016 (see Chart IV.10). This figure illustrates sufficient available stable funding relative to required stable funding. The estimated NSFR differed across the bank groups monitored, but in all cases was above the regulatory limit of 100% scheduled to take effect in 2018. In addition to a strong client deposit base and solid capitalisation, the sufficient NSFR level was due to a high share of highly liquid assets (28% of the sector's total assets; see Table IV.4) with a low stable coverage need. As in the case of the LCR results, building societies had the highest estimated NSFR. Long-term deposits with a contractual maturity of over one year, which are considered 100% stable, accounted for a relatively large share of their funds (see Chart IV.11). However, building societies had the largest coverage need relative to the other groups of banks. More than 50% of their balance sheet required stable funding at the end of 2016 (see Chart IV.12), with loans to natural persons requiring funding with a higher stability weight, or longer maturities, making up the largest part.

23 The LCR is a requirement to cover a net liquidity outflow over a 30-day horizon with liquid assets. It is calculated as the ratio of the liquidity buffer to the net liquidity outflow.
24 The aggregate results take liquidity subgroups into account and exclude state-owned banks.
25 The NSFR is a structural liquidity requirement and is monitored over a one-year horizon. It is defined as the ratio of available stable funding (see Chart IV.11) to required stable funding (see Chart IV.12).

CHART IV.10

Regulatory indicators of bank balance-sheet liquidity
(%; as of 31 Dec. 2016)

	Total	Large banks	Medium-sized banks	Small banks	Building societies
NSFR	124	116	130	182	145
LCR	188	167	171	421	882
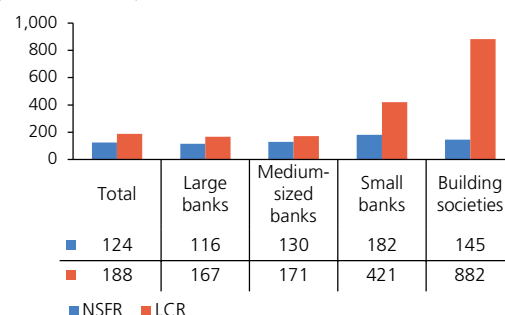
Source: CNB
Note: The LCR is the ratio of the liquidity buffer to the net liquidity outflow of banks over a 30-day stress horizon as defined by EC Regulation 2015/61. The NSFR is the ratio of available stable funding to required stable funding as defined by Basel III. The results take liquidity subgroups into account and exclude state-owned banks.

TABLE IV.4

The LCR for groups of banks
(% of total assets of individual groups of banks as of 31. 12. 2016; rates in %)

	Banks			Building societies	Total
	Large	Medium-sized	Small		
Liquidity buffer	30	22	41	20	28
Liquid assets	30	22	41	20	29
Weighted average rate of eligibility after application of haircuts*	100	100	100	99	100
Expected outflows	23	15	12	4	19
Balances of outflows	94	63	91	25	81
Weighted average rate of outflow*	24	24	13	18	24
Expected inflows	5	2	2	2	4
Balances of inflows	16	6	17	3	13
Weighted average rate of inflow*	31	41	12	76	31
LCR	167	171	421	882	188

Source: CNB
Note: * The extent to which items subject to haircuts, outflows or inflows in the stress period are represented in balance sheets. The results take liquidity subgroups into account and exclude state-owned banks.

CHART IV.11

Structure and amount of items ensuring stable funding
(% of balance sheet as of 31 Dec. 2016)
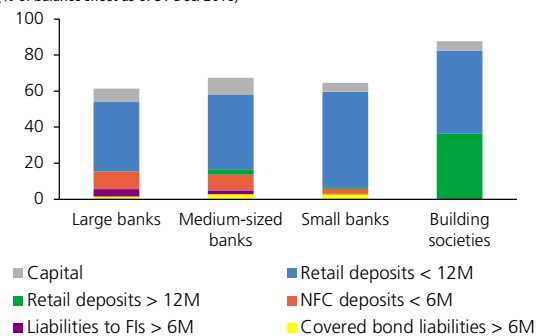
- Capital
- Retail deposits < 12M
- Retail deposits > 12M
- NFC deposits < 6M
- Liabilities to FIs > 6M
- Covered bond liabilities > 6M

Source: CNB
Note: The Chart contains items whose weights exceed 2% in any of the groups of selected banks. M: month; FIs: financial institutions; NFC: non-financial corporations.

Structure and amount of items requiring stable funding
(% of balance sheet as of 31 Dec. 2016)
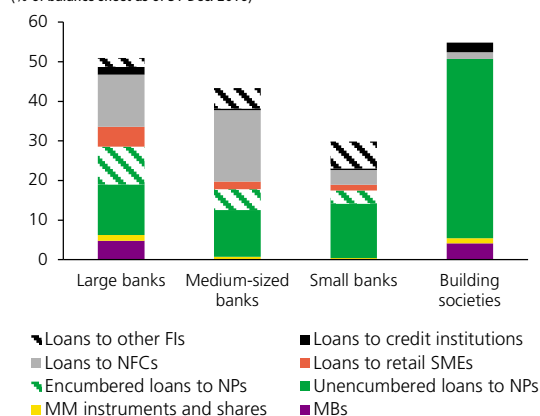
Source: CNB
Note: The Chart contains items whose weights exceed 2% in any of the groups of selected banks. MBs: mortgage bonds; NPs: natural persons; NFCs: non-financial corporations; MM: money market; FIs: financial institutions.

Scenario type and shock size in the liquidity stress test
(%)

Balance-sheet item / Maturity bands	<3M	3M–6M	6M–9M	9M–12M
1. Liquidity buffer	Interest rate and equity shock			
1.1 Q-o-q change in yield curve in pp*				
1Y PRIBOR	0.3	0.0	0.0	0.0
5Y GB yield	1.0	0.6	0.5	0.4
1Y EURIBOR	0.2	0.0	0.0	0.0
5Y EUR GB yield	0.0	0.2	0.3	0.2
1.2 Haircuts from value of capital instrument	30.0	-	-	-
2. Inflows	Size of deduction from expected inflow			
2.1 Secured claims	0.9	0.9	0.9	0.9
2.2 Unsecured claims due**				
on NPs	2.1	2.2	2.4	2.6
on NFCs and retail SMEs	1.1	1.2	1.2	1.2
3. Outflows	Expected outflow rate			
3.1 Drawdown of credit lines	5.0	5.0	5.0	5.0
3.2 Issued debt securities	100.0	100.0	100.0	100.0
3.3 Retail deposits				
insured	3.2	3.5	3.2	3.1
others	6.3	7.0	6.4	6.3
3.4 Liabilities to NFCs				
secured	12.6	14.1	12.9	12.5
other	25.3	28.2	25.8	25.0
3.5 Liabilities to FIs				
secured	12.6	14.1	12.9	12.5
others	31.6	35.2	32.2	31.3
3.6 Growth in new loans, of which***				
secured claims	0.0	1.4	1.3	1.0
due to NPs	0.0	1.0	0.6	0.4
due to NFCs and retail SMEs	2.4	0.0	0.7	0.0

Source: CNB
Note: The parameter values are the averages to those applied to individual banks. M: month, Y: year, NPs: natural persons, NFCs: non-financial corporations, FIs: financial institutions, GB: government bonds.
* The haircut is determined by multiplying the change in the yield curve by the duration of the bond portfolio.
** Due claims on financial institutions were not subject to deductions in this scenario.
*** The credit growth assumption is calculated using satellite models in macro stress tests of bank solvency.

Funds in other banks were more diversified and had shorter residual maturity. By contrast, these banks held a larger liquid asset buffer (see Table IV.4).

The CNB also assesses the banking sector's liquidity using its own macro stress test…

Besides assessing short-term balance-sheet liquidity, the CNB conducts its own macro stress test.[26] The sufficiency of a bank's liquid asset buffer relative to the net liquidity outflow, i.e. the difference between expected outflows and inflows of liquidity, is tested using this indicator over a one-year horizon (four maturity bands).[27] Their level is derived from bank's funding stability and the maturity mismatch in its balance sheet. The model thus incorporates the main features of the LCR and NSFR regulatory requirements. The model is a two-round one and takes into account the links between balance-sheet and market liquidity and the feedback reaction of the banking sector. The banking system is first hit by scenario-defined exogenous shocks, which banks react to under certain assumptions. Those reactions then change the reputational risk of each reacting bank and the systemic risk in the banking sector as a whole (endogenous shocks). Banks have a limited ability to increase their balance-sheet totals over the entire test period. Compared to the LCR or NSFR, the liquidity macro stress test allows for better testing of the impact of scenarios with lagged pass-through of the adverse economic situation to the quality of banks' loan portfolios and to the financial markets.

The stress test was applied to 20 banks having their registered offices in the Czech Republic using the *Adverse Scenario* (see section 2.1.3 and Table IV.1) and the end-2016 data.[28] In the first round of stress, a liquidity outflow was generated for each maturity band by increasing the asset funding requirement (see Table IV.5, lines 3.1 and 3.6) amid lower sources (lines 3.2–3.5). At the same time, the inflow of expected liquidity (lines 2.1 and 2.2) for the relevant maturity band was lowered, and also the value of some assets in the liquidity buffer[29] (lines 1.1 and 1.2). The second round of stress captures the consequences of the rise in reputational and systemic risk brought about by banks' efforts to cover the net outflow and is expressed through additional losses arising from the sale of assets from the buffer.

…which confirmed their high resilience over a longer stress period

The test results reveal that the banking sector as a whole would withstand the simulated stress and would be able to cover a net outflow

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26 For details see the thematic article in Financial Stability Report 2015/2016: *The Relationship between Liquidity Risk and Credit Risk in the CNB's Liquidity Stress Tests.*
27 The expected inflows of liquidity are limited from above so that the minimum net outflow is 10% of the expected outflow.
28 State-owned banks, which have a specific business model, were not included in the stress test. The test takes liquidity subgroups into account.
29 Two liquidity buffer levels are monitored in the stress test. The level 1 liquidity buffer is defined as the sum of cash, claims on the CNB (excluding minimum reserves) and government bonds. The level 2 liquidity buffer additionally includes corporate securities other than those held as loans.

of liquidity lasting even one year (see Chart IV.13). The impacts of the negative shocks on the balance sheets of the groups of banks monitored were mixed. When the impact was measured using the aggregate decline in the total liquidity buffer, large and medium-sized banks were hit hardest (a decline of more than 70%). A smaller impact was apparent for building societies (a decline in the total buffer of around 60%) for similar reasons as in the assessment of the LCR and NSFR results. Three banks would exhaust their entire buffer during the test, although not before the final quarter. The cause was the same for all of them: their liquidity buffer was not sufficient in relation to the maturity mismatch in their balance sheets and their funding stability. It was the lowest relative to total assets compared to the other banks.

Domestic banks' balance-sheet structure changed partially as a result of the CNB's monetary policy…

The use of the exchange rate as a CNB monetary policy instrument from early November 2013 resulted in an increase in koruna liquidity (see section 2.1, Chart II.10), which is held largely by non-resident banks. These are mostly parent institutions of domestic banks (see section 3.4, Chart III.29). Non-resident banks with no access to CNB facilities usually placed korunas in Czech government securities (see section 2.1, Chart II.9) or in short-term time deposits with domestic banks (see Chart IV.14). The high interest of non-resident banks in koruna assets was reflected in an increase in their share in the financing of domestic banks, a rise in their share in holdings of Czech koruna government bonds (see Chart II.11) and a decrease in yields on those bonds to negative levels (see section 2.1, Chart II.5). This led to a change in the structure of liquid assets held by domestic banks. They gradually reduced their holdings of Czech government securities and deposited free koruna liquidity with the CNB at a rate of 0.05% (see Chart IV.15). Non-residents' interest rose sharply in early 2017 as expectations of an exit from the CNB's exchange rate commitment intensified.

…but their liquidity position remained stable and strong

Despite the changes in the foreign exchange, money and bond markets caused by the CNB's interventions, the liquidity position of the domestic banking sector remained stable and strong. This was due mainly to an increasing share of liquid assets in balance sheets and a large excess of client deposits over client loans (excluding credit institutions). Loans from non-resident credit institutions rose from 5% of total assets (January 2013) to almost 16% (February 2017). However, these loans were deposited with the CNB, claims on which grew from around 9% to 26% of the balance sheet (see Chart IV.15). Before the CNB's exchange rate commitment was introduced, client loans accounted for around 48% of the balance sheet (January 2013) and client deposits about 65% (see Chart IV.15). Client loans accounted for 45% and client deposits for more than 60% of the balance sheet at the end of February 2017. The ratio of client deposits to loans thus fell slightly from 139% to 135% in the period under review (see Chart IV.14). However, it remained high and well above the EU average (around 85%).

CHART IV.13

Results of the bank liquidity stress test
(% of total assets of individual groups of banks)
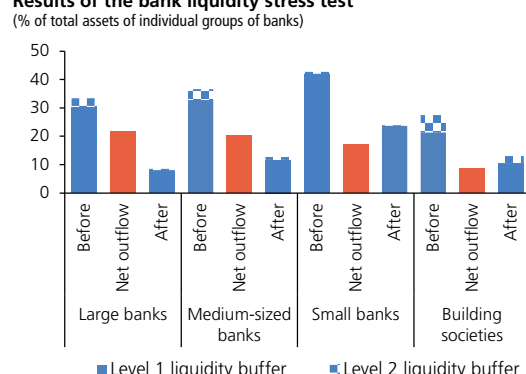
Source: CNB
Note: The column "Before" represents the pre-stress size of the liquidity buffer and the column "After" the post-stress size of the liquidity buffer. The column "Net outflow" represents the outflow of liquidity over the one-year horizon taking the liquidity inflow into account. The inflows are limited from above, i.e. a minimum net outflow of 10% of the expected outflow is assumed.

CHART IV.14

Selected funding sources of the domestic banking sector
(% of balance sheet; right-hand scale: %)
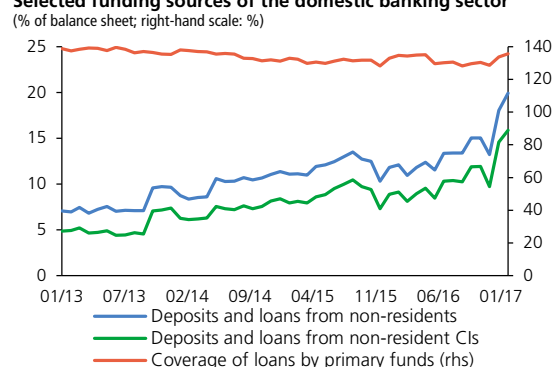
Source: CNB
Note: Coverage of loans by primary funds characterises the coverage of a bank's lending activities to non-bank clients by primary funds, i.e. deposits, loans and similar client liabilities. Claims on CNB and CIs are excluded. CIs: credit institutions.

CHART IV.15

Selected balance-sheet items of the domestic banking sector
(% of balance sheet)
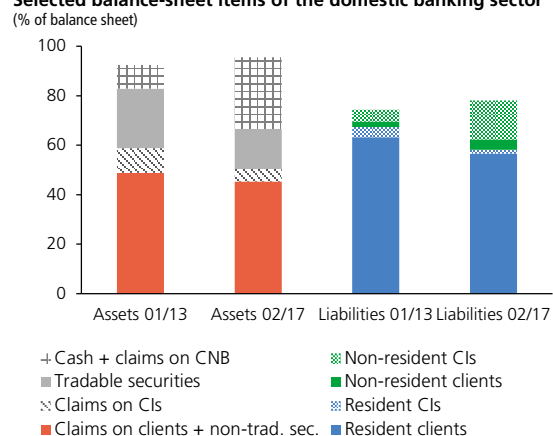
Source: CNB
Note: CIs: credit institutions.

CHART IV.16

Funding plans of domestic banks
(CZK trillions; right-hand scale: %)
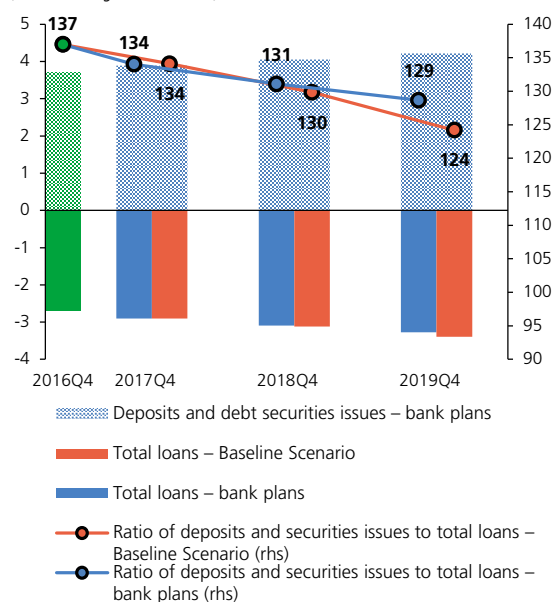
Source: CNB
Note: Includes loans and deposits to the private sector defined as households, non-financial corporations and financial institutions. Also includes debt securities with maturities equal to or more than three years. The green columns denote the position as of 2016 Q4; positive values are deposits and negative values are loans.

CHART IV.17

Comparison of planned and encumbered client deposits and loans
(CZK trillions; right-hand scale: %)

Source: CNB
Note: Clients comprise households and non-financial corporations. The simulation involves 8% year-on-year growth in loans and unchanged deposits. The green columns denote the position as of 2016 Q4; positive values are deposits and negative values are loans.

According to banks' plans, coverage of loans by primary funds will remain high in the future

In their end-2016 funding plans, domestic banks expect loans to the private sector to increase on average by 6.5% year on year, from CZK 2.7 trillion to around CZK 3.1 trillion at the three-year horizon (see Chart IV.16). They are planning to increase private sector deposits and issuance of debt securities with maturities of at least three years by almost 4.5%, from CZK 3.7 trillion to CZK 4.2 trillion. The planned funds of banks would sufficiently exceed their planned loans and would even cover credit growth over the entire three-year horizon in the *Baseline Scenario* (see section 2.1.3, Table IV.1 and Chart IV.16). The three-year outlook for the ratio of client deposits to loans, i.e. the coverage of loans by primary funds, also remains high (see Chart IV.17). This ratio would drop below 100% assuming slightly higher-than-planned growth in client loans (8%) and unchanged client deposits. Banks would be forced to cover the higher growth in loans with other funds, which might increase their costs. Following the planned amendment of the Act on Bonds,[30] issuance of covered bonds (mortgage bonds under the current law) could be a comparable alternative to retail deposits. The new law should provide holders of covered bonds with a higher degree of certainty that they will receive due claims in time and in full. This source of funding is currently not significant for the domestic banking sector.[31] At the end of March 2017, it amounted to around 8% of total liabilities on average for the banking sector as a whole (or around 3.5% excluding banks with specific models). The amendment should result in an increase in the credit quality of covered bonds and thereby boost investor interest.

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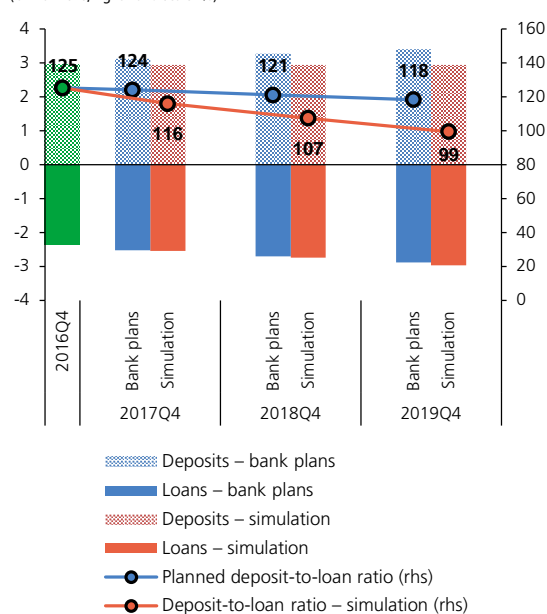
30 A draft law amending Act No. 190/2004 Coll., on Bonds, as amended, and other related laws, in particular the Insolvency Act and the Recovery and Resolution Act, was approved by to the government on 13 March 2017 and submitted to the Chamber of Deputies of the Parliament.

31 The exception is banks with specific business models, whose sole source of funding is issuance of covered bonds. Issues often take place within bank groups and are not held for trading.

4.3 THE HOUSEHOLD STRESS TEST

The household stress test confirms that low-income households and borrowers with a DSTI ratio of over 40% are highly sensitive to unfavourable economic developments and an increase in loan interest rates. Households with mortgages are especially vulnerable.

The household stress tests are based on the *Adverse Scenario* amplified by an increase in loan interest rates

The household stress test[32] focuses on the risk of overindebtedness households, whose potential debt service problems could transform into financial sector credit risk. Household overindebtedness here means an increased probability that a household will fall into arrears with its debt servicing obligations. It is defined with the aid of the ''financial reserve'', which represents households' net monthly income minus essential expenditures and loan instalments. A household is referred to as overindebted if its financial reserve is negative after the chosen scenario is applied. The pre- and post-shock shares of overindebted households are calculated for individual income groups.

The household stress test framework was used to simulate the impacts of the *Adverse Scenario* amplified by an increase in loan interest rates (*Amplified Adverse Scenario*). This scenario assumes the same evolution of macroeconomic variables as the *Adverse Scenario* in the banking sector macro stress test as of the end of 2017 (see section 4.1). It also assumes loan interest rates rise by 3 pp with a 40% mortgage refixation rate (see Table IV.6). The 40% refixation rate corresponds to the percentage of mortgages with a residual fixation period of up to and including one year.

Low-income households with mortgages are especially sensitive to financial stress

The results of the household stress test confirm the higher sensitivity of low-income households to potential adverse shocks. At the end of 2016, the pre-shock share of overindebted households with a net monthly income of less than CZK 25,000 was about 12%; households with mortgages accounted for about half of this figure (see Chart IV.18). After the *Amplified Adverse Scenario* was applied, the share of overindebted households with a monthly income of less than CZK 25,000 increased to about 16%. This was caused almost exclusively by a rise in the overindebtedness of households with mortgages. In other income groups, too, debt service problems in the event of adverse economic developments were encountered above all by households with mortgages. The increase in household overindebtedness is due to a combination of a fall in their net income and a rise in loan instalments.

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32 The household stress test is conducted using data for individual households from the Household Budget Statistics. The most recent available data are for 2015; the 2016 data are estimated. The methodology is described in detail in Galuščák, K., Hlaváč, P. and Jakubík, P. (2014): *Stress Testing the Private Household Sector Using Microdata*, CNB Working Paper 2/2014.

Key variables in the individual scenarios of the household stress tests
(end of period)

	2016	Baseline Scenario 2017	Amplified Adverse Scenario 2017
General unemployment rate (%)	3.8	3.6	5.5
Nominal wage growth (y-o-y, %)	4.7	5.4	-7.3
Inflation (y-o-y, %)	1.4	2.6	-0.6
Interest rate on mortgage loans (%)	2.7	2.7	5.7
Interest rate on consumer loans (%)	12.2	12.2	15.2
Interest rate on other loans (%)	3.8	3.8	6.8
Share of refixed mortgage loans (%)	40	40	40

Source: CNB
Note.: The 40% refixation rate corresponds approximately to the percentage of mortgage loans with a residual fixation period of up to and including one year.

Shares of indebted households by income group
(%; averages in individual income groups)
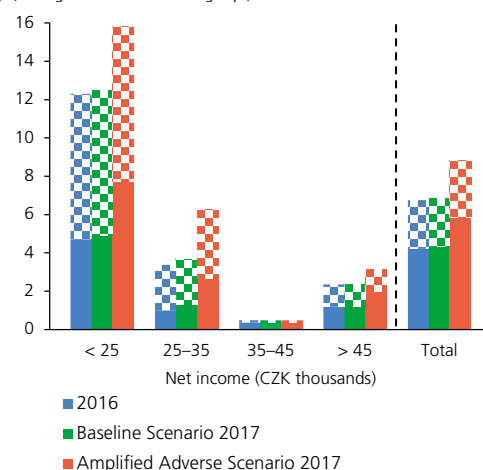
Source: CNB, CZSO
Note: Shares of households with loans. The solid part denotes the share of overindebted households with mortgages and the patterned part the share of overindebted households with loans other than mortgages.

CHART IV.19

Shares of overindebted households by DSTI ratio and income group in the *Baseline Scenario*
(%; averages in individual groups)
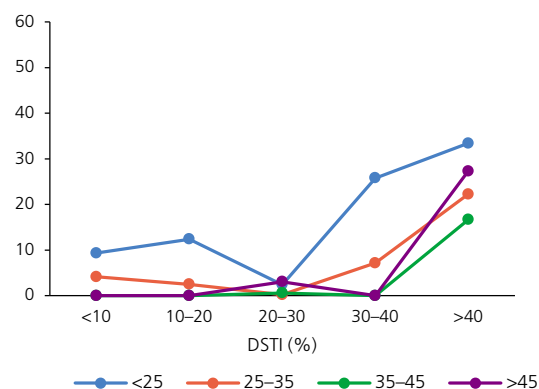
Source: CNB, CZSO
Note: Shares of households with loans. The individual curves divide households into income groups according to the net monthly income of the entire household in CZK thousands.

CHART IV.20

Shares of overindebted households by DSTI ratio and income group in the *Amplified Adverse Scenario*
(%; averages in individual groups)
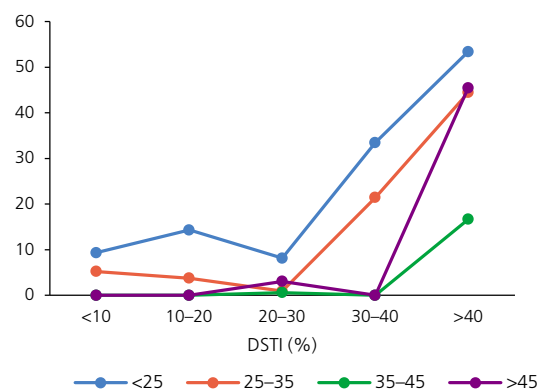
Source: CNB, CZSO
Note: Shares of households with loans. The individual curves divide households into income groups according to the net monthly income of the entire household in CZK thousands.

The significant growth in overindebtedness in the lowest income group is caused mainly by a low or zero pre-stress financial reserve.

Borrowers with a DSTI ratio of over 40% are also highly vulnerable to financial stress

In its Financial Stability Reports, the CNB regularly assesses the ability of debt-burdened households to repay their obligations in the event of extremely adverse economic developments. These analyses focus among other things on the impact of the simulated stress on households' debt service to income (DSTI) ratio. Previously, however, the analyses did not examine what debt burden can be considered excessive, or at what DSTI level Czech households become extremely sensitive to financial stress. For this reason, the stress test has been extended to include an analysis of the DSTI distribution of overindebted households.

The results reveal that the share of overindebted households with a DSTI ratio of over 40% is relatively high even before the stress scenario is applied (see Chart IV.19). Their sensitivity to the simulated stress is significantly higher than that of households with lower DSTI ratios, regardless of their net monthly income (see Chart IV.20). Loans provided to borrowers with a DSTI ratio of over 40% can therefore be regarded as highly risky. This conclusion is in line with the analyses of other central banks[33] and was used in the update of the *Recommendation on the management of risks associated with the provision of retail loans* (see section 5.3.1).

33 See ESRB (2017): *A Review of Macroprudential Policy in the EU in 2016*.

4.4 THE PUBLIC FINANCE STRESS TEST

The CNB assessed credit institutions' exposures to the Czech government as being systemically important. However, given the favourable results of the Czech public finance stress test, the CNB will not require these credit institutions to meet an additional capital requirement to cover the risk of concentration of these exposures over a three-year horizon.

The CNB reviews and evaluates the risks of concentration of sovereign exposures

Since 2015, based on its internal methodology, the CNB has been annually reviewing and evaluating the risks of concentration of exposures to sovereign issuers in balance sheets of credit institutions having their registered offices in the Czech Republic.[34] In its Financial Stability Reports it informs the market about which sovereign exposures it has identified as systemically important and whether it will require the relevant credit institutions to meet an additional capital requirement to cover the risk of concentration of these exposures over a three-year horizon. The methodology defines an important sovereign exposure as an exposure to a sovereign issuer with a minimum ratio of 100% to the credit institution's eligible capital. It becomes systemic if the assets of credit institutions with important sovereign exposures exceed 5% of the total assets of all the credit institutions included. It is indicated that an additional capital requirement must be met if the three-year outlook for the credit risk indicator of the sovereign issuer (sovereign risk indicator, ISR) exceeds one of its thresholds.[35] The CNB requires additional capital where the credit institution holds exposures in excess of the limit and this above-limit exposure is not already sufficiently covered by capital.[36]

The Czech public finance stress test methodology has been refined

The CNB partly adjusted the Czech public finance stress test methodology, which is used for projecting the main variables entering the ISR. The main change concerned the modelling of some types of government spending. Government expenditure (excluding pensions, unemployment benefits and interest expenditure) is now fixed at the level assumed by the CNB's fiscal forecast (see Table II.2.4, p. 20, Inflation Report I/2017) in the first year of the stress scenario.[37] These components of government expenditure therefore do not fall in the first year of the test even if adverse economic developments are expected. Conversely, indexation of current pensions may be lower than in the fiscal forecast, or even zero, in the second and third years of the stress scenario. These

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34 The internal methodology is described in FSR 2014/2015 and on the CNB website: *Internal CNB methodology for the review and evaluation of sovereign exposure concentration risk.*

35 The CNB primarily monitors two thresholds for the sovereign risk indicator (ISR): a soft threshold of 5% indicating the creation of an additional capital requirement where an additional expert analysis proves this to be necessary, and a hard threshold of 8% indicating unconditional creation of an additional capital requirements.

36 The above-limit part of a sovereign exposure is determined using the ISR where this indicator exceeds its thresholds. The ISR provides a simplified assessment of the risk of default on a sovereign exposure. The threshold separating the limit and above-limit parts of a sovereign exposure gradually falls as this indicator increases. As a result, the above-limit part rises. The highest effective limit is 222% and the lowest is 0%.

37 Inflation Report I/2017.

TABLE IV.7

Public finance stress test

| | 2016# | Adverse Scenario | | | Critical limit | |
		2017	2018	2019		
Macroeconomic variables						
Real GDP growth (%)	2.4	-2.3	-2.5	-1.1	<	-2.3
Current account balance (% of GDP)	1.1	1.9	1.2	0.6	<	-1.8
Gross national savings (% of GDP)*	28.1	28.1	28.1	28.1	<	19.3
External debt (% of GDP)*	74.7	74.7	74.7	74.7	>	99.6
Difference between real 10Y GB yield and real GDP growth (pp)	-2.7	3.0	7.5	4.5	>	6.3
Fiscal variables						
Government debt (% of GDP)	37.6	41.8	48.7	55.6	>	64.7
Primary balance (% of GDP)	1.0	-1.2	-3.0	-4.7	<	-3.2
10Y government bond yield (%)	0.4	1.7	2.5	3.2	>	10.8
Government debt maturing within one year (% of GDP)	5.6	7.8	8.7	9.3	>	19.0
Share of government debt maturing within one year (%)	15.0	18.8	17.8	16.7	>	21.7
Share of foreign currency debt (%)	15.3	15.1	11.1	9.9	>	27.1
Share of non-residents in debt holdings (%)*	48.8	48.8	48.8	48.8	>	34.9
Institutional variables						
Government effectiveness (WGI score)*	1.1	1.1	1.1	1.1	<	1.0
Political stability (WGI score)*	1.0	1.0	1.0	1.0	<	0.8
Rule of law (WGI score)*	1.1	1.1	1.1	1.1	<	1.2
Banking crisis*	No	No	No	No	=	Yes
Past sovereign defaults*	No	No	No	No	=	Yes
Sovereign risk indicator (ISR, %)	-	0.12	0.37	0.27		

Source: CNB, CZSO, ECB, World Bank
Note: The symbol > (< or =) denotes that a higher (lower or equal) value means breaching of the critical limit and indication of increased risk. The figures are rounded. Indications of breaching of the critical limit are based on unrounded figures. Where the limit is breached, the relevant variables are further indicated in red.
* Variable not modelled; last known value assumed in projection.
\# The data used are the values known when Inflation Report I/2017 was prepared.

changes brought the government's expected reaction in the stress scenario closer to its actual behaviour and increased the conservatism of the government debt and primary balance values included in the fiscal variables (see Table IV.7).

Exposures to Czech government debt were assessed as systemically important…

The CNB assessed domestic credit institutions' investments in Czech government bonds as a systemically important sovereign exposure. Although the value of these exposures dropped by CZK 281 billion at the end of 2016, at CZK 605 billion it still accounted for around 8.5% of these institutions' total assets and around 137% of their total capital. The assets of institutions with above-limit exposures accounted for 66% of the total assets of all the credit institutions under review. Exposures to other governments, the EU and the EIB were not found to be systemically important.

…but their riskiness did not exceed the thresholds

The ISR was estimated for systemically important exposures. Its three-year outlook was 0.27% (see Table IV.7) and did not exceed the supervisory thresholds of 5% and 8%. The CNB will therefore not require credit institutions having their registered offices in the Czech Republic to meet an additional capital requirement to cover the risk of concentration of exposures to the Czech government.

Few of the variables under review exceeded the critical limit…

Of the variables included in the ISR, the critical limit was exceeded not only by rule of law and the share of foreign holders of government debt (see section 2.1, Chart II.11), but also by real GDP growth and the difference between the real government bond yield and the rate of GDP growth (see Chart IV.21). The combination of a decline of the domestic economy and growth in interest rates resulted in the ISR peaking at 0.37% in 2018. However, a slowdown in the decline in GDP to 1.1% in 2019 caused the two macroeconomic variables to return below the critical limit. The ISR went down in 2019 even though the deficit increased and the primary balance, at -4.7%, exceeded the critical limit. The total government debt increased to 55.6% of GDP at the three-year test horizon. This deterioration in government finances primarily reflected lower tax revenues during the strong recession assumed in the *Adverse Scenario* (see section 2.1.3 and Table IV.1). The deterioration in public finances was also due to the reaction of financial markets in the form of growth in nominal yields on Czech government bonds, especially at the longer end of the koruna yield curve. The ten-year government bond yield rose to 3.2% at the three-year test horizon. However, the higher debt service costs had a relatively limited effect on growth in the total government debt due to its relatively low initial level.

…and the lower ISR level was also due to more favourable evolution of Czech government finances

Czech government debt recorded a year-on-year decline at the end of 2016. In relative terms, it has been decreasing since 2013, from 44.9% of GDP to 32.2% of GDP in 2016[38]. Since 2014 this decrease has been fostered by renewed economic growth and in 2016 also by a decrease in debt service costs (see section 2.1). The favourable trends in these variables reduced the impacts of the stress scenarios (see Chart IV.22) and were reflected in the three-year outlook for the ISR. It dropped from 1.27% in 2015 to 0.27% in 2017. The Czech government CDS spreads, which should reflect market perceptions of its credit risk, also decreased.

Regulation of exposures to sovereign issuers remains part of the international debate

The international debate about the regulation of banks' exposures to sovereign issuers continued within the BIS in 2016. A working group dealing with proposed changes to the treatment of sovereign exposures in international regulations has been active within the Basel Consultative Group (BCG) since 2015. A working sub-group tasked with surveying the treatment of sovereign exposures in emerging economies in the Pillar 1, 2 and 3 prudential regimes was set up under this group. The CNB joined this working sub-group in 2016 and was actively involved in the survey. The results were presented at the BCG meeting in Prague in October 2016. The heterogeneity identified in perceptions of sovereign risk across these countries requires further discussion.

A debate continues at EU level regarding the proposal to create sovereign bond-backed securities of EU Member States issued in euros. The debate includes preferential treatment of such securities in the regulatory framework in relation to government bonds issued by individual EU Member States. A related ESRB working group was established in 2016. The main task of the group, in which the CNB is represented, is to analyse the feasibility of this proposal. The CNB sees two sources of risks in the proposal. The first is the potential threat of market distortion if the regulations treat the proposed securities more favourably than government bonds of individual Member States without proper economic justification. The second is the high cost of changing the existing financial sector regulations if such a financial product is created.

Decomposition of the sovereign risk indicator in the Adverse Scenario
(%)

- Difference between real yield and real GDP growth
- Real GDP growth
- Primary balance
- Share of non-residents in debt holdings
- Rule of law
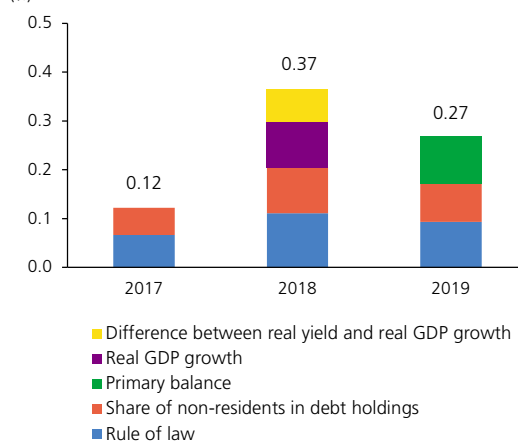
Source: CNB, World Bank

Comparison of the trajectories of public debt in the public finance stress tests
(% of GDP; right-hand scale: bp)

- Actual value
- Stress test 2015
- Stress test 2016
- Stress test 2017
- 5Y CDS spread (rhs)
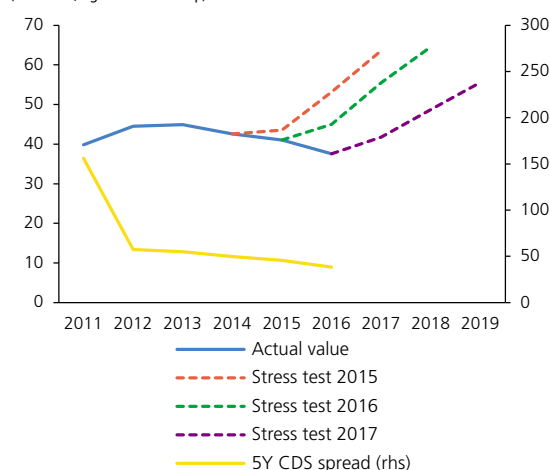
Source: CNB, Bloomberg, Thomson Reuters
Note: Year-end data.

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38 The difference from the 2016-end value used in the stress test (Table IV.7) is caused by subsequent statistical data revisions.

5 MACROPRUDENTIAL POLICY

The aim of this section is to describe the main risks to financial stability and to provide information about risk mitigation instruments. To this end, the text evaluates the risks stemming from the external environment, the current position of the Czech economy in the financial cycle, the resilience of the Czech financial sector to the risks identified, and the tasks and recommendations arising from analyses for macroprudential policy, microprudential supervision and other areas of economic policy. The first part explains the main tasks of macroprudential policy, reflecting key risk sources. The second part describes the settings of the capital buffers used to enhance the resilience of the Czech banking sector. The third part provides detailed information about risks relating to property exposures and describes current and potentially applicable instruments for mitigating those risks. The final, fourth part describes developments of macroprudential policy in the EU and in the national and international regulatory environment.

5.1 SOURCES OF SYSTEMIC RISKS AND MACROPRUDENTIAL POLICY INSTRUMENTS

The macroprudential dashboard indicates persisting potential sources of systemic risks

The macroprudential dashboard provides an overview of systemic risk sources which, if they materialised, could jeopardise future financial stability and the current resilience of individual sectors of the financial system (see Table V.1).[1] Potential sources of risks to financial stability are linked with the environment of low interest rates, increased credit growth and rapid growth in property prices. Further growth in household indebtedness coupled with loan interest rates staying at very low levels fostered an increase in households' sensitivity to potential adverse economic developments. Significant sensitivity is recorded mainly by households with low income and mortgage loans (see sections 4.3 and 5.3). Many of them might not withstand possible future stress in the form of a decline in income and a jump in interest rates, for example due to an external shock. A decline in average loan interest rates and rising maturity transformation resulted in a further increase in interest rate risk in the banking sector. Market liquidity risk remains elevated due to a rising share of non-residents in holdings of government debt coupled with limited market liquidity of government bonds (see section 2.1).

The risks to financial stability are currently being kept low in particular by the banking sector's ability to absorb shocks.[2]

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1   The methodology used to construct the macroprudential dashboard is described in Box 5 of FSR 2015/2016.
2   The macroprudential dashboard indicates a decline in the resilience of other non-banks, due mainly to a fall in the share of quick assets in funds' total assets and a rise in the leverage of non-bank financial corporations engaged in lending. Thanks to the small share of non-banks in financial sector assets, this poses no risk to financial stability.

The most significant risk to current developments is that of a continued spiral between property prices and property purchase loans

Apartment prices rose by 15% year on year as of the end of 2016. The amount of genuinely new mortgage loans increased by CZK 42 billion year on year in 2017 Q1 (see Chart V.1) and the year-on-year growth rate thus accelerated to almost 30%. The amount of new mortgage loans provided last year was almost three times the 2009 level. Such fast loan growth is not sustainable.

TABLE V.1

Macroprudential dashboard

RESILIENCE OF THE FINANCIAL SECTOR
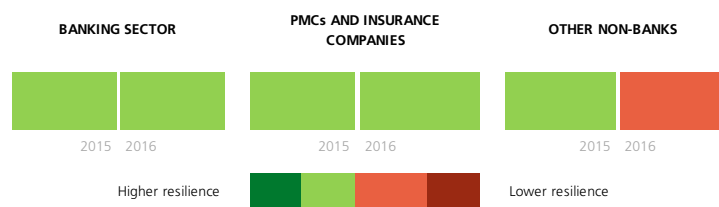
Source: CNB, CZSO
Note: The macroprudential dashboard is divided into two main areas describing the resilience of the financial sector and sources of risks to financial stability. The first area is backward-looking and assesses the change in the current resilience of the financial sector due to actual developments. The second area is forward-looking, as it assesses the strength of potential sources of risks to financial stability in the future. The indicators included in each category are given in an Appendix to this Report.

Apartment prices and new mortgage loans
(year-on-year growth in %; right-hand scale: quarterly totals in CZK billions)
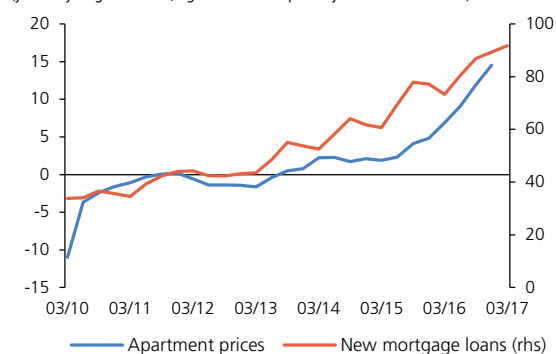
Source: CZSO, CNB, CNB calculation
Note: New mortgage loans comprise new loan agreements and increases in existing loans when refinancing.

Absolute changes in bank loans in selected segments
(CZK billions)
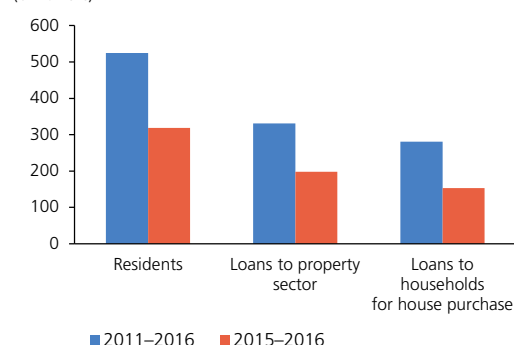
Source: CNB
Note: Loans to the property sector comprise loans to households for house purchase and loans to developers (NACE 411 and 68).

General lending standards in the Czech Republic
(difference in market share of banks in pp)
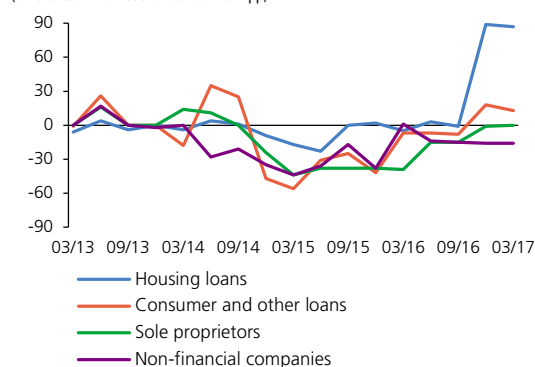
Source: Bank Lending Survey, CNB
Note: The data represent the difference between the market share of banks that reported a tightening of lending standards and banks that reported an easing of lending standards in the past three months. More information on the indicator methodology can be found on the CNB website.

The tighter LTV ratio in the CNB's Recommendation as from April 2017 (an upper limit of 90% with an aggregate limit of 15% for loans with LTVs of 80%–90%) will foster a slowdown in credit growth and a decline in these risks later this year. The increasing concentration of banks' credit exposures in the financing of property purchases and construction is another source of systemic risks. The stock of bank loans to residents (see Chart V.2) has increased by CZK 316 billion over the last two years. The real estate segment accounted for CZK 197 billion (62%) of that total. House purchase loans, in turn, made up CZK 153 billion (48%) of bank loans to residents.

The setting of LTV limits has resulted in tightening the lending standards applying to house purchase loans…
In June 2015, the CNB responded to the rise in potential systemic risks by issuing a *Recommendation on the management of risks associated with the provision of retail loans secured by residential property* (the "Recommendation"). A June 2016 update of the Recommendation tightened the upper limit on the LTV ratio in order to gradually reduce the share of new loans with LTVs of over 80% (see section 5.3). In the Bank Lending Survey, banks indicated that they had significantly tightened the lending standards applying to house purchase loans in 2017 Q1 due mainly to the decreasing LTV limit (see Chart V.3).[3] In the case of non-financial corporations, banks relaxed their credit terms and conditions in response to a favourable economic outlook, competitive pressure, low financing costs and a good liquidity position. Given the continuing shift of the economy into an expansionary phase of the financial cycle, the CNB will continue to carefully assess lending standards.

…given growing risks in the areas of debt and debt service, the CNB is extending the scope of application of the Recommendation to loans provided to consumers following the provision of a mortgage loan and to all credit providers
Property prices can be considered modestly overvalued in some regions. From the point of view of lenders, the mortgage loans currently being provided are riskier at a given LTV ratio than in previous years. The CNB responded to the expected increase in the riskiness of mortgage loans by tightening the LTV limits as of April 2017 (an upper limit of 90% with an aggregate limit of 15% for loans with LTVs of 80%–90%). The CNB will assess the compliance of providers with the tighter limit in December 2017 at the latest, and also the adequacy of the existing setting of its macroprudential instruments. In the current environment, characterised by optimistic expectations and low interest rates, compliance with all prudential standards and procedures in the provision of house purchase loans is crucial, especially the ones regarding the capacity of a debtor to repay the loan in less favourable economic environment. CNB analyses are indicating that a significant percentage of new mortgage loans have

3   CNB (2016): *Bank Lending Survey*, April.
    http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/en/bank_lending_survey/download/
    2017_q1_BLS_en.pdf.

highly risky characteristics in terms of applicants' incomes, such as DSTI ratios in excess of 40% (see Chart V.4) and DTI ratios in excess of 8. The indebtedness of households is relatively low in the Czech Republic compared to the euro area average (see Chart V.5), but it is steadily rising (see Chart II.42). In view of the potential risks associated with households getting deeper into debt, the CNB is extending the scope of application of the Recommendation to all consumer credit providers and to other loans provided subsequently to consumers with a mortgage loan (see section 5.3).

The domestic economy is shifting visibly into a growth phase of the financial cycle, to which the CCyB rate is responding…

The shift into a growth phase of the financial cycle is associated with an increase in cyclical risks, mainly as a result of continued high growth in loans, rising property prices and a persisting environment of low interest rates and easy lending standards. The CNB reacted to the shift of the financial cycle to a phase of stronger recovery in December 2015 by setting the countercyclical buffer (CCyB) rate at 0.5% with effect from January 2017. It stated in March 2017 that it stood ready to further increase the CCyB rate should cyclical risks grow. Due to continued growth in cyclical risks, the CNB Bank Board decided to increase the CCyB rate to 1% with effect from 1 July 2018 (see section 5.2.2).

…some sources of structural risks are also intensifying and the CNB is considering which instruments to use to mitigate them

Concentration of property market-related loan exposures is rising further in the banking sector. This, coupled with growth in household debt and property prices and a decline in mortgage loan risk weights set using internal models, is increasing the banking sector's vulnerability in the event of shocks. The risks in this area may also be intensified by changes in building societies' business models indicating greater risk-taking (see section 3, Box 1). If these risks rise further, CNB will be prepared to apply Article 164 of the CRR, i.e. to increase the minimum LGD level for IRB banks and thereby boost their resilience to shocks, even though no agreement has been reached at EU level on relevant regulatory and technical standards. If necessary, the CNB can also apply Article 458 of the CRR, which enables it to respond to macroprudential or systemic risks of this type by, among other things, regulating risk weights. The sources of structural risks also include government debt refinancing risk, which has also increased, albeit only slightly (for details see section 2.1.1).

A high loss absorption capacity of banks remains the basis of financial stability in the Czech Republic

A sudden drop in economic activity leading to large credit losses is still a constant risk to the domestic financial sector. Robust capital adequacy and prudential liquidity management remain the basis for absorbing such shocks and maintaining high confidence in the stability of the Czech banking sector. The banking sector remains in good shape. This is confirmed by solvency and liquidity stress test results (see sections 4.1 and 4.2). However, significant differences persist across institutions. Pension management companies are increasingly exposed to interest rate risk. This is placing higher requirements on the management of this risk.

DSTI distribution of new loans
(x-axis: DSTI in %; y-axis: share of loans in %)

■ 2015 H2　■ 2016 H1　■ 2016 H2
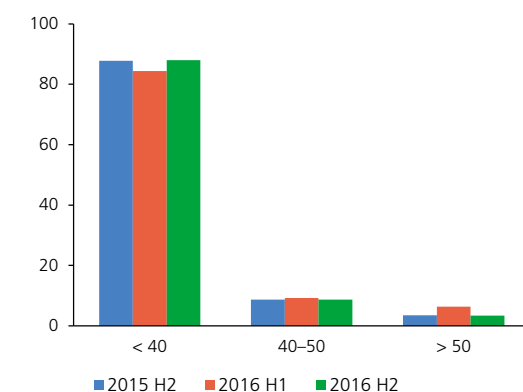
Source: CNB

Comparison of non-financial private sector debt and property prices in the Czech Republic and the EMU
(%)

■ CZ　■ EA
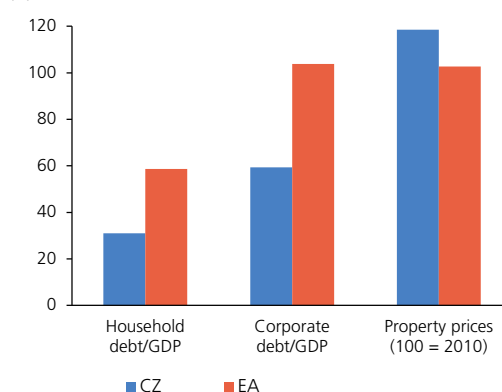
Source: BIS
Note: Property prices as of 2016 Q4, other data as of 2016 Q3.

Comparison of selected Czech and EU banking sector indicators
(%)
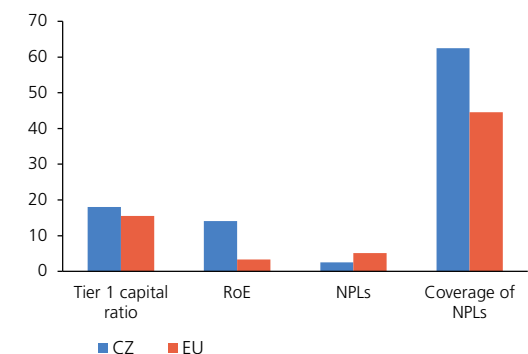
Source: EBA

Ratios of interest profit to capital and assets
(%)
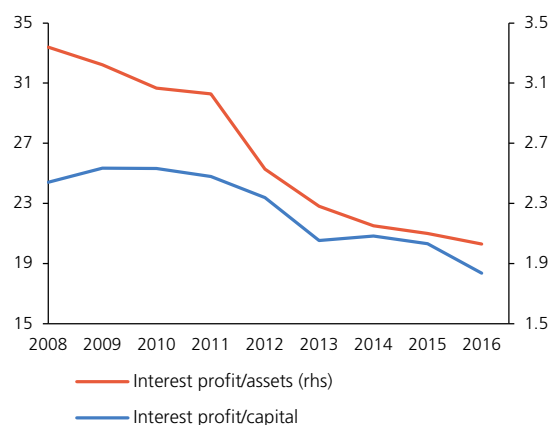
Source: CNB

Dynamics of NPL and loan loss provisions
(year-on-year change in %)
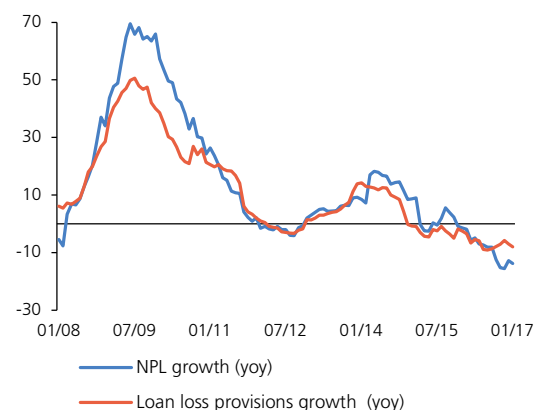
Source: CNB

PMCs should prudently assess the size of the impact of the potential rise in interest rates and the ensuing decline in prices of their debt security holdings and further strengthen their capitalisation for the purposes of absorbing potential shocks.

Banks should take advantage of high profitability and a low level of credit risk to strengthen their capitalisation…
The positive economic developments in 2016 were reflected in sustained high profitability and a reduction in credit risk in the banking sector. The profitability of the domestic banking sector remains high by international comparison (see Chart V.6) even though the ratios of interest profit to capital and assets have been falling since 2008 (see Chart V.7). The fall in interest profit is due mainly to low interest rates, which, by contrast, are positively affecting credit risk (see Chart V.8). Even so, exposures to non-financial corporations are still showing increased riskiness in some branches of activity (energy and construction). The generally low NPL ratio is reducing impairment losses and thus increasing the profit of the banking sector. Banks can use the profit to meet the increasing capital requirement for the countercyclical buffer without having to reduce their financing of any segments of the real economy.

…as potential risks to financial stability originate in good economic times
One of the best documented principles regarding the financial sector is that the biggest risks to financial stability originate in good economic times. A long period of robust economic growth in an environment of low interest rates generates optimistic expectations, due to which banks and their clients are willing to take greater risks. In such periods, it is vital for banks to manage credit risk highly prudently, assess collateral quality conservatively and to set aside sufficient loan loss provisions. A lower default rate in good times and the currently low risk costs cannot be interpreted as evidence of a low systemic risk level and high robustness of the system.[4] The CNB will continue to assess risks in the banking sector to ensure that the capital buffers are consistent with the level of systemic risk (for the settings of macroprudential instruments by risk type see Table V.2). Maintaining robust capital buffers is of particular importance for banks that are systemically important by dint of their position and character (see 5.2.3).

The CNB is paying a high degree of attention to changes in EU financial regulation and the banking union project
Within the European supervisory authorities, the CNB is actively involved in the preparation and implementation of the regulatory instruments and

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4   When a spiral is developing in the housing market, a low mortgage default rate cannot be used as an argument against tightening macroprudential instruments. Take, for example, the Irish banking crisis in 2007–2010. Immediately before the crisis struck in early 2007, the NPL ratio was almost zero, but during the crisis it surged to 25% (17% for loans for owner-occupied housing and 36% for buy-to-let loans). Just before the crisis broke out, two-thirds of mortgages for owner-occupied housing had an LTV of between 90% and 100% and one-third of them had an LTV of more than 100%. Like now in the Czech Republic, it was argued that no action was necessary because borrowers were repaying without any problems. The Irish government subsequently provided banks with assistance amounting to 40% of Irish GDP in 2008–2010 to avert a systemic crisis.

measures required by the CRD IV framework. Within the Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS) it participates in discussions on the development of standards for the banking sector. Within the European Systemic Risk Board (ESRB) it is involved in designing macroprudential policies. Stability of the regulatory framework remains the CNB's general priority. The CNB therefore responded actively to the Commission's November 2016 proposal containing legislative proposals for a change in the CRD IV/CRR legal framework and will continue to work closely with the Ministry of Finance in this matter. Of the regulatory changes under preparation, the CNB still views the minimum requirement for own funds and eligible liabilities (MREL) as crucial. Agreement has yet to be reached at EU level on the final version of the MREL rules. The CNB considers it vital for these rules to take conditions in national banking sectors and banks' individual business models and risk profiles into account.

TABLE V.2

Summary of intermediate objectives and macroprudential instruments and evolution of specific risks

Intermediate objectives	Key instruments	Specific risk	Existence of specific risk in CZ	Y-o-y change in intensity of specific risk	Applied in CZ	Detailed information
Mitigate excessive credit growth and leverage	Countercyclical capital buffer	Strong credit recovery accompanied by easing of lending standards	Yes	[red arrow ↗]	Yes, 0.5% since 2017, 1% since 2018	section 5.2.2
	Macroprudential leverage ratio	Rising leverage, low aggregate risk weights, rising off-balance-sheet risk	Potential	[yellow arrow →]	Microprudential component expected to be introduced in 2018	section 3.1
	Sectoral capital requirements (in particular real estate exposure)	Elevated growth of loans and risks in specific sector	Potential	[yellow arrow →]	Not as yet	section 5.3
	LTV caps	Risk of spiral between property prices and property financing loans	Yes	[red arrow ↗]	Yes, since 2015, tightened in 2016 and 2017	section 5.3
	LTI, DTI, DSTI caps	Risk of excessive household indebtedness and debt service	Yes	[yellow arrow →]	Not as yet	section 5.3
Mitigate excessive maturity mismatch and illiquidity	Macroprudential NSFR	Long-term liquidity risk	Potential	[yellow arrow →]	Microprudential component expected to be introduced in 2018	section 4.2
	Macroprudential LCR	Short-term liquidity risk	No	[black arrow →]	Microprudential component introduced in 2015	section 4.2
Limit exposure concentrations	Systemic risk buffer	Property exposure concentration	Potential	[yellow arrow →]	Not as yet, CNB reacts to property exposure risks with other instruments	sections 3.1 and 5.3
	Public finance stress test	Sovereign exposure concentration	Yes	[green arrow →]	Yes, option of additional capital requirements in event of elevated sovereign risk, since 2015	section 4.4
Limit misaligned incentives	SIFI capital surcharges (G-SII and O-SII buffer)	Potential impacts of problems in SIFIs on financial market stability and real economy	Yes	[black arrow →]	No, O-SIIs identified, different instrument applied	section 5.2.3
	Systemic risk buffer		Yes	[black arrow →]	Yes, since 2014 for four banks, since 2017 for five banks	section 5.2.3
Strengthen resilience of financial infrastructures	Margin and haircut requirements on CCP clearing	Counterparty default risk, interconnectedness of financial infrastructures	No	[black arrow →]	No	-
	Increased disclosure				No	-
	Systemic risk buffer				No	-

Source: CNB
Note: The classification of intermediate objectives and instruments is based on Recommendation of the ESRB of 4 April 2013 on intermediate objectives and instruments of macro-prudential policy (ESRB/2013/1). The macroprudential component of some instruments has not yet been incorporated into the legislation. The microprudential component of these instruments has been activated already (LCR) or is expected to be activated (leverage, NSFR).

Summary of capital buffers in the Czech Republic
(%)

Capital buffer	Rate	Year of effect
Capital conservation buffer	2.5	2014
Countercyclical capital buffer	1.0	2018
Systemic risk buffer	1 – 3	2014
Buffer for other systemically important institutions	-	-

Source: CNB

5.2 MACROPRUDENTIAL CAPITAL BUFFERS

5.2.1 OVERVIEW OF CAPITAL BUFFERS

Capital buffers are an important part of the bank regulatory framework in CRD IV/CRR. These buffers are "stacked" on top of the required 8% capital minimum and the Pillar 2 requirements (see section 3.1). The CNB currently applies three of them (see Table V.3) to increase the resilience of individual banks and the banking sector as a whole to any adverse developments. The buffer rates[5] reflect the cyclical and structural characteristics of the Czech banking sector.

The capital conservation buffer is used to absorb losses in adverse phases of the cycle. It has applied to all banks in the Czech Republic since 2014 at a rate of 2.5%.[6] This rate will not change over time. The countercyclical buffer applies to the domestic exposures of all banks and is intended to reduce the risks associated with excessive credit growth and leverage.[7] Information on the countercyclical buffer rate, along with an analysis of cyclical risks, is given in section 4.2.2. The systemic risk buffer can be used to suppress various sources of non-cyclical risks to banking sector stability. The CNB uses this buffer to mitigate the structural risks associated with the existence of systemically important banks. Information on the systemic risk buffer rate is given in section 5.2.3. The legislation also allows the CNB to apply a buffer for other systemically important institutions (O-SIIs). Information on O-SIIs is also given in section 5.2.3.

5.2.2 THE COUNTERCYCLICAL CAPITAL BUFFER

The countercyclical capital buffer (CCyB) is a pure macroprudential tool. It is designed to protect the banking sector against risks arising from its behaviour over the financial cycle, especially excessive growth in lending, which creates systemic risks and increases the potential for sharp swings in economic activity. The CCyB rate is set on a quarterly basis. It becomes legally binding on the institutions concerned upon the issuance of a provision of a general nature.[8] Methodological information summing up the CNB's approach to the setting of the buffer rate is presented in the thematic article *The Countercyclical Capital Buffer in the Czech Republic* published in this Report.

Current and announced CCyB rate in the Czech Republic
(% of total risk exposure)
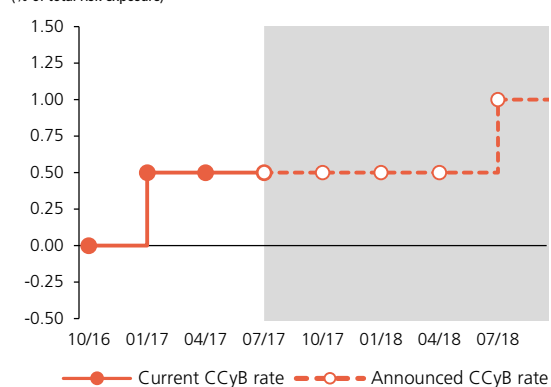
Source: CNB

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5   More detailed information about buffer rates and other macroprudential policy instruments in the Czech Republic can be found on the CNB website: http://www.cnb.cz/en/financial_stability/macroprudential_policy/index.html.
6   The buffer rate is expressed as the ratio of best-quality capital (Common Equity Tier 1) to the total risk exposure.
7   The principle of mandatory reciprocity of this buffer by EU banks having exposures in the Czech Republic applies within the EU.
8   Their texts are available on the CNB website: http://www.cnb.cz/en/financial_stability/macroprudential_policy/countercyclical_capital_buffer/index.html.

The CNB confirmed the buffer rate at 0.5% in March 2017

The CCyB rate for exposures located in the Czech Republic has been 0.5% since January 2007 (see Chart V.9). In March 2017, the CNB confirmed the buffer rate at this level (with effect from 1 April 2018). It stated that if credit growth remains high, lending standards ease and systemic risks grow, the CNB will stand ready to increase this buffer rate further. An assessment of the position of the economy in the financial cycle and systemic risk is conducted below using a set of simple and composite indicators, based on which the CNB Bank Board decided to increase the countercyclical buffer rate.

The deviation of the credit-to-GDP ratio from its trend remains an unreliable financial cycle indicator for the Czech Republic

According to an ESRB Recommendation[9], the CNB is obliged to regularly publish the credit-to-GDP ratio and the corresponding deviation of this ratio from its long-term trend. In 2016 Q4, the ratio[10] was 90.6% and the corresponding gap 1.4 pp. These values indicate that the economy is in a modest recovery phase of the financial cycle (see Chart V.10). An alternative gap – the expansionary credit gap – indicates gradual growth in cyclical risks in 2016. However, the picture given by the two types of gaps has been affected to a large extent by the faster growth in economic activity over the last two years and generally does not provide a reliable guide for determining the position of the Czech economy in the financial cycle.

The aggregate financial cycle indicator increased further in 2016, with faster dynamics in some components

The aggregate financial cycle indicator (FCI), which combines signals of cyclical risks from various segments of the economy, showed a further increase in 2016 (see Chart V.11). Besides a recovery in segments previously characterised by subdued activity, the continued growth in the aggregate indicator was due to an increase in the correlation between components (e.g. loans to households and property prices). This points to rising interconnectedness of supply and demand factors and a possibility of increasing feedback between them. Cyclical risks are growing sharply in the household sector in particular. The contribution of new koruna loans to households to FCI growth was close to a historical high in 2016 Q4, and the speed of household borrowing relative to income has been increasing gradually since the end of 2014. Intensifying growth in cyclical risks is also being fostered by rapid growth in residential property prices. In 2016 Q4, the year-on-year rate of growth of apartment prices reached 14.5%, about three times the ten-year average. The speed of borrowing by non-financial corporations (relative to gross operating surplus) was twice the ten-year average in 2016 Q4 (1.2%). Banks

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9 European Systemic Risk Board: Recommendation (ESRB/2014/1) on guidance to EU Member States for setting countercyclical capital buffer rates, January 2014.

10 The original amount of total loans to the private sector increased by about CZK 500 billion owing to a switch to the ESA 2010 methodology and the new BPM6 balance of payments manual. The increase is due mainly to different reporting of cross-border loans (net vs gross reporting). The credit-to-GDP ratio rose by around 13 pp in 2016 Q4 as a result of the change in methodology. The methodological change affected the entire time series.

Credit-to-GDP gap and additional gap
(pp)
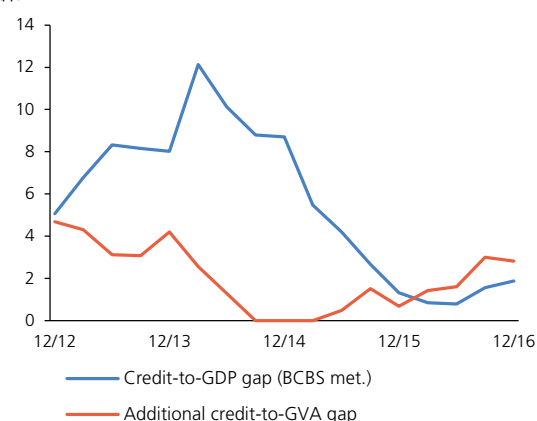
Source: CNB
Note: In the case of the standard deviation, the trend is estimated on the basis of the HP filter (lambda = 400,000) over the entire time series. The additional gap – the expansionary credit gap – is calculated as the difference between the ratio of bank loans to the gross value added (GVA) of the non-financial private sector and the moving minimum over the last eight quarters.

CHART V.11

The financial cycle indicator (FCI) and its components
(0 minimum, 1 maximum)
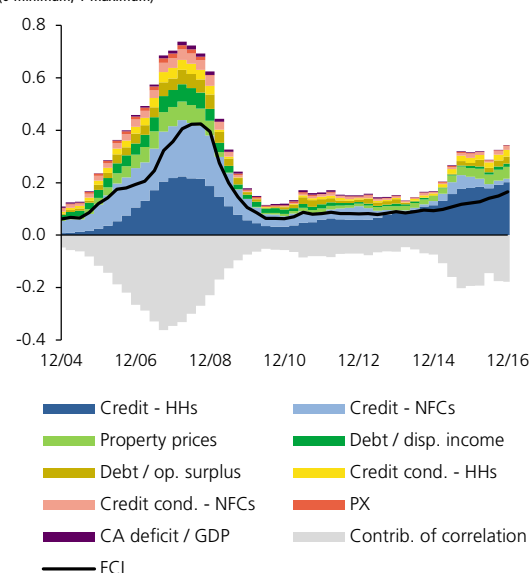
Source: CNB, CZSO
Note: The negative contribution of the cross-correlation structure to the FCI value (the loss due to imperfect correlation of the subindicators) is due to the difference between the current FCI value and the (potential) upper bound, which assumes perfect correlation between all indicators. Weak correlation between the subindicators is reflected in growth in the negative contribution to the overall FCI value.

Absolute year-on-year change and growth in bank loans to the private non-financial sector
(CZK billions; right-hand scale: %)
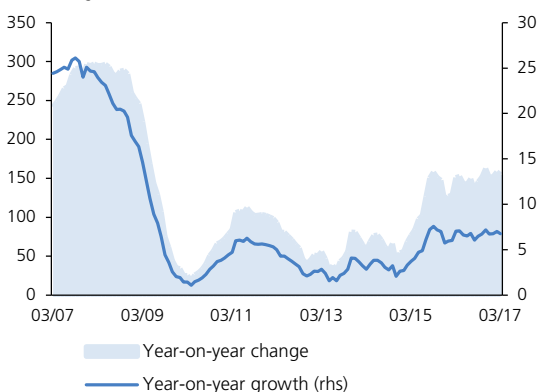
Source: CNB

Year-on-year growth in bank loans to the private non-financial sector
(%)
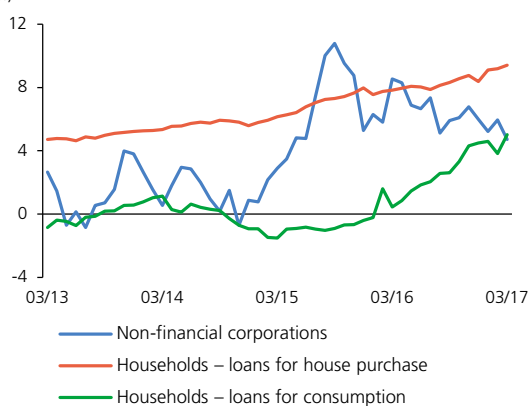
Source: CNB

Average and current growth in bank loans to the private non-financial sector
(%)
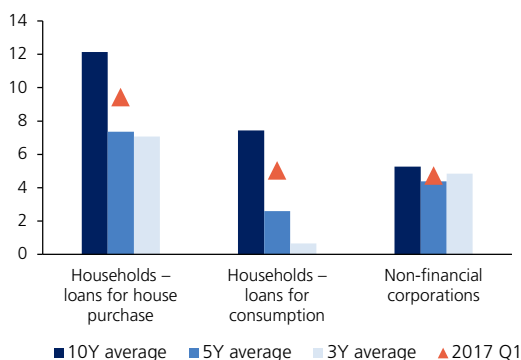
Source: CNB

indicated in 2016 Q4 that lending standards for loans to households were – for the first time since 2014 – tightened across the board due to legislative and regulatory changes (see Chart V.3 in section 5.1). However, this indication is not fully in line with the data obtained by the CNB in the *Survey of new loans secured by residential property* (see section 5.3). Standards applied to loans to non-financial corporations eased further.

Growth in total loans was affected by faster growth in bank loans
Growth in total loans to the private sector (comprising all loans plus bonds issued) accelerated. Total loans went up by 5.4% in 2016 Q4, the largest rise since 2014. This was due mainly to faster year-on-year growth in bank loans. The year-on-year growth rate of these loans reached 6.7% in 2017 Q1, the highest absolute figure since 2009 Q2 (see Chart V.12). This growth was driven by the household sector (see Chart V.13): the biggest increases were recorded for loans to households for house purchase (9.4% in 2017 Q1). The growth rate of consumer credit has also been rising since 2016 Q1 (5.0% in 2017 Q1). Credit growth in non-financial corporations slowed slightly in 2016 and early 2017, but stayed at the historical averages and can be evaluated as above-average compared to the situation in other European countries (4.7% in 2017 Q1; see Chart V.14).[11]

Growth in new bank loans is being driven by the household sector
Data on genuinely new koruna loans also confirm high lending activity (see Chart V.15). The highest increases are being recorded for loans to households for house purchase, where the year-on-year growth rate (as measured by the three-month moving average) was 29.0% in March 2017. Genuinely new loans to households for consumption rose by 5.6% year on year in March, while those to non-financial corporations fell by 17.3%. The sizeable decline recorded for non-financial corporations can be explained by a shift in part of the sector towards foreign currency loans, which are not included in the statistics on genuinely new loans. Previous quarters had seen a big surge in foreign currency loans, associated mainly with natural hedging against exchange rate risk (see section 2.3). As a result, short-term koruna loans (operating loans and loans for current assets) are recording a year-on-year decline, while long-term koruna investment loans are rising.

The domestic economy recorded a further shift into a growth phase of the financial cycle…
The above indicators can be interpreted overall as meaning that the Czech economy has shifted further into a growth phase of the financial cycle. This phase is characterised by rapid growth in loans in a number of credit segments. The faster growth in loans is also affecting property prices, which the CNB currently assesses as being modestly overvalued. Despite tighter macroprudential measures aimed at mitigating risks

11 Higher annual growth rates of loans to non-financial corporations (as measured by the three-year average) are currently being reported only by Luxembourg (a specific case), Estonia and Poland. European Systemic Risk Board: *Risk Dashboard*, March 2017.

relating to the residential property market (see section 5.3), credit growth in this segment remains strong and conditions are in place for further development of the spiral between property prices and property purchase loans. Owing to higher growth in loans to non-financial corporations in the real estate segment (see section 2.3), the vulnerability of the entire sector to adverse developments in this market and to income and interest rate shocks is thus continuing to rise. This assessment implies a need to create a countercyclical capital buffer for exposures located in the Czech Republic.

…consistent with which is an increase in the countercyclical buffer rate

In several previous settings of the CCyB rate level, the CNB pointed out that it stood ready to increase the rate further if credit growth remained high, lending standards eased and systemic risks grew. Credit growth remains strong despite a partial tightening of credit conditions in the past two quarters. Given the risks to banks' future profitability identified (see section 3.1.1), banks can be expected to strive to maintain their current profitability levels by increasing the amount of new loans in the economy. This may be reflected in a further rise in property prices above levels consistent with fundamental factors. As a result, systemic risks and the potential for future sharp swings in economic activity are increasing. In the spirit of the existing regulatory framework, it is essential to respond to such developments by raising the countercyclical buffer rate.

The CNB's quantitative approaches confirm the need for an increase in the CCyB rate

An indication of the desirable CCyB rate level is provided by a set of analytical approaches presented in greater detail in the above-mentioned thematic article of this Report. The first approach is based on the FCI, which exceeded 0.16 in 2016 Q4. According to the conversion applied by the CNB, this corresponds to a CCyB rate of 1.0% (see Chart V.16 and Table V.4). This rate is consistent with a rule of thumb which states that the CCyB rate should be increased by 0.5 pp in each year of the expansionary phase of the financial cycle. According to the CNB's analyses, the Czech economy is in the second year of the expansionary phase, so according to the above rule the CCyB rate should be 1.0%. An approach based on a macro stress test of banks which aligns modelled future credit losses with the capital buffer sufficient to cover them indicates a need for a CCyB rate of 0.75%. The final decision on the CCyB rate is not based on mechanical application of the said approaches and always takes into account the results of a comprehensive assessment of systemic risks.

The CNB decided to increase the countercyclical capital buffer rate to 1.0% with effect from July 2018

In line with the above assessment, the CNB Bank Board decided at its meeting on 25 May 2017 to increase the countercyclical buffer rate to 1.0% with effect from 1 July 2018. However, if credit growth remains

CHART V.15

Amounts of genuinely new loans to the private non-financial sector
(CZK billions)

Loans for house purchase / Investment loans
Consumer credit / Operational loans
Other loans / Loans for current assets
Other loans
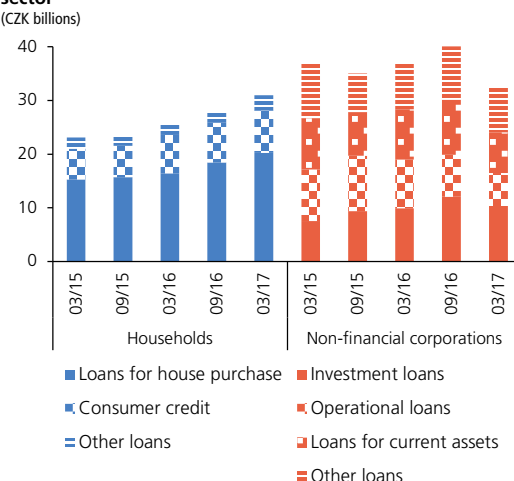
Source: CNB
Note: Genuinely new loans also include increases in existing loans.

CHART V.16

The FCI and the implied CCyB rate
(0 minimum, 1 maximum; rhs: % of total risk exposure)

Aggregate FCI — Implied CCyB rate (rhs)
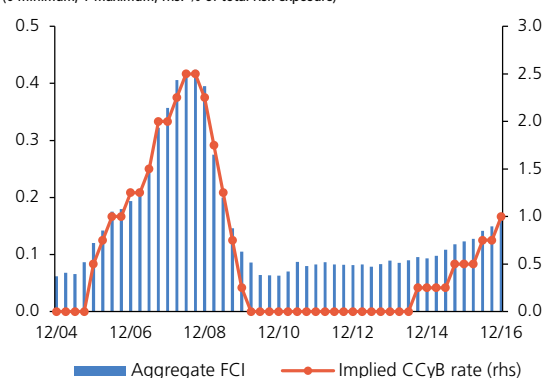
Source: CNB

TABLE V.4

The implied CCyB rate based on various approaches
(% RWA)

Approach	Implied CCyB rate
Conversion based on FCI values	1.00%
Conditional distribution of future credit losses	0.75%
Duration of expansionary phase of cycle	1.00%

Source: CNB

high, lending standards ease and systemic risks relating to the financing of property purchases grow, the CNB will stand ready to increase this buffer rate further.[12]

Other European countries also responded to the shifts in the cycle with changes in CCyB rates

A total of five European countries had set a non-zero CCyB rate at the end of March 2017 (see Table 2 in the said thematic article). In three of them (except CZ), macroprudential authorities have raised the rate further.[13] In all cases, the increase in the CCyB rate was due to a shift of the economy further into an expansionary phase of the financial cycle characterised by growth in loans to households, high indebtedness of households and rising property prices.

Russia and Turkey were identified as material for the Czech Republic in relation to the recognition of CCyB rates in third countries; they will be monitored by the ESRB

In addition to automatic recognition of CCyB rates among EU Member States up to a level of 2.5%, the ESRB introduced a unified methodology for setting CCyB rates for exposures to third countries.[14] Under this methodology, Member States should monitor in detail and assess cyclical risks in third countries to which the domestic banking sector has material exposures.[15] If increased cyclical risks are identified in the countries monitored, Member States should set the CCyB rate for those exposures in accordance with the ESRB Decision. The Russian Federation and Turkey were identified as material for the Czech Republic. At the pan-European level, the ESRB applies a similar approach to countries which are material for the EU as a whole. The ESRB also issues recommendations in respect of such countries for EU Member States regarding the setting of the CCyB rate. Since the Russian Federation and Turkey are countries which are material for both the Czech Republic and the EU as a whole, the CNB exercises the option of not conducting its own monitoring for these countries and complies fully with the ESRB recommendation when setting the rate on relevant exposures.

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12 The Czech economy entered the expansionary phase in 2015 Q4 (see *Provision of a general nature on setting the countercyclical capital buffer rate* No. IV/2015 of 3 December 2015). If credit growth remains high, the Czech economy will enter the third year of the expansionary phase in 2017. A CCyB rate of 1.5% would be consistent with this development.

13 Norway, Sweden and Iceland also increased their non-zero CCyB rates. Further information on CCyB rate levels in European countries is available at: https://www.esrb.europa.eu/national_policy/ccb/all_rates/html/index.en.html.

14 "Third countries" means non-European Economic Community countries (i.e. countries other than EU Member States, Iceland, Norway and Liechtenstein).

15 Under ESRB Decision 2015-3 on the assessment of materiality of third countries for the Union's banking system in relation to the recognition and setting of countercyclical buffer rates, countries shall be identified as material for a given Member State in the following two circumstances: (i) the arithmetic mean of exposures to the third country in the eight quarters preceding the reference date was at least 1% for at least one of three metrics (risk-weighted exposure amounts, original exposure and, defaulted exposures); (ii) the exposures in each of the two quarters preceding the reference date were at least 1% for at least one of the metrics.

5.2.3 CAPITAL BUFFERS OF SYSTEMICALLY IMPORTANT INSTITUTIONS

The systemic risk buffer

CRD IV gives the option of applying a systemic risk buffer (SRB) as a relatively flexible tool primarily for preventing non-cyclical risks. The CNB uses the SRB to prevent systemic risk arising from the potential destabilisation of systemically important banks. The destabilisation of any of these banks could undermine confidence in the banking sector's ability to provide its services effectively, which, in turn, could have serious repercussions for the financial system and the entire Czech economy.

The CNB's decisions on which banks will be required to maintain an SRB, and at what rate, are based on an estimate of the systemic importance of each bank. This estimate draws on a range of indicators describing four key parameters of the bank: size, complexity, substitutability for the economy and interconnectedness with other financial institutions.[16] The CNB set SRB rates for the first time in 2014 for the four systemically most important banks. The CNB is required by law to review its reasons for setting the SRB once every two years. The first regular review of the set of banks required to maintain the systemic risk buffer was conducted in 2016, using end-2015 data. The number of systemically important banks with the SRB rose from four to five and the buffer was increased for two banks. With effect from 1 January 2017, the SRB is 3% for Česká spořitelna, ČSOB and Komerční banka, 2% for UniCredit Bank and 1% for Raiffeisenbank. The CNB will further revise the set of banks required to maintain the SRB and the level of the buffer rate to be applied by them at least once every two years.

The capital buffer for other systemically important institutions

Since 2015, the CNB has been required by law to identify other systemically important institutions (O-SIIs) and to review the list at least once a year. Like the first list of O-SIIs, the first review in November 2016 was based fully on the methodology defined by the relevant guidelines of the European Banking Authority (EBA).[17] It calculates scores governing the designation of entities as O-SIIs for all relevant institutions at the highest consolidation level. As a result, only regulated consolidated groups, not directly banks that are members of such groups, may be designated as O-SIIs.[18] This consolidation may cover banks and selected non-banks, including subsidiaries in other countries. The CNB applies the option of exempting investment firms from the calculation, because this segment does not play a systemically important role in the Czech financial system. In line with the guidelines, the CNB raised the threshold

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16 See the thematic article *An Additional Capital Requirement Based on the Domestic Systemic Importance of a Bank* in Financial Stability Report 2012/2013.
17 Guidelines on the criteria to determine the conditions of application of Article 131(3) of Directive 2013/36/EU (CRD) in relation to the assessment of other systemically important institutions (O-SIIs).
18 In this respect, the methodology for identifying O-SIIs differs fundamentally from the methodology the CNB uses to identify the set of institutions (banks, not regulated consolidated groups) which the CNB requires to fulfil the SRB (see section 5.2.3).

Comparison of O-SII scores for mid-2015 and mid-2016
(%)

CNB threshold 4.25%
Base threshold 3.5%

■ 2015 ■ 2016
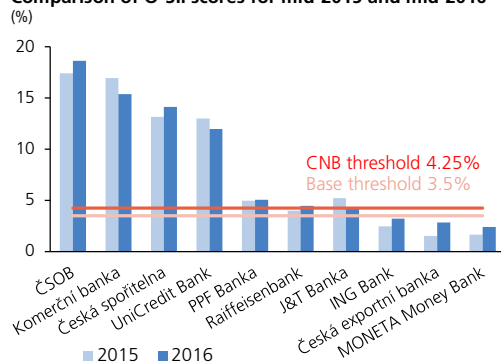
Source: CNB

CHART V.18

Apartment price gaps according to various methods
(%)

— Supply and demand model
— Adjusted price-to-income ratio
— Adjusted price-to-rent ratio
— Accelerator model
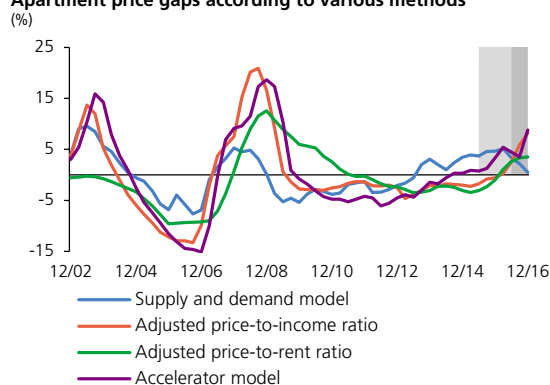
Source: CZSO, IRI, MRD, EC, CNB calculation
Note: The light and dark grey areas indicate, respectively, the periods since the entry into force of the CNB's June 2015 and June 2016 Recommendation on the management of risks associated with the provision of retail loans secured by residential property.

CHART V.19

Alternative estimate of apartment price overvaluation and LTV limits
(overvaluation in %; right-hand scale: LTV in %)

— Apartment price overvaluation
— Aggregate LTV limit (rhs)
— Individual LTV limit (rhs)
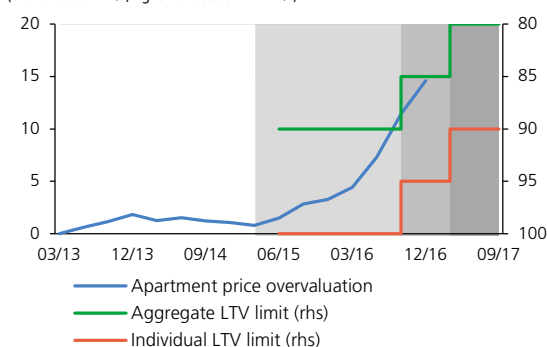
Source: CZSO, CNB, CNB calcualtion
Note: The overvaluation of apartment prices was obtained as the difference between the growth in those prices since the last day of June in 2013 Q1 and the growth in wages since the same date. The grey areas indicate, respectively, the phases of the entry into force and tightening of the recommended LTV limits in the CNB's June 2015 and June 2016 Recommendation on the management of risks associated with the provision of retail loans secured by residential property.

for designating entities as O-SIIs from the base level (350 bp, i.e. 3.5%) to the highest level allowed by the guidelines (425 bp, i.e. 4.25%).

Based on the review conducted in November 2016 (using mid-2016 data), the list for 2017 was unchanged. The following regulatory consolidated groups remain O-SIIs: Československá obchodní banka, Komerční banka, Česká spořitelna, UniCredit Bank Czech Republic and Slovakia, Jakabovič & Tkáč (relevant entity of the regulated consolidated group: J&T banka), PPF FH B.V. (relevant entity of the regulated consolidated group: PPF banka) and Raiffeisenbank. Only the scores of the individual consolidated groups changed (see Chart V.17).

Under the Act on Banks, an additional capital requirement can be imposed on a bank that is a member of a regulated consolidated group designated as an O-SII. However, the CNB does not regard this as necessary at the moment. Since 1 October 2014, banks with a high level of domestic systemic importance have been required to maintain a systemic risk buffer. Depending on developments in European legislation, however, this buffer may in the future be converted into a buffer for O-SIIs (for details see section 5.4.2).

5.3 RISKS ASSOCIATED WITH PROPERTY MARKETS

5.3.1 RISKS ASSOCIATED WITH RESIDENTIAL PROPERTY MARKETS

The overvaluation of property prices is increasing, as is transaction activity

Residential property prices were slightly above the level consistent with fundamentals at the end of 2016.[19] Two of the approaches employed by the CNB to assess house price sustainability[20] were indicating that house prices were overvalued by 8%–9% (see Chart V.18). An alternative metric based on the income affordability of housing was indicating greater overvaluation. This assessment, comparing growth in house prices since the last price trough (recorded in 2013 Q3 with wage growth, was indicating overvaluation of more than 14%, with year-on-year growth of 11% (see Chart V.19). The rising growth in residential property prices was accompanied in 2016 by growth in the number of loan-financed residential property transactions (see Chart V.20).[21] According to data from the *Survey of new loans secured by residential property* conducted by the CNB (referred to hereinafter in part of section 5.3.1 as the "Survey" and "secured loans"), these loans – including refinanced ones –

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19 Property price fundamentals include macroeconomic variables, labour market indicators, demographic characteristics and financial market indicators or indicators of housing supply. Market prices are also affected by non-fundamental, often psychological and behavioural, factors, such as mass hysteria and self-fulfilling expectations.

20 The CNB uses four model-based and statistical approaches to assess house price sustainability – see Hlaváček and Hejlová (2015): *A Comprehensive Method for House Price Sustainability Assessment*, FSR 2014/2015.

21 The source of these data is the *Survey of new loans secured by residential property*. Data are available since 2014. An indicative breakdown between Prague and other districts has been available since 2015 Q3.

amounted to CZK 133 billion in 2016 H2. In year-on-year terms, they were up 5% in Q3 and more than 20% in Q4. The average loan size increased by 4% in 2016 H2.[22] Year-on-year growth in the number of loans was similar in Prague and the rest of the Czech Republic. This was linked with balanced growth in property prices in the two parts of the country monitored.

High asking prices of apartments are indicating the risk of a continued price spiral

Until last year, the apartment price trend was characterised by faster growth in asking prices than transaction prices (see section 2.2). While asking prices in Prague as of the end of 2016 recorded cumulative growth of 34% compared to their previous lows (44.5% for data not adjusted for the rapid growth in 2012[23]), transaction prices were 28% higher on the same date.[24] A sustained lead of asking prices over transaction prices could lead to self-fulfilling expectations of future price growth and a price spiral.

The CNB reacted to the risk of a price spiral by tightening its Recommendation

In June 2016, the incipient overvaluation of property prices, the high rate of growth of new loans and the significant proportion of new loans with a combination of higher loan-to-value (LTV), loan-to-income (LTI) and debt service-to-income (DSTI) ratios, led the CNB to tighten the LTV limits contained in its June 2015 *Recommendation on the management of risks associated with the provision of retail loans secured by residential property* ("Recommendation"). The recommended LTV limit ("individual limit") of 100% (with a 10% limit for loans with LTVs of 90%–100%, "aggregate limit") was lowered to 95% (with a 10% limit for loans with LTVs of 85%–95%) as from 1 October 2016 and to 90% (with a 15% limit for loans with LTVs of 80%–90%) as from 1 April 2017. The reduction of the LTV limits is consistent with the rise in the estimated overvaluation of apartment prices (see Chart V.19), which is leading to an increase in the riskiness of mortgage loans for the providers of such loans.

The limits in place until 1 October 2016 were mostly complied with…

In the first three quarters of 2016, institutions mostly observed the LTV limits. In the third quarter, as in the first half of the year, loans with LTVs of over 100% accounted for 3% of all new loans provided (see Chart V.21).[25] Loans with LTVs of 90%–100% accounted for 7% of total loans provided in Q3 (9% in the first half of the year), which meant

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22 The average loan size was approximately CZK 1.8 million in 2016 Q2.
23 According to the CZSO, asking prices of apartments in Prague recorded rapid year-on-year growth in 2012. As these prices went down according to alternative estimates, however, this could be just a statistical anomaly in the CZSO data.
24 The average difference between asking and transaction prices in Prague cannot be determined exactly – information on such prices is only available in the form of a price index measuring their relative growth, not their absolute level.
25 This amount corresponds to the 3% exemption from the limits contained in the compromise version of the proposed amendment to the Act on the CNB concerning the power to set limits on the LTV, DTI and DSTI ratios, which is currently in the legislative process.

Volumes and numbers of credit-financed residential property transactions
(CZK billions; right-hand scale: thousands)
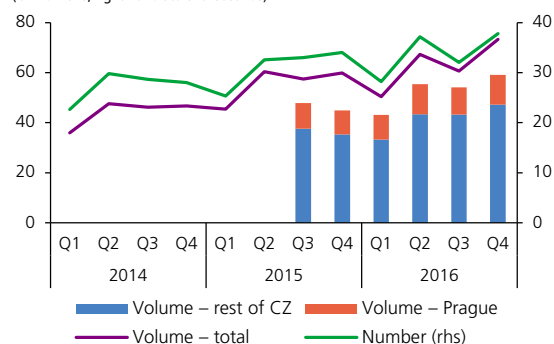
Source: CNB
Note: For some new loans, the Survey lacks postcode data for the properties used as collateral for those loans. These "unclassified" loans account for the difference between the total volume of transactions and the volume of transactions in Prague and the rest of the Czech Republic.

Fulfilment of the recommended LTV limits
(x-axis: LTV in %; y-axis: share of loans in %)
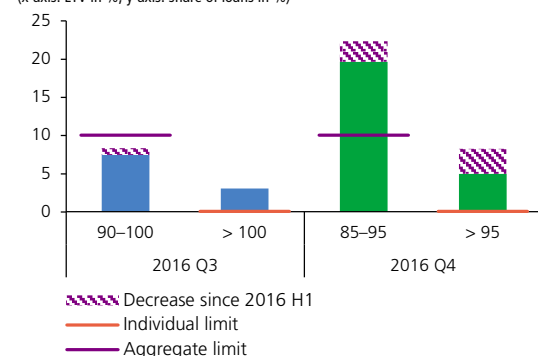
Source: CNB
Note: The share of loans with LTVs of over 100% in 2016 Q3 was unchanged from 2016 H1.

Share of loans with LTVs above the recommended limits
(LTV in %; y-axis: share of loans in %)
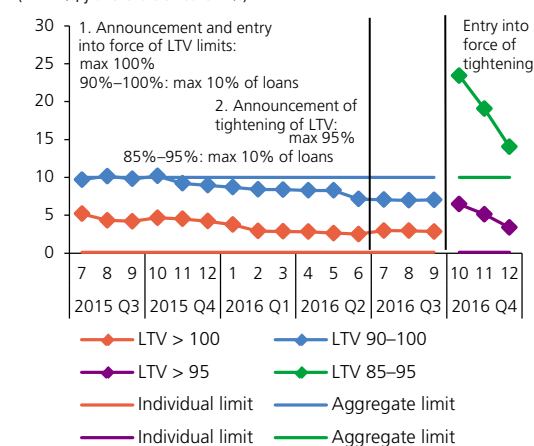
Source: CNB

LTV distribution of new loans
(x-axis: LTV in %; y-axis: share of loans in %)
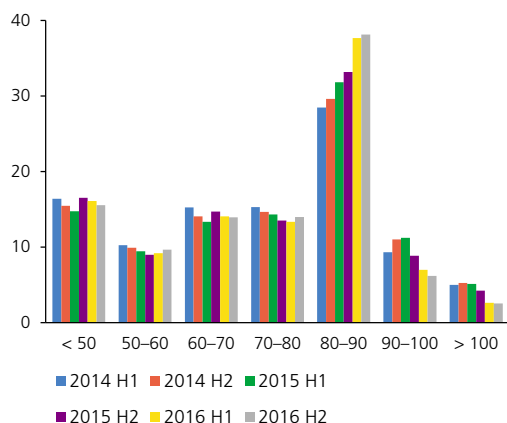
Source: CNB

Characteristics of loans in selected LTV categories
(x-axis: LTV in %; y-axis: share of loans in %)
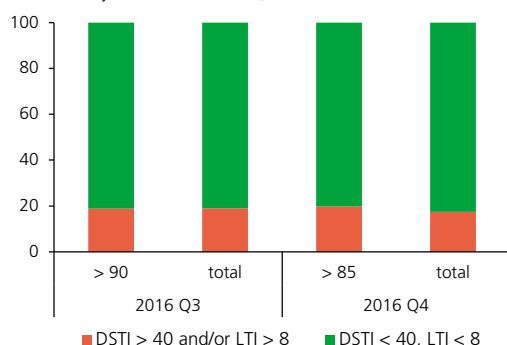
Source: CNB

LTI distribution of new loans, average interest rate
(x-axis: LTI; left-hand scale: share of loans in %; right-hand scale: interest rate in %)
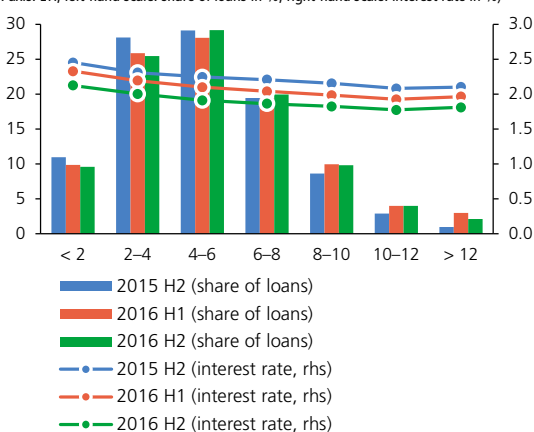
Source: CNB

that that their limit (10%) was fulfilled at the aggregate level. However, there are still differences between institutions in their compliance with the Recommendation. The CNB responded to some of those differences in the past by imposing measures in the area of the Pillar 2 capital requirements on some institutions.

…but the tightened limits were exceeded
The tightened limits that entered into force in 2016 Q4 were complied with to a much lesser extent (see Chart V.21). Loans with LTVs of over 95% accounted for 5% of the total provided (8% in the first half of the year). Loans with LTVs of 85%–95% made up 20% of all loans provided (23% in the first half of the year), meaning that the cap on the recommended amount of such loans was exceeded by 10 pp (i.e. CZK 7 billion). However, a sharp reduction in the amount of loans in excess of the limit was recorded in December, i.e. five months after the reduction in LTV limits was announced by the CNB and two months after it entered into force (see Chart V.22). The gradual lowering of the LTV limit led to a slowdown in growth in the share of loans with LTVs of 80%–90% (see Chart V.23).

Loans in excess of the limits are being provided to clients with risky characteristics
The Recommendation stipulates that institutions should, when providing retail loans secured by residential property, prudently assess indicators of clients' ability to service loans from their own resources – especially in the case of loans with LTVs capped by the aggregate limit – and set internal limits for such indicators (see section IV, paragraph 1 and section V, paragraph 1 of the *Recommendation*). Such indicators include, for example, LTI and DSTI. An LTI ratio of 8 and a DSTI ratio of 40% can be considered highly risky levels, i.e. thresholds above which the risk of default increases significantly (see Box 5.1 and section 4.3 *The household stress test*). Even so, institutions are continuing to provide loans with high LTVs to clients with risky levels of these ratios. In 2016 Q3 and 2016 Q4, the proportion of such loans was similar for loans with LTVs above the aggregate limit (i.e. with LTVs above 90% in 2016 Q3 and with LTVs above 85% in 2016 Q4) as it was for loans as a whole (see Chart V.24).[26] The same conclusions apply to December 2016, despite the fact that institutions reduced the amount of loans with LTVs in excess of the recommended limits closest to the stipulated aggregate limit.

The riskier client characteristics are not affecting interest rates…
Interest rates on unsecured loans went down in 2016 H1 as LTI ratios rose (see Chart V.25). Likewise, rates are declining with increasing loan maturity, due, among other things, to a rising average loan size (see Chart V.26). Rates were more or less constant across DSTI ratios up to DSTI levels of 50% and above (see Chart V.27). This indicates that the interest rate level may reflect a "discount" for loan size and partly also for

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26 Loans with an LTI ratio above 8 and/or a DSTI ratio above 40% accounted for approximately 19% (CZK 11 billion) of loans with LTVs of over 90% in 2016 Q3 and around 20% (CZK 14 billion) of loans with LTVs of over 85% in 2016 Q4.

the expected length of the business relationship with the client.[27] At the same time, however, it may point to a lower risk component of the interest rate on loans with riskier characteristics. Institutions' observed interest policies may therefore be giving rise to risks associated with a potential future change in the risk component of the rate on such loans. A reassessment of the risks could lead to growth in debt service for clients with riskier characteristics and to a further increase in the risk of default.

…and the low interest rates are stabilising debt service
The lowering of interest rates to exceptionally low levels led to a reduction in debt service costs. However, the rising size of individual loans had the opposite effect. The DSTI breakdown of loans was thus little changed in year-on-year terms in 2016 H2 (see Chart V.27). As most loans have maturities of around 30 years and the dispersion of interest rates is relatively low, the relationship between the DSTI and LTI ratios is strongly correlated (see Chart V.28). The LTI breakdown of loans was also unchanged in year-on-year terms in 2016 H2 (see Chart V.25).

Institutions are also becoming increasingly reliant on intermediaries…
The proportion of loans provided through intermediaries rose by 5 pp year on year to 66% in 2016 H2. According to institutions' records, the share of buy-to-let loans remained constant at around 5%. This figure is far lower than the estimates presented by real estate firms in the media. Loans provided through intermediaries are often provided with higher LTVs and buy-to-let loans also with higher LTI and DSTI ratios. This indicates that providers are exposed to the risk of excessive reliance on intermediaries, who could exert pressure for an excessive easing of lending standards. The CNB therefore recommends institutions not to create incentive schemes for intermediaries that could result in conditions favourable for the formation of systemic risks.

…who provide loan applicants with information on how to circumvent LTV limits
One of the recommendations states that institutions should not circumvent the LTV limits by concurrently providing unsecured consumer credit. According to information provided by banks, there is little concurrent provision of secured and unsecured loans aimed at circumvention of the recommendation by the same institution. Nonetheless, intermediaries advertise concurrent provision of loans by other institutions through their servers. Combining secured and unsecured loans could be in breach not only of the CNB Recommendation, but also of the Consumer Credit Act if it were to cause a loan applicant to become overindebted. From the perspective of the prudential approach to risk management, the rule is that clients should partly use their own funds to buy property and institutions should assess

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27 However, this is conditional on the client's behaviour at the time of refixation and on potential use of the provisions of the Consumer Credit Act allowing less strict conditions for early loan repayment.

CHART V.26

Maturity distribution of new loans, average interest rate and loan size in 2016 H2
(x-axis: maturity in years; left-hand scale: share of loans in %; right-hand scale: interest rate in %, loan size in CZK millions)

Share of loans with given maturity
Average interest rate (rhs)
Average loan size (rhs)
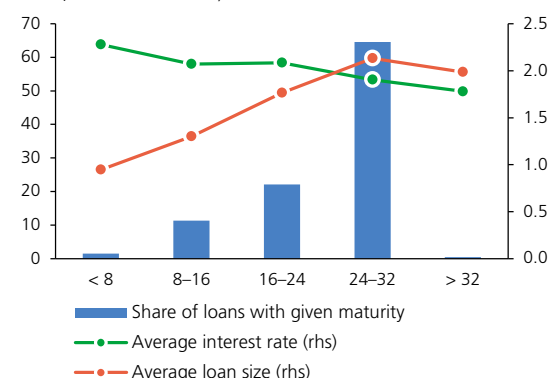
Source: CNB
Note: The possibility of drawing loans over two years is included in the maturities.

CHART V.27

DSTI distribution of new loans, average interest rate
(x-axis: DSTI in %; left-hand scale: share of loans in %; right-hand scale: interest rate in %)

2015 H2 (share of loans)
2016 H1 (share of loans)
2016 H2 (share of loans)
2015 H2 (interest rate, rhs)
2016 H1 (interest rate, rhs)
2016 H2 (interest rate, rhs)
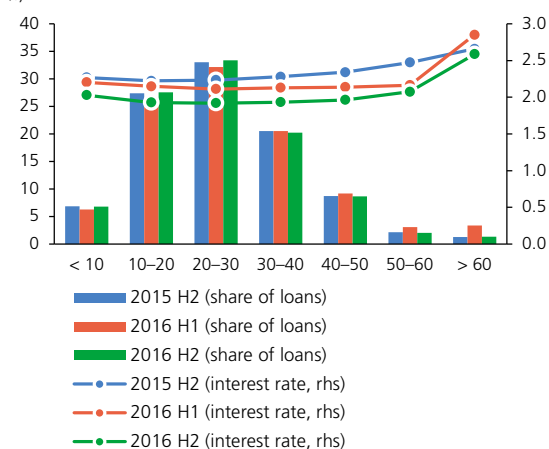
Source: CNB

CHART V.28

LTI and DSTI distribution of new loans
(x-axis: DSTI in %; y-axis: LTI; bubble size: share of loans)
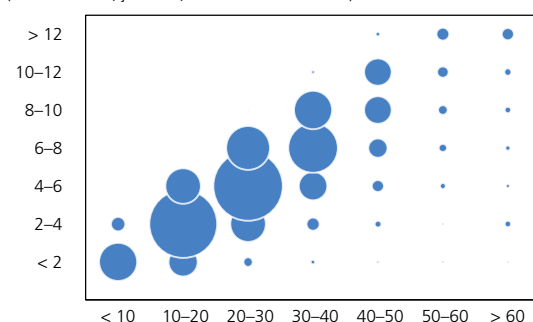
Source: CNB

Characteristics of loans provided in 2016 Q4 in LTV categories capped by the recommended limits since 1 April 2017
(x-axis: LTV in %; y-axis: share of loans in %)

- DSTI > 40% and/or LTI > 8
- DSTI < 40%, LTI < 8
- LTV limits in force since 2017 Q2
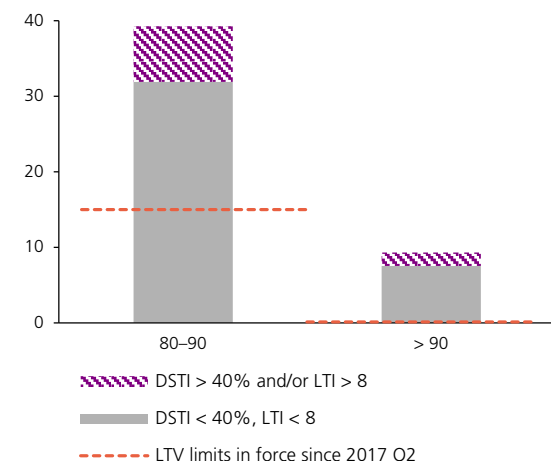
Source: CNB

clients' overall level of debt, not just their individual loans. CNB will therefore regularly examine this risk in its supervisory work.

The observed risks in the area of client creditworthiness necessitate an extension of the scope of application of the CNB Recommendation…
Given the frequent provision of loans with higher LTVs to clients with riskier characteristics, the CNB deems it necessary for providers to pay great attention to indicators of borrowers' ability to repay loans from their own resources even in a less favourable economic situation. Providers should monitor the DTI and DSTI ratios,[28] set internal limits for them and prudently assess loan applications on the basis of them. In view of its assessment of the intensity of systemic risks, the CNB is not setting upper DTI or DSTI limits for the time being. However, providers should assess loan applications particularly carefully in the case of applicants with a DTI ratio of over eight and a DSTI ratio of over 40%. This applies notably to loans with high LTV that are subject to the aggregate limit of 15% that is in place since April 2017. Above the said thresholds, many clients do not have the necessary financial reserve to maintain their ability to service their loans in the event of adverse changes in their income situation or in the level of interest rates (see Box 5 and section 4.3 *The household stress test*). The CNB is also extending the scope of application of the Recommendation to other loans provided to clients who already have a loan secured by residential property. Given the possibility of risks spreading to non-bank funding providers, the CNB is simultaneously extending the scope of application of the Recommendation to all credit providers.[29]

…which could also have a favourable effect on fulfilment of the LTV limits
Prudential evaluation of DTI and DSTI ratios by providers can lead to mitigation of the risks associated with loans with high LTVs. In 2016 Q4, loans with a DSTI ratio of over 40% and/or LTI of over 8 accounted for around 17% of new loans (around CZK 12 billion), while almost half were in LTV categories capped by the recommended limits since 1 April 2017 (see Chart V.29).

The CNB will step up microprudential supervision of prudent provision of consumer credit by credit institutions
The CNB will continue to increase the intensity of microprudential supervision of prudent provision of secured and unsecured consumer credit by credit institutions, including the management of intermediary networks by individual credit institutions. The CNB will declare supervisory expectations in the area of prudent provision of consumer credit. It will introduce extraordinary reporting of credit portfolio quality

28 The ratio is calculated on the basis of the client's total debts when the secured loan is provided. The calculation method is described in detail in the Official Information of the Czech National Bank of 13 June 2017 *Recommendation on the management of risks associated with the provision of retail loans secured by residential property*.

29 i.e. to all persons authorised as entrepreneurs to provide consumer credit.

and reporting on the functioning of consumer credit provision systems. It will ask institutions to perform internal assessments of compliance of their systems with the expected principles. After evaluating the information it receives, the CNB will give the institutions feedback and will choose on-site inspection procedures on the basis of a risk-oriented approach. The CNB will deal with any shortcomings by imposing remedial measures and, where necessary, an additional capital requirement for the risk management system.

The current settings of the CNB Recommendation do not significantly restrict the availability of housing loans
The adverse trend in the affordability of housing in some cities (see section 2.2) reflects considerably faster growth in house prices than in income, not a reduced availability of housing loans due to the CNB's macroprudential measures to date. The current settings of the CNB Recommendation do not represent a significant hit to the availability of loans for house purchase. This can be demonstrated using the example of three apartments with a floor area of 75 m^2 (or 50 m^2) in three different cities on calculations based on average apartment prices and average incomes in those cities and on assumptions of an LTV of 80% (or 90%),[30] valuation of collateral at price, size of loan equal to size of applicant's debt, interest rate of 3% and a maturity of 30 years.

In Plzeň, given an apartment price of CZK 1,975,000, the applicant would obtain a loan of CZK 1,580,000, i.e. she would need to contribute CZK 394,000 of her own (197,000 with LTV at 90%). The DSTI of the loan would be 34.6% and the DTI 6.8. Similar DSTIs and DTIs below the levels viewed by the CNB as highly risky would apply for the applicants in other towns and cities, the only exceptions being Brno and Prague. In Brno, given an apartment price of CZK 2,829,000, the applicant would obtain a loan of CZK 2,263,000, i.e. she would need to contribute CZK 566,000 of her own (283,000 with LTV at 90%). The DSTI of the loan would be 49.6% and the DTI 9.8. In Prague, given an apartment price of CZK 3,950,000, the applicant would obtain a loan of CZK 3,160,000, i.e. she would need to contribute CZK 790,000 of her own (395,000 with LTV at 90%). The DSTI of the loan would be 53% and the DTI 10.5. However, if the application is made by the family of two persons with average income, resulting DSTI and DTI values would be halved, falling thus below the levels that the CNB finds as highly risky. The viable alternative for young people is a smaller starting apartment. Despite the high prices of apartments in Prague, the DSTI of the loan would be 35% and the DTI 7 for an apartment with a floor area of 50 m^2 for a single applicant with average income. The DSTI of 33% and the DTI of 6.5 would apply in the similar case in Brno. For applicants with average income, the creditworthiness checks laid down in the Consumer Credit Act will represent a far greater constraint than the macroprudential recommendations adopted by the CNB.

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30 This assumption of an LTV of 80% has been chosen to illustrate the potential quantitative implications of the CNB Recommendation. It does not represent an indication of the future settings of the indicator upper limit and should not be interpreted in this way.

The CNB has drafted legislation incorporating macroprudential instruments for managing risks related to mortgage lending

Given the low legal force of the Recommendation and the limited set of institutions it pertains to, the CNB submitted a legislative proposal giving it the power to set binding credit ratio limits for consumer credit providers (and hence also providers of secured loans).[31] This power is contained in a proposal for an amendment of the Act on the CNB drawn up by the CNB together with the Ministry of Finance.[32] Following consultations with industry, a compromise proposal containing limits on three credit ratios, namely LTV, DTI (debt-to-income) and DSTI (debt service-to-income).[33] If the CNB were to identify growth in systemic risks on the basis of its regular assessments, it would announce limits on one or more credit ratios by issuing a provision of a general nature. The provision would take effect no earlier than four months after the announcement of the limit so that institutions have enough time to incorporate the changes into their transaction and risk management systems, internal methodologies and IT systems. The CNB also accepted an industry proposal for providers to be able to apply exemptions from the limits set by the CNB for 3% of loans in each quarter. After approval by the Government of the Czech Republic, discussion of the amendment to the Act on the CNB was commenced in the Chamber of Deputies (the lower house of the Czech parliament).

Limits on credit ratios are becoming a standard part of macroprudential instruments in EU countries

According to information from the ESRB, macroprudential authorities in 19 EU countries currently use one or more of the above-mentioned credit ratios.[34] All 19 countries use LTV, 14 of them through legally binding regulations. Fourteen countries use a DTI or DSTI ratio, nine of them through binding regulations. The legislation in force in the Netherlands allows for the application of three proposed instruments (LTV, DTI and DSTI). A draft law under preparation in Austria contains the same option.[35] In Slovakia, too, the central bank is empowered under the loans act to set three instruments – besides LTV and DSTI it also determines the maximum loan maturity.[36]

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31 The scope of application is thus extended to non-bank providers of such loans and to credit unions.
32 Chamber of Deputies Document 1009,
http://www.psp.cz/sqw/text/tiskt.sqw?O=7&CT=1009&CT1=0 (in Czech only).
33 The method for calculating the ratios would be set in a CNB decree.
34 ESRB: A Review of Macroprudential Policy in the EU in 2016, April 2017.
35 Advice of the Financial Market Stability Board, FMSG/2/2016
https://www.fmsg.at/en/publications/warnings-and-recommendations/2016/advice-2-2016.html.
36 NBS Decree No. 10/2016,
http://www.nbs.sk/en/financial-market-supervision1/macroprudential-policy/current-status-of-macroprudential-instruments/current-setting-of-instruments-for-retail-loans.

BOX 5: RISKY DSTI AND LTI LEVELS

Assessment of risky DSTI levels

The DSTI ratio serves as an indicator of clients' ability to service their loans in accordance with their chosen repayment schedule. To determine risky DSTI levels, the CNB uses the concept of the financial reserve under stress (FR$_S$) for new loans:

$$FR_s = net\ income_s - (subsistence\ level + property\ maintenance\ costs) - loan\ repayment_s$$

The calculation of this indicator is based on the logic of the household stress test (see section 4.3).[37] The financial reserve denotes consumers' monthly net income minus essential costs (the subsistence level plus property maintenance costs) and repayments associated with the consumer's debt under the chosen stress. Subsistence costs (net of housing costs) are based on the values set by the Ministry of Labour and Social Affairs for the first and other persons in the household and take into account the number of loan applicants and their dependants for loans reported in the Survey.[38] Property maintenance costs are set at 1.5% of the collateral on these loans per year and cover the set of costs associated with owning property (maintenance, repairs, management, insurance, etc.). The stress consists in a 10% decrease in income – expressing the probability of loss of employment or a drop in income for a certain period of time – and a rise in interest rates of 0.6 pp a year for five years (i.e. a cumulative increase of 3 pp). The interest rate stress respects the fixation and repayment periods of the individual loans reported in the Survey. So, if the loan has a fixation period of five years, the interest rate increase will happen all at once in the fifth year (a 3 pp rise in rates) and will affect subsequent instalments only up to the amount of the unrepaid part of the principal. If such a loan has a maturity of five years, the rise in interest rates will not affect it at all.

FR$_S$ levels lower than the financial reserve threshold (FR$_{TH}$) are deemed risky.[39] For the purposes of determining the upper DSTI

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[37] There are differences between the household stress test and the financial reserve calculation in this box. The household stress test assesses the overindebtedness of the household sector and works with stocks of loans. The financial reserve calculation in this box is focused on the financial resilience of mortgage applicants and therefore works solely with new loans.

[38] The figures are CZK 3410 for the first person in the household, CZK 2,830 for the second person in the household and CZK 2,110 for each dependant. The subsistence level therefore works out at CZK 8,350 for a couple with one child and CZK 10,460 for a couple with two children.

[39] As the methodology presented in this box is aimed at assessing the resilience of applicants for new mortgages, the calculation of the financial reserve risk threshold works with a narrower definition of essential expenditure than the household stress test and the threshold is therefore set at a positive level.

Share of loans by DSTI and financial reserve under stress
(x-axis: DSTI in %; y-axis: share of loans in %; reserve in % of net income)

Reserve < 0 | 0–5 | 5–10 | 10–15 | 15–20 | > 20
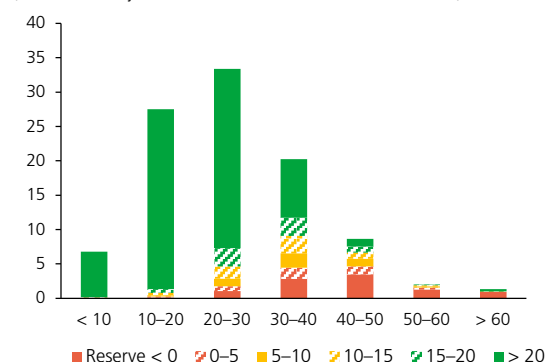
Source: CNB

Share of loans by LTI and ratio of the loan provided to the hypothetically repayable loan
(x-axis: LTI in %; y-axis: share of loans in %; ratio in %)

Ratio > 120 | 100–120 | 80–100 | 60–80 | 40–60 | < 40
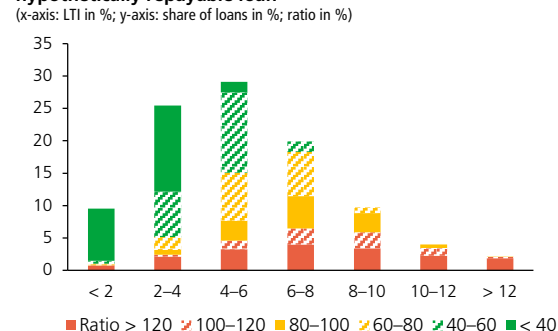
Source: CNB
Note: If the loan provided is equal to or greater than the hypothetically repayable loan, the ratio of the two is, respectively, equal to or greater than 100%. HRLS denotes the hypothetically repayable loan of the consumer under stress as described in Box 5. It represents the biggest loan the consumer would be able to repay over the longest possible maturity if her monthly instalments were at the maximum permissible level. After paying such instalments, the consumer under distress would be left at the financial reserve threshold of 10% of net income and at least CZK 5,000 a month.

Share of loans with risky LTI and DSTI levels
(y-axis: share of loans in %; DSTI in %)

DSTI > 40 %, LTI > 8 | DSTI > 40 %, LTI < 8
DSTI < 40 %, LTI > 8 | DSTI < 40 %, LTI < 8

Source: CNB

limit, that threshold is 10% of net income, or at least CZK 5,000. The requirement for a minimum absolute FR_S serves to cover sudden necessary expenditures, which to some extent are independent of income level. The share of loans provided in 2016 H2 for which FR_S falls below the reserve threshold increases significantly for loans with a DSTI ratio above 40% and predominates for loans with a DSTI ratio above 50% (see Chart V.1 Box). Such loans can therefore be regarded as highly risky. Despite some minor methodological differences, the same conclusion applies to the household stress test conducted on existing loans (see section 4.3).

Assessment of risky LTI (DTI) levels
The LTI ratio serves as an indicator of clients' ability to service their loans over their period of economic activity. To determine risky LTI levels, the CNB uses the concept of the hypothetical repayable loan under stress (HRL_S) for new loans:

$$HRL_S = (1 - FR_{TH})*(net\ income_S - subsistence\ level - loan\ repayment_S - property\ maintenance\ costs)*maturity_{max}$$

HRL_S represents the biggest loan the consumer would be able to service over the longest possible maturity if her monthly instalments were at the maximum permissible level. After paying such instalments, the consumer under stress would be left at the financial reserve threshold FR_{TH} ($FR_S = FR_{TH}$). As in the DSTI case, a stress consisting in a 10% decrease in income and a 3% rise in interest rates is considered. The financial reserve threshold is again 10% of net income and at least CZK 5,000. The consumer's remaining period of economic activity up to the age of 65 or 30 years, whichever is the shortest, is taken as the longest possible maturity.

The HRL_S of individual consumers is compared with the size of the loans actually provided to them. This yields the share of loans (L) which are larger than those which consumers would, under stress, be able to service over their period of economic activity ($L > HRL_S$ or also $L/HRL_S > 100\%$). The share of such loans provided in 2016 H2 increases significantly for loans with an LTI ratio above 8 (see Chart V.2 Box), and they can thus be regarded as highly risky. However, the share is already rising sharply for loans with an LTI ratio above 6. The above conclusions also apply to the DTI ratio, which providers should monitor.

Combination of risky DSTI and LTI levels
Loans for which both credit ratios exceed the highly risky DSTI 40% and LTI 8 levels accounted for almost 9% of credit production in 2016 H2. A further 2.5% and 6% of loans,

respectively, had a risky DSTI or LTI level only. The share of loans with risky DSTI and/or LTI levels provided to finance residential property in Prague was larger. This is linked with the higher price-to-income ratio in the capital city (see section 2.2 and Chart V.3 Box). It can be seen from the HRLs relationship that the setting of the LTI limit would be quantitatively the same as the setting of the DSTI limit combined with the constraint on the maximum maturity. The DSTI limits could thus serve as the regulatory maximum instalment in the HRLs calculation. The combination of a DSTI limit and a maximum maturity is applied by the macroprudential authorities in, for example, Slovakia, Estonia and Lithuania. LTI limits have been set in Ireland and the UK.

5.3.2 RISKS ASSOCIATED WITH COMMERCIAL PROPERTY MARKETS

Commercial property prices may be slightly overvalued, but the amount of new loans for financing commercial property is not increasing significantly

The method used by the CNB to assess commercial property prices in the prime segment[40] was indicating modest but rising overvaluation for commercial property – like residential property – at the end of 2016 (see Chart V.30). However, the trend in commercial property prices in the Czech Republic is similar to that in many other European countries and is linked to a large extent with the very low yields on alternative assets. While the amount of prime property transactions increased year on year in 2016 H2 (see section 2.2), the amount of new loans secured by commercial property provided by banks in the Czech Republic[41] fell slightly (see Chart V.31). In the first half of the year this amount had still been rising in year-on-year terms. Credit activity shifted from investment in office and retail property to investment in industrial property in the second half of the year.

As for lending standards, the LTV ratio and the debt service coverage ratio are showing favourable trends…

The share of new loans with LTV ratios of higher than 70% decreased sharply in 2016 H2. Lending standards were therefore tightened in terms of collateralisation. The majority of new loans were provided with LTV

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40 Overvaluation estimated by panel regression on a sample of Central and Eastern European countries, specifically CZ, SK, PL, HU and RO, and also DE. The panel regression consists in estimating equilibrium prices for individual property types using data on rent and vacancy rates for each property type, the VIX volatility index, GDP and government bond yields in each country of the panel as well as the USA. Estimated overvaluation obtained by comparing estimated equilibrium prices and observed prices, which are obtained as the rent-to-prime yield ratio. In the case of retail property, the estimate does not take into account the vacancy rate, for which data are not available. For more details, see CNB Research Project C5/16. The data on commercial property market for this project are obtained from Jones Lang LaSalle.

41 According to data from a now regular survey of eight banks covering around 70% of the market as of 30 June 2015.

CHART V.30

Estimated overvaluation of commercial property prices
(%)

Source: Jones Lang LaSalle, Datastream, Eurostat, Bureau of Economic Research (US), CNB calculation
Note: Overvaluation as estimated by panel regression on a sample of Central and Eastern European countries (CZ, SK, PL, HU and RO) and also DE.

CHART V.31

Amount of new loans secured by commercial property
(CZK billions)
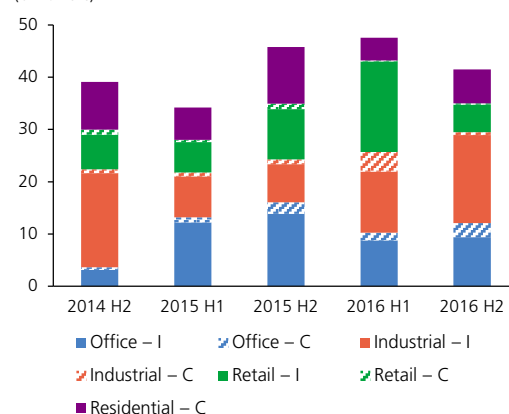
Source: CNB
Note: I: investment in commercial property, C: construction of commercial property.

CHART V.32

Distribution of new loans by LTV in 2016 H2
(x-axis: LTV in %; y-axis: CZK billions)
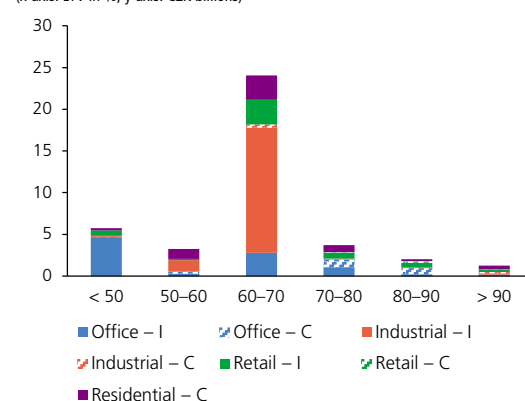
Source: CNB
Note: I: investment in commercial property, C: construction of commercial property.

Distribution of new loans by LTV over time
(x-axis: LTV in %; y-axis: CZK billions)
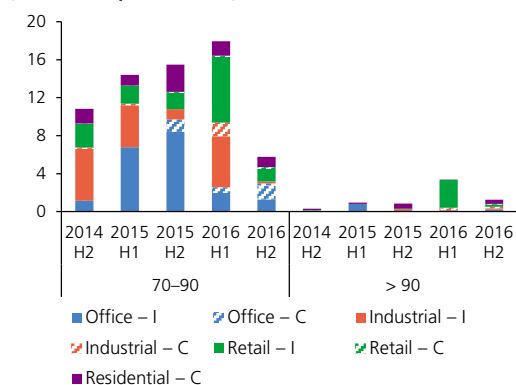
Source: CNB
Note: I: investment in commercial property, C: construction of commercial property.

Distribution of new loans by DSCR in 2016 H2
(x-axis: LTV in %; y-axis: CZK billions)
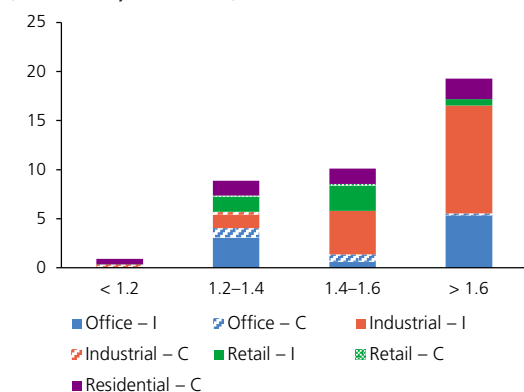
Source: CNB
Note: I: investment in commercial property, C: construction of commercial property.

Distribution of new loans by DSCR over time
(CZK billions)
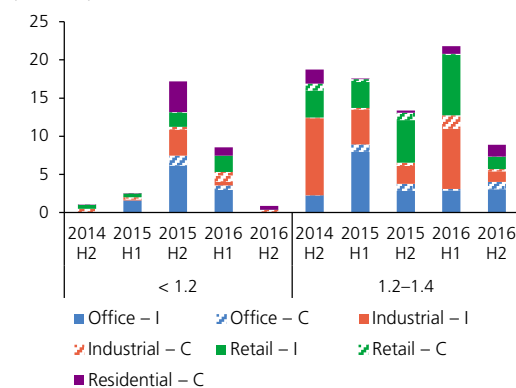
Source: CNB
Note: I: investment in commercial property, C: construction of commercial property.

ratios of 60%–70% (see Chart V.32). In the first half of the year, new loans had still been moving from lower LTV categories to the 70%–80% category. The amount of new loans in this category was gradually increasing since 2014 H2 (see Chart V.33). A tightening of lending standards is also indicated by the debt service coverage ratio (DSCR). In the second half of the year, almost two-thirds of loans were provided with a DSCR of more than 1.4 (see Chart V.34). The tightening of lending standards that began in the first half of the year, when the share of new loans with a DSCR of less than 1.2 fell sharply, thus continued (see Chart V.35).

…but institutions may not necessarily behave prudently when determining DSCR values
The share of new loans with both a risky LTV and a risky DSCR decreased substantially in 2016 H2 compared to 2015 H2 (see Chart V.36). However, the determination of DSCR values is subject to subjective assessment by the provider, as it entails estimating the future income arising from the construction or possession of property. However, perceptions of property market developments can be strongly procyclical. For example, expected property rental income or the future vacancy rate may be set on the basis of currently high levels.

The risk has increased most of all in the case of new loans secured by industrial property
The indicator of the riskiness of new loans secured by commercial property[42] (see Chart V.37) indicates a year-on-year decrease in riskiness across all the monitored types of commercial property in 2016 H2. The indicator of the risk-weighted amount of new loans,[43] which additionally takes the amount of new loans into consideration, increased only slightly in the case of industrial property.

5.4 MACROPRUDENTIAL POLICY AND THE REGULATORY ENVIRONMENT IN THE EU

5.4.1 AN OVERVIEW OF MACROPRUDENTIAL MEASURES IN THE EU

Macroprudential authorities in EU countries mostly use instruments to prevent misaligned incentives and curb excessive credit growth. Non-euro-area countries are more active in applying macroprudential instruments. The CNB ranks among the most active macroprudential authorities in the EU.[44] Table V.5 summarises the application of the instruments as of January 2017 and the year-on-year change in the

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42 The indicator of the riskiness of new loans secured by commercial property was created using data on the estimated overvaluation of property prices for each property type and the LTV and DSCR of loans in the individual categories of values, weighted by the share of loans in those categories. Higher values of this indicator signal higher loan riskiness. Conversely, higher DSCR values mean lower loan riskiness. For this reason, inverse values of the DSCR were used to construct the indicator.
43 This indicator is calculated by multiplying the amount of new loans in the individual categories by their riskiness indicators.
44 Review of Macroprudential Policy in the EU in 2016. ESRB, 2017.

settings of macroprudential policy in the European countries under review (the EU plus Norway).[45]

Misaligned incentives can be prevented by means of a buffer for O-SIIs or the SRB. All the EU Member States completed the process of identifying systemically important institutions in 2016. There are 202 systemically important institutions, 14 of which are global systemically important institutions (G-SIIs). Two of these are parent banking groups of domestic systemically important banks.[46] The CNB drew up a list of O-SIIs in 2015 and regularly reviews its composition (see section 5.2.3). As in Denmark, it uses the SRB to mitigate risks associated with domestic systemically important banks. The SRB rate is no more than 3% in the countries under review. Other Member States have reduced the risks associated with domestic systemically important banks using a capital buffer for O-SIIs, which can be no more than 2%. In some countries, a combination of an SRB and an O-SII buffer is used. The identified G-SIIs started to fill up the buffer during 2016. The buffer should reach full capacity corresponding to their systemic importance by 2019.

Most Member States, including the Czech Republic, have introduced the capital conservation buffer at the highest admissible rate. The rest will make it up by the end of 2018. Given the credit market situation, some countries are applying the countercyclical buffer (CCyB). All Member States were obliged to set a CCyB rate in 2016. The CNB has been doing so since 2014. Of the European countries under review, non-zero CCyB rates have been introduced in Sweden, Norway, Slovakia and the UK as well as the Czech Republic (see section 5.2.2).[47] Only in Sweden and Norway, however, were the rates active in 2016.

The residential property sector continues to be a source of risks to financial stability in many Member States. Measures mitigating residential property market risks thus continue to be introduced and tightened. The most common measure is an upper LTV limit combined with a LTI or DSTI limit. A minimum risk weight increasing the capital requirements for mortgage loan providers is also used (see section 5.3.1). The ESRB identified increased risks associated with exposures secured by residential property in some EU countries in its regular analyses of systemic risk in 2016. A detailed risk review with regard to national market specificities was performed for 11 Member States (AT, BE, DK, FI, LU, NL, SE, UK, EE, MT and SK). It was based on an assessment of the risk of default, a drop in collateral values and unexpected losses for the banking system. The risk of a drop in collateral values was identified for all the countries under review, and the risk of default was identified in all but one country (EE).

45 ESRB (2017): National measures in the EU/EEA notified to the ESRB, or of which the ESRB is aware, and that are of macro-prudential interest (January 2017), https://www.esrb.europa.eu/mppa/html/index.en.html.

46 Société Générale as the parent banking group of Komerční banka and UniCredit Group as the parent banking group of UniCredit Bank CZ/SK.

47 The CCyB was introduced in Slovakia in 2016 with effect from June 2017. In Sweden the CCyB rate was increased from 1.5% to 2% in April, and in the UK it was lowered from 0.5% to 0% in June in response to Brexit.

CHART V.36

Amount of new loans with an LTV of more than 70% and a DSCR of less than 1.2
(CZK billions)
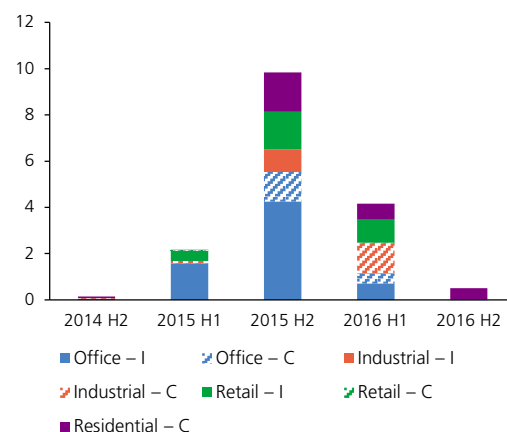
Source: CNB
Note: I: investment in commercial property, C: construction of commercial property.

CHART V.37

Indicator of the riskiness and risk-weighted amount of new loans
(average across all property types in 2015 H2 = 100)
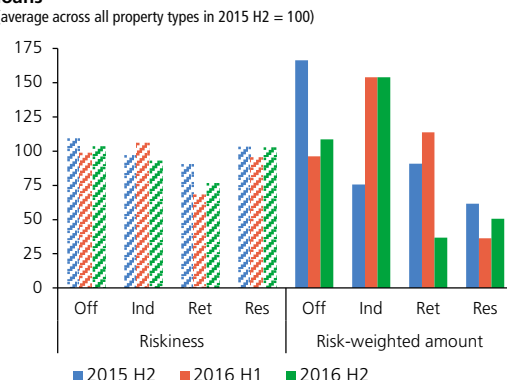
Source: CNB
Note: Off: office property, Ind: industrial property, Ret: retail property, Res: residential property. The indicator of the riskiness of new loans secured by commercial property was created using data on the estimated overvaluation of prices for each property type and the LTV and DSCR of loans in the individual categories of values, weighted by the share of loans in those categories. The indicator of the risk-weighted amount of new loans was created by multiplying the previous indicator by the amount of new loans.

The risk of losses for the banking system was identified for a smaller number of countries (BE, FI, LU). The ESRB issued warnings[48] to all the countries under review except SK, EE and MT. For those countries, the ESRB confirmed the existence of risks, but stated that the adopted and planned preventive macroprudential measures to mitigate them were sufficient and praised the proactive stances of their macroprudential authorities.[49] The Czech Republic was not among the countries under review. In the regular risk assessment, however, it was very close to the reviewed countries according to the quantitative criteria and was one of the candidates for a warning. Compared to the other countries, the Czech Republic was the worst off in terms of overvaluation of residential property prices, as measured by the ratio of residential property prices to income, and also in terms of year-on-year growth in loans for house purchase to households.

The CNB monitors the activities, risk assessment approaches and measures of foreign macroprudential authorities. It also analyses their possible cross-border effects in connection with the framework for mutual recognition of macroprudential measures. Based on voluntary reciprocity,[50] the Member States decided on the reciprocation of a Belgian measure reducing the risks in the residential property market and the Estonian systemic risk buffer in 2016. The approaches of Member States varied considerably. The CNB did not reciprocate the Belgian measure,[51] as the exposure of domestic banks to mortgage loans for residential property located in Belgium is virtually zero. Neither did the CNB directly reciprocate the Estonian measure,[52] as the Czech banking sector has non-material exposure to Estonia. However, the setting of an SRB of at least 1% of the total exposure contains elements of reciprocation of the above measure for the five systemically most important banks.

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48 The warnings are available on the ESRB website
   https://www.esrb.europa.eu/mppa/warnings/html/index.en.html.
49 In Slovakia, this included approval of the legal possibility to implement these measures.
50 For details see FSR 2015/2016, section 4.4.2.
51 The Belgian macroprudential authority decided to prolong a measure requiring banks applying the IRB approach to credit risk management to increase the risk weight for mortgage loans for residential property located in Belgium by 5 pp.
52 Under Article 133 of the CRD, the Estonian macroprudential authority decided to set a 1% systemic risk buffer rate applied to domestic exposures of all banks authorised in Estonia with effect from 1 August 2016.

TABLE V.5

List of active macroprudential instruments in the EU and Norway
(as of 1 January 2017)

Riziko / Risk	Opatření / Measure	AT	BE	BG	CY	CZ	DE	DK	EE	ES	FI	FR	GR	HR	HU	IE	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	SE	SI	SK	UK
Excessive credit growth and leverage	Capital conservation buffer			●	●	●		●	●		●			●		●	●	●	●	●	●	●	●	●	●	●	●		●	●
	Countercyclical capital buffer (CCyB)					●																	●				🔴		🔴	
	Leverage ratio																													●
	Loan-to-value (LTV)				●	🔴		●	●		●				●	●		●		●	●	●	●	●		●	🔴	🔴	🔴	
	Debt-service-to-income (DSTI)				●				●									●						●		●	●	🔴	🔴	
	Loan-to-income (LTI)							🔴							🔴	●							🔴							●
	Loss-given-default (LGD)																						●							
	Risk weights		●								🔴			●		●			🔴				●			●	●	🔴	●	●
Misaligned incentives	Systemic risk buffer (SRB)	🔴		●		🔴			🟢					●	🟢							●	●				●		🔴	
	Global systemically important institution buffer (G-SII buffer)						●			🔴		●					🔴					●					●			
	Other systemically important institution buffer (O-SII buffer)	🔴	●	🔴			●	●	🔴	●	●	●		●	●	🔴		●	●	🔴	●	●	●	🔴	🟢	●	●	●	🟢	🔴
Liquidity	Liquidity ratio														●									●			●			
	Loan-to-deposit (LTD)				●																							●		
Other	Pillar II		●																		●						●	●	●	
	Loan amortisation					●			●													●	●				🔴		●	
	Loan maturity																	●						●		●				
	Stress test				●											●			●				●			●			●	●
	Other measures															●					🔴			●			●		●	

Source: ESRB, adapted by CNB

Note: The table is derived from the overview of macroprudential measures published on the ESRB website. It is a simplified list of measures. Red dots denote a tightening and green dots a relaxation of the measures in 2016.

CHART V.38

Scheme for reporting financial assets under IFRS 9
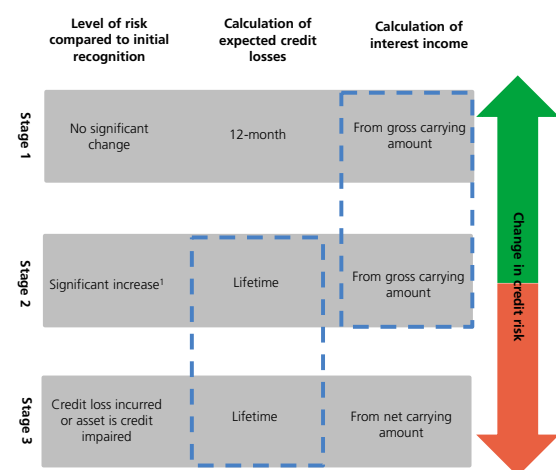
Source: CNB
Note: *There is a rebuttable presumption that the credit risk has increased significantly when contractual payments are more than 30 days past due.

TABLE V.6

Results of the EBA and CNB impact assessments of IFRS 9

Estimated increase of provisions (%)

75% percentile (EBA/CNB)	+30/+20 (STA), +10 (IRB)		
	Low estimate*	Mid estimate*	High estimate*
Average (EBA/CNB)			
	+13/+2.5	+18/+8.3	+23/+13.3
Median (EBA/CNB)	+20/+10		

Impact on Tier 1 ratio (bp)

75% percentile (EBA/CNB)	-75/-50		
	Low estimate*	Mid estimate*	High estimate*
Average (EBA/CNB)			
	-43/-21	-57/-33	-73/-46
Median (EBA/CNB)	-50/-50		

Source: CNB, EBA
Note: *The low estimate is the least conservative value. The mid estimate is the value between the low and high estimates. The high estimate is the most conservative value. The exact survey methodology is given in EBA (2016): Report on results from the EBA impact assessment of IFRS 9.

5.4.2 IMPLEMENTATION OF IFRS 9 AND ITS EXPECTED IMPACT ON THE CZECH AND EU BANKING SECTORS

IFRS 9 is a new international accounting standard governing the accounting, classification and valuation of financial assets, liabilities and hedge instruments. This standard will be implemented by banks which currently report their results according to international accounting standards (IFRS) for accounting periods beginning on or after 1 January 2018.[53]

The introduction of the standard is expected to have the biggest impact on the reported results of European banks in the area of impairment of financial assets and provisioning. The other areas governed by the standard are not expected to record such significant changes. As regards impairment, the concept of incurred losses[54] will be replaced by the concept of expected losses. The aim is to identify credit losses earlier and prevent a recurrence of the situation recorded during the financial crisis, when credit losses were reported too late and provisioning was insufficient.[55]

Financial assets will be reported in three stages according to the level of credit risk. Rules for calculating losses and interest income are set for each stage (see Chart V.38). The switch to the new standard will probably result in a one-off increase in provisions, which will be newly accounted for as the amount of expected losses. The higher level of provisions will be reflected directly in a drop in banks' book equity.[56] The impact of the standard is therefore a subject of debate and numerous analyses at the national and international level.

In the EU, the EBA conducted a survey of 58 banks and banking groups at the beginning of 2016.[57] According to the survey results, the growth in total provisions will mainly be the result of stage 2 financial assets, as expected lifetime credit losses will now be estimated for them. The increase in total provisions compared to the current levels is estimated at up to 30%. The total capital ratio and the Tier 1 capital ratio are estimated to decrease by up to 75 bp, and maybe more for some banks (see Table V.6).

As domestic banks were not included in the EBA survey, in April 2016 the CNB asked the six most important domestic banks and banking groups to fill in the same questionnaire as the one used by the EBA. The survey results indicate that the impact on domestic banks should be lower. The new standard will lead to an increase in provisions of up to 20%

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53 The large majority of domestic banks (as measured by market share in the banking sector) report their results according to IFRS.
54 Under the IAS 39 standard currently in force.
55 Cohen, B. H. and Edwards, G. A. (2017): *The new era of expected credit loss provisioning*.
56 The overall changes in the net book value of bank assets resulting from the changes in accounting methods (the changes in the amount of total provisions, the classification of financial instruments, etc.) will be reflected directly in equity in the retained earnings/accumulated losses of previous accounting periods.
57 EBA (2016): Report on results from the EBA impact assessment of IFRS 9.

compared to the current levels. The total capital ratio and the Tier 1 ratio are estimated to decrease by up to 50 bp, and possibly more in some cases.

In September 2016, the European Parliament issued a *resolution on International Financial Reporting Standards: IFRS 9*[58] owing to the potential adverse impact on European banks' capital and hence on their ability to lend. Referring to the results of the EBA survey, it called for an examination of the possibility of introducing a phase-in regime to distribute the impact of the standard on regulatory own funds over time.[59] Based on the European Parliament's request, the European Commission issued a set of concrete suggestions on transitional arrangements in November 2016.[60] The European Commission's proposals were assessed by the EBA[61] and discussed at the level of the Council of the European Union in April 2017. The specific form of the temporary arrangements was still under discussion at the time this report was being prepared. However, it is likely that banks will get the opportunity to distribute the impact on regulatory capital over four to five years (2018–2021/2022).

5.4.3 THE CNB AS A RESOLUTION AUTHORITY AND THE MREL

Pursuant to the Recovery and Resolution Act, the CNB has been the resolution authority in the Czech Republic since 1 January 2016. The resolution framework is aimed at providing for fast and effective resolution with minimum risk to financial stability while maintaining any systemically important functions of the institutions concerned. This objective is served by both planning (which involves the CNB drawing up resolution plans for banks and other institutions) and the resolution financing arrangement. A Resolution Fund, to which all relevant institutions contribute, has been set up. This is a source of funds that can be used in potential resolution to finance resolution itself. The CNB has a wide range of harmonised resolution instruments and processes.

Resolution processes and instruments also have systemic impacts. One of the most discussed areas – one which is also very important for the stability of the domestic banking sector – is the setting of minimum requirements for eligible liabilities (MREL). These are based on one of the most important resolution instruments, the bail-in. The aim of this instrument is to transfer the costs and losses of resolution of an institution to its shareholders or certain groups of creditors and thus minimise resolution expenditure from the public purse. However, for a bail-in to be viable, the institution must have enough eligible liabilities for loss absorption or possible recapitalisation, which the CNB will decide to convert or amortise in the event of a crisis.

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58 European Parliament resolution 2016/2898(RSP).
59 This pertains solely to the distribution of the impact on regulatory capital. The impact on equity will be one-off in nature and there is no discussion of distributing it over time.
60 European Commission regulation 2016/0360 (COD).
61 Opinion EBA–Op-2017-02.

The CNB will set the MREL for individual institutions taking into account the resolution strategy applied and the expected use of instruments. According to the BRRD directive, it was supposed to do so as from 2016. However, it is not doing so as yet, because the interpretation of the legislation and standards has yet to be unified at the EU level. The MREL should consist of two components: a loss absorption amount (LAA) and a recapitalisation amount (RCA). It is also still expected that where the resolution plan assumes that the institution will be wound up in standard liquidation or insolvency proceedings in the event of failure, it will be possible to set the RCA at zero. For institutions where full liquidation is not appropriate and ensuring continuity of critical functions is preferable, and for systemically important institutions, the MREL may be markedly higher given the need to maintain the recapitalisation component.

The view of the base for the calculation of the MREL and of how capital buffers should be taken into account in its calculation has shifted. It is likely that the Pillar 1 and Pillar 2 capital requirements will form the base for calculating the MREL. Capital buffers should not be included in the base for the recapitalisation need. Nevertheless, they should be taken into account when setting the MREL as a loss absorption buffer. The schedule for meeting the MREL has also changed. A transition period lasting up to 2022 can be expected to be set for fulfilment of the new duty.

The CNB regards the rules for setting the MREL as an important element of the new regulatory framework, one which may significantly affect banks' behaviour and business models. The CNB considers it important that the future applicable framework allows a sufficiently high MREL to be set for loss absorption and possible recapitalisation, particularly for systemically important institutions. On the other hand, the framework should respect the conditions in national banking sectors and the business model, mode of financing and risk profile of each institution.

5.4.4 REGULATORY CHANGES UNDER PREPARATION IN THE EU

The Commission is preparing a review of the macroprudential policy framework in the EU.
The Commission launched a public consultation on the preparation of a review of the EU macroprudential framework. The CNB regards it as crucial to increase the flexibility of the use of capital buffers. It has long maintained position that the use of the SRB instead of the O-SII buffer is primarily a result of incorrectly configured O-SII buffer rules. It therefore recommends significantly increasing or completely abolishing the current 2% cap and removing the link to capital buffers mitigating risks associated with the systemic importance of the parent company. The SRB could then be used as a buffer serving primarily to address risks arising from institutions' exposures and it should also be possible to apply it to sub-categories of institutions with similar business models or to individual sub-categories of exposures. The CNB welcomes the debated possibility to apply the CCyB to only a part of exposures, for example to mortgage loans to households. If this is not incorporated into the revised framework, the CNB recommends that the option to apply Article 458 of

the CRR, which can be used to respond to emerging systemic risks by implementing various macroprudential measures, be made simpler and more flexible. It considers it appropriate to incorporate instruments mitigating risks on both the residential and commercial property markets into EU legislation. However, it should be left to national authorities to set such instruments.

The ESRB is discussing the outlines of macroprudential policy beyond banking

To a large degree, current macroprudential policy and its instruments apply solely to banks. However, the importance of non-bank institutions is growing in the EU. The assets of investment funds have been recording particularly strong growth in the Czech Republic in recent years (see Chart III.1). In June 2016, the ESRB issued a strategic document[62] analysing systemic risks beyond banking and ways of managing such risks effectively. Many of the risks targeted by current macroprudential policy are also relevant to non-bank financial institutions, so there should be similar ways of curbing them (an activity-based approach). Besides the existing risks, the extension of the macroprudential framework beyond banking should limit regulatory arbitrage between the two sectors. The CNB has long maintained that macroprudential regulation beyond banking is desirable, but its instruments must reflect the specificities of the non-banking sector.

Regulatory technical standards governing the use of Articles 124 and 164 of the CRR have not yet been set

Property risks can be addressed using Article 124 of the CRR, which allows minimum risk weights to be increased for banks applying the STA approach, and Article 164 of the CRR, which enables the minimum LGD to be increased for banks applying the IRB approach (see section 4.3.2 of FSR 2015/2016). These provisions allow the supervisory authority to increase the risk weights in the standardised approach and LGD in the internal rating based approach to credit risk management. To apply the articles, the supervisory authority must prove that the risks weights or LGD do not match the real risks. In addition, it should take into account future developments on the property market and financial stability. Limits on the relevant indicators were preliminarily set in a 2015 EBA consultative document. However, technical regulatory standards have yet to be published.[63] Despite that, Article 124 is applied by seven Member States, with one also simultaneously applying Article 164. For the CNB, Article 164 is more relevant, as it can be used in the event of a build-up of risks linked with a continued downward trend in risk weights set using domestic banks' internal models for mortgage loans (see section 3.1). Where appropriate, macroprudential authorities can also respond to systemic risks of this type by applying Article 458 of the CRR, as is the

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62 Macroprudential policy beyond banking: an ESRB strategy paper, July 2016.
63 The absence of such standards may also complicate the application of Article 458, which the macroprudential authority may use to increase risk weights, among other things, in the event of growth in systemic risks, although only if the risks cannot be reduced by setting capital buffers or by applying Articles 124 and 164.

case in Belgium, where the macroprudential authority has increased the risk weight on mortgage loans for banks using the IRB approach by 5 pp. In connection with the approaches to setting risk weights, a debate on the rules for credit risk management approaches [64] is continuing in the Basel Committee (for details see FSR 2015/2016, p. 113). The ECB, too, has started to assess the variability of supervised banks.

The ECB has launched a review of internal models of banks supervised in the SSM

The ECB is assessing whether the internal models of banks supervised in the SSM comply with regulatory requirements. The aim of the project (the targeted review of internal models, TRIM) is to reduce unwarranted differences in the internal models that the supervised banks use to set risk weights, which have a fundamental influence on capital requirement levels. The conclusions of the project should be available in 2019 and may have an impact on the use of internal models by banks operating in the Czech Republic.

In the EU, there are signals that some banking groups are considering converting their subsidiaries into branches

Owing to the different degrees of strictness of national supervisory, macroprudential and resolution authorities, parent companies from the euro area are considering converting their subsidiaries in countries with "too" strict approaches into banks. One example of less strict policy is the approach applied in the Single Supervisory Mechanism (SSM) in the euro area, according to which the buffer rate applying to systemically important banks should not exceed 2% of CET1. These signals cannot be ignored and need to be incorporated into strategic thinking about the course of policies at national level. From the macroprudential policy perspective, the conversion of subsidiaries into branches would have only minor impacts. The CNB would be left with reduced room to set capital requirements for systemically important banks and macroprudentially motivated requirements under Pillar 2. The possibility of setting requirements for exposures located in the Czech Republic through the countercyclical buffer would remain preserved. Measures in the area of property exposures could be imposed using Article 458 of the CRR or through the ESRB mechanism of reciprocation of national macroprudential measures. However, it would be slower and more complicated than at present.

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64 Both for the IRB approach (where the risks weights on individual exposures should to some extent be linked with their levels in the STA approach) and for the STA approach (where the risk weights would to some extent respond to changes in underlying risks).

PART II – THEMATIC ARTICLES

THE COUNTERCYCLICAL CAPITAL BUFFER IN THE CZECH REPUBLIC

Jan Hájek, Jan Frait, Miroslav Plašil

This article sets out the CNB's approach to the countercyclical capital buffer in the Czech Republic and describes its decision-making process from assessing the position of the economy in the financial cycle through to setting the buffer rate. The CNB's approach is based on a set of simple and composite indicators of the financial cycle and systemic risk, but also puts an emphasis on comprehensive expert assessment of developments in the financial sector. The article then describes the factors that the macroprudential authority takes into account when setting the specific countercyclical capital buffer rate. These include estimates of credit losses in the event of adverse shocks and stylised facts about the financial cycle.

1. INTRODUCTION

The countercyclical capital buffer (CCyB) is an important macroprudential policy tool. It is designed to protect the banking sector against risks arising from its behaviour through the financial cycle, and in particular from excessive credit growth, which generates systemic risks and increases the potential for sharp swings in economic activity. As a macroprudential policy authority, the CNB should ensure that banks create a capital buffer during the expansion phase of the financial cycle to enable them to absorb losses in the event of an adverse shock accompanied by elevated financial stress and growth in loan defaults. Use of the buffer at such a time should prevent a fall in the supply of credit to the sound part of the economy and stop the shock spreading from the financial sector to the real economy and causing the banking sector further losses.

At first glance, the CCyB is a very simple tool. In reality, though, setting the CCyB rate is a complex task in terms of both decision-making and communication. It can be particularly difficult to justify the specific level at which it is set. This article aims to present key aspects of the CNB's approach to setting the CCyB rate, contribute to better formation of expectations about the future path of the rate and thereby facilitate capital planning for credit institutions. A closer knowledge of this important macroprudential tool would also help the general public get a better idea about macroprudential policy-making at the CNB.

The article is structured as follows. Section 2 summarises the essence and purpose of the CCyB, describes the BCBS/ESRB methodology and points out some issues with its application to the Czech economy. Section 3 introduces the main indicators used to determine the position of the economy in the financial cycle. Section 4 details the CNB's approach to setting the buffer rate and discusses its decision-making process, which draws on stress test results and known facts about the morphology of the financial cycle. The final section concludes.

2. THE COUNTERCYCLICAL CAPITAL BUFFER AND THE BCBS/ESRB METHODOLOGY

2.1 The rationale behind the tool

The recent financial crisis revealed that stress in the financial sector can easily spread to other sectors of the economy. Faced with capital shortages due to losses, banks in some countries severely curtailed the supply of credit even to sound non-financial corporations (a situation generally referred to as a "*credit crunch*"; see, for example, Iyer et al., 2014). In response to these funding constraints, some firms had to cut their production substantially. This led to rising unemployment, falling household incomes and, in turn, to a deepening recession. Inadequate capital creation by banks in the upward phase of the financial cycle was thus reflected in a downward spiral where falling aggregate demand due to difficulties in raising funds for viable projects led to further credit losses and further lending constraints. In some countries, public money had to be used to resolve the crisis in the banking sector. This was reflected in growth in long-term interest rates and also adversely affected the real economy.

To avoid a repeat of the spill-over effects of such shocks from the financial sector to the real economy, a countercyclical capital buffer (CCyB) has been incorporated into the macroprudential policy toolkit (BCBS, 2010). The CCyB is aimed at "protecting" banks against excessive impacts of the financial cycle, which banks themselves are involved in creating. In the spirit of this regulation, banks are meant to set aside a sufficient buffer in good times – characterised by rapid credit growth accompanied by relaxation of credit standards and growth in property prices – to cover losses arising from the switch to the downward phase of the financial cycle. Given the need for capital planning, macroprudential authorities usually give the institutions concerned one year to build up the CCyB buffer. However, this time limit can be reduced in exceptional cases.

The buffer should be released when risk materialises, so banks should be able to apply a reduced capital requirement to maintain the supply of credit to the sound part of the real economy. As adverse shocks can occur unexpectedly, the macroprudential authority can set a new CCyB rate with immediate effect when deciding to release the buffer. The CNB is prepared to cut the CCyB rate to zero if there is a risk of disruption to smooth lending to the economy. The CNB can also release the buffer by gradually lowering the CCyB rate if the financial cycle enters a downward phase and the risk of excessive credit growth decreases.

The addition of a CCyB rate to the overall capital requirement may help tame credit growth in the expansion phase of the financial cycle; however, this can be regarded only as a positive side-effect of the CCyB and is not the main purpose of creating the buffer.[1] The primary objective is still to boost the banking sector's resilience to adverse shocks at times of financial instability and to ensure smooth funding of the real economy through the financial cycle.

2.2 Experience with the use of the tool

The CCyB is a new macroprudential tool and there is limited experience with its use so far. Uncertainty about the final form of the new regulatory framework and the unfinished process of banking sector stabilisation in the euro area are hindering more active use of the tool. A universally shared approach to the introduction of non-zero CCyB rates and the setting of their specific level has yet to emerge in the international regulatory community. Some macroprudential authorities view the CCyB as a tool that should only be applied in a strongly expansionary phase of the financial cycle when systemic risks are already clearly visible. Other macroprudential authorities prefer a more prudent approach in which the CCyB should be created right at the start of a credit recovery or at a certain level even in the neutral phase of the cycle.[2] A more prudent approach

TABLE 1

COUNTRIES WITH NON-ZERO CCYB RATES

Country	Applicable CCyB rate	Valid from	Announced CCyB rate	Valid from
Czech Rep.	0.50%	01/17	1.00%	07/18
Hong Kong	1.25%	01/17	1.875%	01/18
Iceland	1.00%	03/17	1.25%	11/17
Norway	1.50%	06/16	2.00%	12/17
Slovakia	0.00%	09/14	0.50%	08/17
Sweden	2.00%	03/17	-	-

Source: ESRB, BIS
Note: Positive CCyB rate was set also in the United Kingdom in April 2016. In correspondence with the uncertainty floating from the results of the Brexit referendum, the FPC decided to set the CCyB rate to 0 % with immediate effect.

allows the CCyB rate to increase in more gradual steps when risks increase. Such an approach is likely to have a smaller impact on the cost of equity (in comparison with a sharp and relatively large increase) and would reduce the probability of the CCyB entailing a negative impact on real economic activity. A more prudent approach would also ensure that the capital buffers are consistent with potential future losses and would help prevent systemic risks from growing to a dangerous level.

Five countries in the European Economic Area had set non-zero CCyB rates by March 2017 (see Table 1). In all these countries, the tool had been applied because the economy had switched to an expansion phase of the financial cycle, reflected primarily in rapid credit growth[3] or a high level of total private sector debt and rising property prices.

2.3 The BCBS/ESRB methodology

The basic framework for applying the CCyB was formulated by the Basel Committee on Banking Supervision (BCBS) and subsequently introduced into EU regulatory practice through the CRD IV directive and its transposition into the Member States' national legislation.[4] The European Systemic Risk Board (ESRB) further developed the core principles of the original framework in the form of a Recommendation (ESRB, 2014). These two documents (referred to here in

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1   There is no clear consensus across the economic community on whether the creation of a capital buffer will give rise to a reduction in the supply of credit by banks. Financial sector representatives often assert that higher capital requirements lead to a decrease in the supply of loans (see Admati et al., 2011). Based on an analysis of data for advanced countries, however, Gambacorta and Shin (2016) find that better capitalised banks have lower funding costs and are capable – especially in worse times – of lending more to the economy than banks with lower capitalisations. For that reason, efforts to constrain credit growth should not be the main motivating factor in CCyB rate decisions.

2   One example is the UK's Financial Policy Committee (FPC). It recommends maintaining the CCyB rate at 1% after the impacts of a crisis have faded away, even if systemic risks are at a standard level, i.e. neither elevated nor subdued. According to the FPC, the CCyB rate in this region, combined with other elements of the capital framework, provides sufficient capital to withstand a severe stress. For more details, see BoE (2016).

3   The European Systemic Risk Board publishes a summary of credit growth, the credit-to-GDP ratio and the private sector debt ratio in its quarterly ESRB Risk Dashboard on its website *www.esrb.europa.eu*.

4   In the Czech legal environment, the CNB's mandate to set the CCyB rate was incorporated into the Act on Banks, the Act on Credit Unions and the Act on Capital Market Undertakings. The CCyB rate, expressed as a percentage of total risk exposure for institutions that have credit exposures in the Czech Republic, must take a value between 0% and 2.5%. The legislation also allows a rate of higher than 2.5% to be set in justified cases.

**THE LOGIC OF THE BCBS/ESRB REGULATORY FRAMEWORK FOR
SETTING THE CCYB RATE**
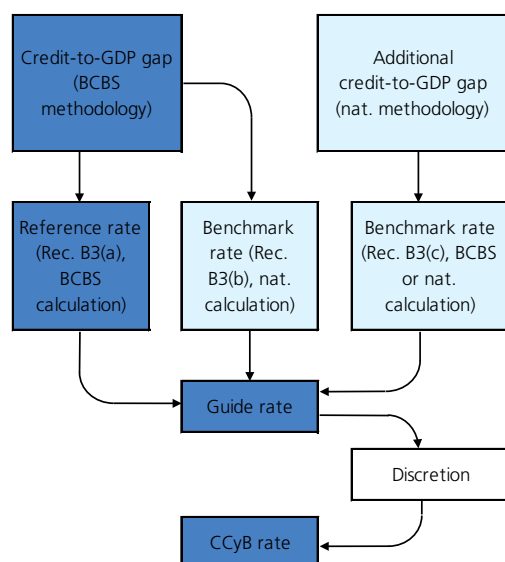
Source: BCBS (2010), ESRB (2014)
Note: Dark blue boxes indicate mandatory elements and light blue boxes voluntary elements of the
          ESRB (2014) methodology for setting the CCyB rate.

CHART 1

CREDIT-TO-GDP GAP AND REFERENCE RATES
(deviation in pp; right-hand scale: rate in % of RWA)

Source: CNB
Note: The trend in the BCBS methodology is estimated using the HP filter with lambda = 400,000.
          The trend in the national methodology is estimated by analysis of local extremes.

short as the "BCBS/ESRB methodology") jointly form the basic methodological guidance for the use of the tool in the Member States. From the operational macroprudential policy-making perspective, though, the BCBS/ESRB methodology still represents only a very rough guide to when to introduce a buffer rate and what rate to set. For this reason, it needs to be further elaborated and tailored to the specifics of each national financial sector.

The BCBS/ESRB methodology can be summarised into four main steps (see the dark blue boxes in Figure 1). The first involves determining the deviation of the credit-to-GDP ratio from its long-term trend using the Hodrick-Prescott (HP) filter and then using that gap to set a so-called benchmark buffer rate. In the BCBS/ESRB methodology, this rate serves as a guide for setting the CCyB rate.[5] EU Member States are required publish a credit-to-GDP gap and a benchmark

buffer rate quarterly every time they set a CCyB rate. However, they are given discretion to calculate the CCyB guide rate using a different method not necessarily based on the BCBS methodology (see the light blue boxes in Figure 1).

This discretion is allowed because the original BCBS methodology would produce incorrect recommendations in many countries if applied mechanically (see, for example, Geršl and Seidler, 2011). This is true for the Czech Republic, where the use of this methodology would have implied a significantly non-zero benchmark buffer rate as from 2011 Q2 and the maximum rate of 2.5% in 2013 Q2 (see the solid red line in Chart 1). During 2013, however, loans recorded only weak growth, property prices continued to fall in year-on-year terms (as they had done since 2009 Q1) and credit standards were tightened further. These conditions can hardly be interpreted as an expansion phase of the financial cycle.

The main sources of the misleading results of applying the BCBS/ESRB methodology in the Czech economy are a structural break in the time series related to the 1990s banking crisis, when bad loans were written off from banks' balance sheets, and the existence of a specific trend typical of converging economies. The ESRB (2014) Recommendation takes such cases into consideration and

5   Total credit comprises total loans to the private non-financial sector (households, non-financial corporations and non-profit institutions serving households) plus debt securities issued. The recommended smoothing parameter for the HP filter, λ, is 400,000. The benchmark buffer rate is 0% of risk-weighted assets if the gap is less than or equal to 2 pp and is greater than zero if the gap is larger than 2 pp. The equation used to calculate the rate on the basis of the gaps is: benchmark buffer rate = 0.3125*(gap) − 0.625. The benchmark buffer rate is 2.5% if the gap is greater than or equal to 10 pp. The resulting benchmark buffer rate should be calibrated in steps of 0.25 pp or multiples thereof.

allows the gap calculation to be tailored partially to the specifics of the national economy. In line with this, the CNB calculates additional gaps that may be more appropriate for macroprudential decision-making. One of these is a credit-to-GDP gap based on a shorter time series excluding the structural break that occurred in the 1990s. Specifically, the CNB calculates the gap using data since the start of 2004, when the structural characteristics of the Czech banking sector began to be consistent with the standard behaviour of banking sectors in advanced countries. Another is based on the ratio of bank loans to GDP and disregards other sources of credit financing (unlike the BCBS/ESRB methodology). Restricting the calculation to bank loans is logical since the CCyB is a tool targeted at the banking sector and at ensuring stable bank lending.

In addition to gaps calculated using the HP filter, the CNB uses an alternative method for determining the deviation from the trend which eliminates some of the known issues with the said filtration technique. This method is based on analysis of local extremes[6] in the time series. This eliminates the problem of the removal of old loans from banks' balance sheets after the late-1990s crisis and (unlike the HP filter) does not lead to changes in the trend estimate as new observations come in. The corresponding gap (referred to as the expansionary credit gap) is very different from the original signal and much closer to the true course of the financial cycle (see the solid blue line in Chart 1).

Regardless of the estimation technique, however, the credit-to-GDP gap is just an initial guide to the position of the economy in the financial cycle. The credit-to-GDP ratio is only a very rough measure of leverage in the economy, on the basis of which it is hard to identify turning points between phases of the financial cycle in a timely manner (for more details, see Frait and Komárková, 2012, pp. 14 and 22). While the credit-to-GDP ratio plays an important role in considerations of the need to introduce a non-zero CCyB rate, setting it mechanically in relation to the size of the credit-to-GDP gap does not represent the optimum approach.

Source: CNB

3. MAIN INDICATORS USED AT THE CNB

For the reasons given in the previous section, the Recommendation of the ESRB (2014) requires national authorities to take into account other variables indicating excessive credit growth and the build-up of system-wide risk when setting the CCyB rate. To this end, the CNB uses the following set of indicators, which are assessed in section 5.2 of this Report.

The composite financial cycle indicator (FCI, Plašil et al., 2016) plays an important role in determining the position of the economy in the financial cycle. The FCI was created in order to measure the accumulation of risks in the financial sector and to provide an early warning (6–8 quarters ahead) signal of the potential materialisation of such risks (see Chart 2). The FCI includes indicators covering a wide range of demand and supply factors which, according to earlier studies and expert judgement, well characterise the cyclical swings in financial risk perceptions.[7] Decomposing the FCI into individual factors allows the CNB to identify the determinants of the current evolution of the composite

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6   To reveal extremes indicating credit expansion, the CNB uses the difference between the present value of the ratio and the minimum value achieved in the past eight quarters. Other time periods were tested but the results remained robust. This analysis is loosely inspired by the definition of the cycle proposed in Burns and Mitchell (1946) and by the unemployment recession gap (Stock and Watson, 2010).

7   The indicators are credit growth, property prices, lending conditions, sustainability of the debt of non-financial corporations and households, asset prices and the adjusted current account deficit-to-GDP ratio. The IFC takes into account the changing cross-correlation structure and takes its highest values at times of rising synchronisation between all the input signals. The weights of the variables in the composite indicator are calibrated so that the indicator best predicts the loan impairment losses observed in the Czech banking sector (i.e. the risk materialisation phase).

FIGURE 2

THE CNB'S APPROACH TO SETTING THE CCYB RATE
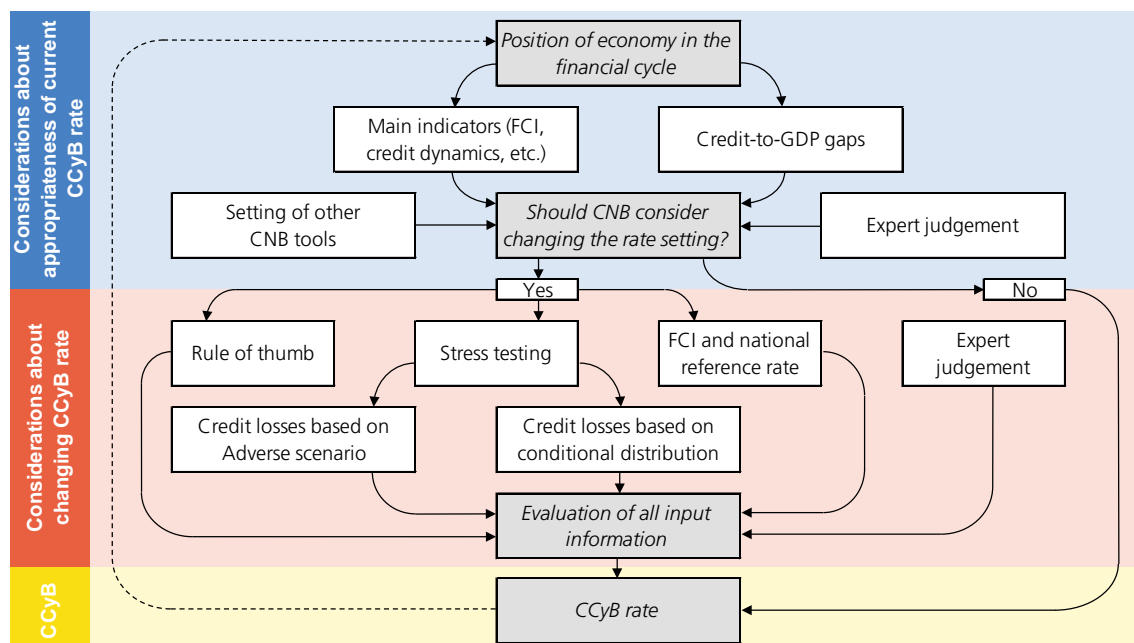
Source: CNB

indicator and, where relevant, helps it choose the optimal macroprudential response.

When determining the position in the financial cycle, the CNB also pays increased attention to the dynamics of bank loans with respect to both the stock (overall amounts) and flows (new business) of credit. The dynamics of the stock of loans provide information on the evolution of overall leverage, while the dynamics of new loans indicate current tendencies in risk-taking by households and non-financial corporations. Long-term averages and past values from periods assessed in retrospect as risky are used as benchmarks for evaluating whether credit growth is excessive. To assess the dynamics of the stock of loans, the year-on-year rate of growth is complemented by the year-on-year changes in absolute amounts in order to eliminate the low base effect. Absolute amounts are also used when assessing new bank loans. Thanks to additional data from the Czech Central Credit Register, new loans to non-financial corporations can be broken down further by sector and by the purpose for which they were provided. This allows us to better understand the main motivation for taking out a loan and helps better assess credit market developments.

In addition to credit dynamics, the CNB focuses on other areas linked closely with lending, most notably the property market and the potential for a spiral between property price growth and growth in house purchase loans. Rising property prices can give the impression that the financial benefits of buying a house are increasing and can thus motivate other households to buy property financed by mortgage loans. Besides the annual rate of growth of property prices, the CNB tracks measures of overvaluation and sustainability relative to economic fundamentals (e.g. the price-to-annual wage ratio, the price-to-income ratio and other indicators presented in more detail in Hlaváček and Hejlová, 2015). Furthermore, the CNB focuses on indicators of indebtedness of economic sectors, external imbalances and structural risks in financial institutions' balance sheets. Signals of inadequate appraisal of risks in financial markets are also investigated.

4. DECISION-MAKING ON THE CCYB RATE

The CCyB rate decision-making process is largely formalised and has clearly defined rules. For the reasons described in detail in section 2, however, the CCyB rate cannot be set in a purely mechanical fashion. The CNB's approach is thus one of "guided discretion", requiring, in addition to regular

assessment of the main indicators, a great deal of expert judgement on developments in the financial sector. The entire process is illustrated in simplified form in Figure 2. In the initial phase, the CNB needs to judge whether the current CCyB rate is commensurate with the observed situation (the blue area in Figure 2). The CNB thus has to decide whether conditions in the economy necessitate the introduction of a non-zero rate and, if so, whether a tightening or easing of macroprudential policy is needed. This phase of the process is based on the CNB's assessment of the position of the economy in the financial cycle (see sections 2.3 and 3 for details) as well as other aspects such as the settings of other CNB tools whose effects might partially overlap with those of a non-zero rate.[8] Given the complexity of the financial cycle, expert judgement is a necessary part of our considerations about the appropriateness of the current CCyB rate.

If the CNB concludes that the current CCyB rate is appropriate, it can confirm it at the current level. If, however, it feels that economic conditions call for a rate adjustment, be it a tightening or an easing, it moves to considering a change in the CCyB rate (the red area in Figure 2). The aspects taken into account when changing the rate are described in more detail below in this section. Before the final decision is made, expert judgement enters the process once again, and the new CCyB rate is then set on the basis of all the available information (the yellow area in Figure 2).

Where application of the BCBS/ESRB methodology is not a suitable starting point for determining the rate (see above), other criteria must be taken into account in the decision-making process. The simplest guide for setting the rate is past historical experience and the known facts about the morphology of the financial cycle. The economic literature states that the average length of the financial cycle in advanced countries is around 15 years. The downward phase from the peak to the trough of the cycle is around half as long as the upward phase from the trough to the next peak (see, for example, Drehmann et al., 2012, 2013). Moreover, the upward phase can be divided into a recovery phase, when the subdued economy slowly emerges from

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TABLE 2

THE INDICATIVE RELATIONSHIP BETWEEN THE FCI VALUES AND THE CCYB RATE

FCI values		CCyB rate
from*	to	
0.00	0.09	0.00%
0.09	0.11	0.25%
0.11	0.13	0.50%
0.13	0.16	0.75%
0.16	0.19	1.00%
0.19	0.23	1.25%
0.23	0.27	1.50%
0.27	0.32	1.75%
0.32	0.37	2.00%
0.37	0.42	2.25%
0.42	1.00	2.50%

Source: CNB, authors' calculations
Note: * inclusive. The financial expansion observed in the Czech economy just before the global financial crisis started was so strong that it would have necessitated setting the rate at least at the "upper limit" of 2.5% had the tool been available. For this reason, the historical maximum of the FCI is associated with a CCyB rate of 2.5%.

the trough of the cycle, and an expansion phase, when credit dynamics surge and systemic risk rises. The two phases are roughly equal in length (see Drehman et al., 2012). On a general level, then, the observed historical experience implies that the economy is in the expansion phase of the financial cycle for around five years on average. When there is a need to build up the CCyB during an expansion phase, a simple rule of thumb based on the ratio of the assumed maximum rate (2.5%) to the assumed length of the expansion phase (five years) can be used. This rule therefore states that the macroprudential authority should increase the CCyB rate by at least 0.5 pp in each year of the expansion phase. According to CNB analyses, the Czech economy was in the second year of an expansion phase of the financial cycle at the end of 2016, so according to the rule of thumb the CCyB rate should have been set at around 1.0%. Despite being only a rule of thumb, this can be a useful guide for setting the rate given the difficulty of predicting a turning point in the financial cycle at a time when most indicators are not sending out negative signals.

Another rough guide is based on the specific historical experience of the Czech banking sector and on domestic indicators of the financial cycle. On the one hand, the CNB can use the national credit-to-GDP gap and the rate implied by it (see Chart 1). On the other hand, our considerations about the level of the rate can be based on the composite FCI (see section 3 for more details). Table 2 shows the indicative relationship between the FCI values and the CCyB rate. The presented relationship can be formally derived by adopting a set of assumptions, two of which exert a decisive influence on it. The first is that the maximum observed FCI

value from the peak of the previous cycle in mid-2008 corresponds to a rate of 2.5%. The second is that the median of the sub-indicators entering the FCI calculation corresponds to a kind of "equilibrium" situation where the financial cycle is neither significantly subdued nor overheating. The FCI is constructed using a quadratic system of weights (for more details, see Plašil et al., 2016), so the relationship between the FCI values and the CCyB rate is non-linear. A consequence of this property is that the bands of FCI values are not necessarily of the same width for all the rates, and it does not hold that an increase in the FCI values leads to a proportional change in the rate. Using the relationship in Table 2, the FCI values in 2016 Q3 would have implied a CCyB rate of 0.75% and a need to change it soon to 1.00%.

More formal approaches to setting the CCyB rate are based on the idea that the size of the CCyB should ensure that the total capital buffers are consistent with the potential losses that the banking sector as a whole may be exposed to in the event of future stress. A natural way of doing this is to link CCyB rate decision-making with bank stress testing. The crudest option is to compare the overall impact of the adverse shock with the sum of the capital conservation buffer (CCoB) and the CCyB. If the CCoB and the CCyB are not capable of absorbing the simulated decrease in capital at the sector level in the *Adverse Scenario*, the macroprudential authority may consider raising the CCyB rate to the level at which the capital buffers would be able to absorb it fully. The impact of the adverse scenarios in the CNB's macro-stress tests has fluctuated around 5 pp of the banking sector's capital ratio in recent years. If this rule were applied purely mechanically, this impact would imply a rate of 2.5% for both buffers. However, this is too crude an approach, among other things because it does not take into account the banks' own prudent approach (e.g. provisioning).

A more sensitive option is to compare the credit losses in the *Adverse Scenario* with the expected losses in the *Baseline Scenario*.[9] In the CNB stress tests published in December 2016, which were conducted using the end-2016 Q3 data, the cumulative credit losses over the two-year period in the *Adverse Scenario* amounted to CZK 85 billion. The expected credit losses in the *Baseline*

Scenario were around CZK 45 billion lower.[10] In this case, the CCyB rate ensuring that the capital buffers are consistent with the potential losses would be 2.0% (CZK 45 billion represented 1.84% of risk-weighted assets in 2016 Q3, and the nearest possible rate covering this loss is 2.0%).

However, the *Adverse Scenario* is designed to test the resilience of the banking sector to an exceptionally large and implausible stress. One could therefore argue that considerations about the CCyB rate should take into account the fact that the probability of such situations occurring varies across the phases of the financial cycle. For example, the probability of a crisis is much higher in a strongly expansionary phase of the cycle than when the subdued economy is just starting to recover. An estimate of the conditional credit loss probability distribution can be used for this purpose. In the case of the conditional distribution, the potential size of the losses (the variance and shape of the distribution) differs depending on the current phase of the cycle. In simplified terms, the risk of a crisis – and hence also the probability of greater cumulative losses in future – steadily increases as the economy moves into the expansion phase of the cycle. To ensure consistency with the most likely outcome, the conditional distribution is constructed in such a way that the expected size of the losses (the expected value of the distribution) always matches the losses in the *Baseline Scenario*.

Owing to the complexity of stress testing, the conditional loss distribution cannot be derived mathematically and must be estimated using simulation techniques. The principle consists in simulating a large number of alternative paths for the stress test input variables and calculating the corresponding cumulative losses for each of them. An empirical estimate of the probability distribution is then obtained by summarising the losses simulated in this way. The technique for generating the alternative paths is based on the maximum entropy bootstrap method (see Vinod, 2006).[11] The size of the deviation of the simulated

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9 Since 2010, the CNB has distinguished between a *Baseline Scenario* and an *Adverse Scenario* in its stress testing. The *Baseline Scenario* is based on the CNB's macroeconomic forecast and thus indicates the most probable future developments, while the *Adverse Scenarios* represent unlikely developments with a very strong impact (see section 3 of this Report).

10 These figures correspond to the cumulative losses arising between 2016 Q3 and 2018 Q3. The two-year time period was chosen with regard to the fact that the CCyB rate usually enters into force a year after it is announced. To this, one has to add the macroeconomic data publication lag and the time it takes to conduct the assessment.

11 Unlike traditional bootstrap techniques, this method preserves the cyclical properties of the time series and is also suitable for directly simulating non-stationary series. A total of 1,000 bootstrap simulations with a time period of 12 quarters were performed for variables including PD, LGD and growth in bank loans for the sectors of non-financial corporations and households. The LGD values in the simulation are limited as follows: (i) non-financial corporations: 0.45–0.55; (ii) households – loans for house purchase: 0.2–0.3; (iii) households – consumer credit: 0.55–0.65.

paths from the *Baseline Scenario* projection can be regulated by changing the settings of the input parameters of the chosen method. The degree of deviation is set by the CNB depending on the current phase of the financial cycle. The specific values of the time-varying parameters are obtained by solving an optimisation problem taking into account, among other things, the size of the past differences between the losses in the *Baseline Scenario* and the actual losses.

When deciding on the rate, the macroprudential authority can then choose its own level of sensitivity to unexpected events. Like most macroprudential and supervisory authorities in other advanced countries, the CNB prefers a prudential approach, i.e. it tries to ensure that there are sufficient buffers in place to cover even relatively unlikely credit losses. This corresponds to the 99% quantile of the probability distribution, in which credit losses totalled CZK 53.5 billion over two years in the stress tests published in December 2016.[12] This figure is roughly CZK 13 billion higher than the expected credit losses in the *Baseline Scenario* (see Chart 3). The CCyB rate ensuring that the capital buffers are consistent with the possible cyclical losses would thus be 0.75% (CZK 13 billion represented 0.6% of risk-weighted assets in 2016 Q3).

The need to raise the rate is naturally lower in the case of a less strict approach to setting macroprudential tools. For example, if the 60% quantile were used, the difference would be around CZK 7 billion and a CCyB rate of 0.5% would be sufficient to cover this level of credit losses. The relationship between the final rate decision and the stress test results is not entirely mechanical, but it does represent a logical enhancement of the forward-looking principle of macroprudential policy. This approach to applying stress test results to assess whether capital requirements are adequate is also being discussed in the context of the planned EBA guidelines on bank stress testing (EBA, 2015).

Deciding on the CCyB rate setting is not mechanically based on the aforementioned approaches. Instead, it reflects a complex evaluation of systemic risks.

CHART 3

THE DIFFERENCE BETWEEN EXPECTED CREDIT LOSSES AND ALTERNATIVE QUANTILES OF THE CONDITIONAL CREDIT LOSS PROBABILITY DISTRIBUTION
(CZK billions)
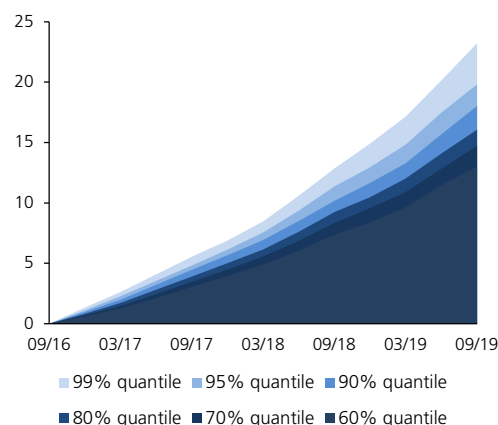
Source: Authors' calculations

5. CONCLUSION

For macroprudential policy to be effective, the available instruments have to be set in a timely and appropriate manner with a deep understanding from financial market participants. In the case of the capital tools applied by the CNB, it is vital to anchor the expectations of the financial institutions concerned and give them a guide for capital planning. This article contributes to this objective by detailing the CNB's approach to setting the countercyclical capital buffer.

The decision-making process in the Czech Republic contains both systematic elements and expert judgement and takes the form of guided discretion. The first step is to assess the position of the economy in the financial cycle. To do so, the CNB uses a composite financial cycle indicator and other indicators of credit dynamics and property prices. Its decision-making on the specific level of the CCyB rate also takes into account a wide range of factors, which, in addition to an assessment of the main indicators of the financial cycle, include stress test results and stylised facts about the financial cycle.

The CNB's approach to setting the CCyB rate has been stabilised and formalised since the rate was first set in 2014. At present, the CNB is focusing on linking CCyB rate decision-making with bank stress testing to ensure that the overall capital buffers are consistent with the potential losses that the banking sector as a whole may be exposed to in the event of future stress. Given the nature of systemic

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12 From the perspective of the conditional probability distribution, the probability of losses implied by the *Adverse Scenario* would thus be less than 1%.

risks, however, the CNB remains flexible and is ready to incorporate into its decision-making process any new factors that would help boost the resilience of the banking sector and ensure smooth funding of the real economy through the financial cycle.

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THE BANK LENDING SURVEY

Eva Hromádková, Oldřich Koza, Petr Polák

This article describes the bank lending survey that the CNB has been using since 2012 to gather valuable qualitative information about the bank credit market as a complement to statistical reporting. The article sets out to conduct a quantitative assessment of the survey results and to determine the roles played in new credit developments in 2012–2016 by changes in credit supply and changes in demand for loans as reported by banks in the survey. The results of the analysis indicate that although some of banks' survey responses are statistically significant in explaining the amounts of new loans reported by banks, the survey's ability to explain credit growth is currently limited. Growth in new loans for house purchase can be attributed primarily to growth in demand driven by falling interest rates. According to the results, supply and demand factors both played a role in the case of loans to non-financial corporations, consumer credit and other lending to households. However, the results of the analysis are less robust than in the case of loans for house purchase.

1. INTRODUCTION

Credit standards and credit terms and conditions[1] play a key role in the decisions of non-financial corporations and households, as they determine the availability of loans. Credit standards also fundamentally affect the quality of banks' credit portfolios. Excessively easy credit standards represent a risk to financial stability, because they can lead to excessive risk-taking by banks and their clients. Strong credit growth associated with the easing of credit standards is thus a source of systemic risk. Monitoring credit standards is therefore a very important part of the creation and assessment of macroprudential policy by the CNB. Understanding the transmission of macroprudential policy to banks' credit terms and conditions (such as loan rates) is vital for CNB monetary policy-making.

In its bank lending survey (BLS), the CNB asks banks to assess qualitatively their supply of loans (via credit standards and credit terms and conditions) and to disclose the changes they perceive in demand for their loans. Similar surveys are conducted in other countries, for example the USA (since 1964), the euro area (since 2002), the UK (since 2007) and other European countries. The CNB introduced the BLS in the Czech credit market in 2012. A total of 19 regular quarterly rounds of the survey had been completed by the end of 2016.

Unlike the statistical data gathered in the standard reporting process, the BLS allows the CNB to disentangle credit supply and demand trends. This helps it understand and isolate factors that affect the amount of credit provided by banks. Bell and Young (2010) and Bell and Pugh (2014) explain

how the BLS provides an understanding of the factors causing developments in credit markets. By way of example, they give the global financial crisis, when lending activity fell sharply. It is impossible to determine from the statistical data to what extent this fall reflected a decrease in demand for credit and to what extent banks tightened the supply of credit, whereas the information from the BLS can answer this question.

This article begins by (i) introducing the Czech BLS and (ii) describing the evolution of credit standards, demand for loans and related factors in 2012–2016 at the aggregate Czech banking market level. In an econometric analysis, the responses of banks participating in the BLS are then used (iii) to assess their ability to explain the dynamics of new loans and (iv) to determine the roles played in credit developments by changes in credit supply and changes in demand for loans as reported by banks in the BLS.

One of the main contributions of this article is that it is the first in the Czech Republic to perform an in-depth analysis of BLS data in relation to statistical reporting data. Furthermore, this article – unlike earlier studies of this type from other countries – uses BLS data to explain amounts of new loans rather than changes in stocks of existing loans. That is a more appropriate approach because in addition to inflows of new loans, changes in stocks of loans are affected by repayments of existing loans, which are not investigated by the BLS and are not taken into account by banks in their survey responses.

The article is structured as follows. Section 2 provides a brief literature survey, section 3.1 describes the nature of the data gathered in the BLS and section 3.2 presents the method used to assess the aggregate survey results. Section 3.3 describes the history of the survey results at the aggregate level and section 3.4 analyses those results in the

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[1] The exact definitions of the terms "credit standards" and "credit terms and conditions" are given in section 3.1.

context of amounts of new loans. Section 4.1 describes the methodology used for the econometric analysis of the relationship between the dynamics of new loans and banks' responses in the BLS, and section 4.2 presents the results of that analysis. Section 5 concludes.

2. LITERATURE SURVEY

The first European studies to use bank lending surveys to explain credit growth factors (De Bondt et al., 2010; Blaes, 2011; Del Giovane et al., 2011) focused on loans to non-financial corporations during the global financial crisis of 2007–2009. On a panel of European countries, De Bondt et al. (2010) showed that banks' responses in the survey conducted by the ECB help explain growth in loans to non-financial corporations, real GDP growth and foreign investment growth. Del Giovane et al. (2011) used data on Italian banks from the ECB survey and found that the decline in lending in the crisis years was caused not only by a fall in demand, but also by tightened supply. The effect of supply factors was identified as having been strongest after the Lehman collapse. Blaes (2011) conducted a similar study on a sample of German banks and reached similar conclusions.

Maddaloni and José-Luis (2013) also analysed the period of the financial crisis, but, in contrast to the above studies, concentrated on the effect of monetary and macroprudential policy on banks' credit standards. Their results reveal, among other things, that the accommodative monetary policy of the ECB helped soften banks' lending standards before the crisis. Macroprudential policy had the opposite effect at the same time. During the crisis, conversely, the ECB's low interest rates combined with access to Eurosystem long-term liquidity helped mitigate the impact of the crisis on lending to non-financial corporations.

Among the more recent studies is Bell and Pugh (2014), who examined the situation in the UK. They looked at loans to households in addition to loans to non-financial corporations. Their analysis reveals that the survey responses – especially those for house purchase loans – are significantly associated with movements in the statistical data and that banks' expectations can be used to predict lending growth and changes in credit spreads[2] one quarter ahead. Van der Veer (2016) describes the situation in the Netherlands and, like earlier studies, focuses on the effect of the financial crisis. He finds that the easier pre-crisis credit

standards explain credit growth, and the post-crisis tightening likewise led to a drop in lending. Pintaric (2016) analyses data from the Croatian BLS in 2012–2015 and finds, among other things, that changes in demand have a bigger effect on the amount of loans provided than do changes in the supply of credit (captured in the form of credit standards).

3. THE BANK LENDING SURVEY IN THE CZECH REPUBLIC

3.1 Nature of the data obtained in the survey

The analysis was performed on a panel of the most significant Czech banks participating in the BLS conducted by the CNB. A total of 18 banks and building societies took part in the BLS in 2012–2015. At the beginning of 2016, the sample of participating banks was modified to reflect changes in the credit market. One bank was dropped from the BLS and four new ones that had grown in significance since 2012 were added. The 21 participating banks currently account for more than 90% of the banking market.[3] This high market share of the participating banks represents an advantage over similar national studies drawing on data from the BLS conducted by the ECB.[4]

The Czech BLS takes the form of a questionnaire in which banks express their opinions on past and expected future changes in credit supply and demand for loans. The structured questionnaire contains 20 questions on banks' lending policies and on non-financial corporations' and households' demand for loans as perceived by banks. Banks' lending policies are captured in questions on credit standards[5] and credit terms and conditions.[6]

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2 The difference between the bank lending rate and the central bank monetary policy rate.

3 As measured by the amount of loans and claims on clients.

4 For example, Del Giovane et al. (2010) worked with data representing "only" 60% of the Italian banking sector, while Van der Veer (2016) used data representing 65% of the Dutch banking sector.

5 Credit standards are internal criteria or procedures that reflect a bank's lending policy. They are written and unwritten criteria or procedures that are set before the specific credit terms and conditions are negotiated and before the decision on whether or not to approve a loan is made. They define, for example, the types of loan a bank considers desirable/undesirable, its designated geographical priorities and collateral deemed acceptable. They also specify lender eligibility requirements (such as maximum debt, income situation, age and employment status). For the purposes of the survey, changes in formal criteria and changes in their application are relevant.

6 Credit terms and conditions are defined as the contractual obligations agreed upon by the lender and the borrower. For the purposes of the survey, these obligations consist of the price or interest rate, the maximum size of the loan and the access conditions, and other terms and conditions in the form of charges, collateral (including compensating balances), loan covenants and maturities. The credit terms and conditions depend on the lender's characteristics and can change in accordance with, or independently of, the credit standards.

FACTORS AFFECTING CREDIT STANDARDS AND DEMAND FOR LOANS AND THEIR CATEGORISATION

Categories of factors affecting credit standards	Factors affecting credit standards	Categories of factors affecting demand for loans	Factors affecting demand for loans (non-financial corporations)	Factors affecting demand for loans (households)
Cost of funds and balance sheet constraints	Costs related to the bank's capital position	*Financing needs*	Fixed investment	Housing market prospects
	The bank's ability to access market financing		Working capital Mergers/acquisitions and corporate restructuring	Consumer confidence
	The bank's liquidity position			Consumption expenditure
				Spending on durable consumer goods
Pressure from competition	Competition from other banks	*Use of alternative finance*	Internal financing	Savings
	Competition from non-banks		Loans from other banks	Loans from other banks
	Competition from market financing (issuance of bonds and equity)		Issuance of debt securities	Other sources of finance
Risk perception	Expectations regarding the general economic situation		Issuance of equity	
	Industry or firm-specific outlook			
	Risk on collateral demanded			

Source: CNB

RANGE OF RESPONSES FOR EACH TYPE OF QUESTION

Credit standards	Factors affecting credit standards	Demand for loans	Factors affecting demand for loans
Tightened considerably	Contributed considerably to tightening	Increased considerably	Contributed considerably to higher demand
Tightened somewhat	Contributed somewhat to tightening	Increased somewhat	Contributed somewhat to higher demand
Remained basically unchanged	Contributed to basically unchanged credit standards	Remained basically unchanged	Contributed to basically unchanged demand
Eased somewhat	Contributed somewhat to easing	Decreased somewhat	Contributed somewhat to lower demand
Eased considerably	Contributed considerably to easing	Decreased considerably	Contributed considerably to lower demand

Source: CNB

The analysis contained in this article draws on banks' responses to questions relating to loans to non-financial corporations, loans to households for house purchase and consumer credit and other lending to households.[7] Specifically, the questions cover:

- changes in credit standards made by banks in the reference quarter,
- factors affecting credit standards,
- perceived changes in loan demand in the reference quarter,
- and factors affecting demand for loans.

In the questionnaire, banks can select factors that led to changes in credit standards or demand for loans from the list given in Table 1. These factors are divided into categories and are analysed in this article at the aggregate category level only.

The questionnaire responses are qualitative in nature. Table 2 shows the range of responses for each type of question. To date, banks have most often perceived no change both in their own credit standards and in demand for loans. Changes in demand have been reported significantly more often than changes in credit standards (see Charts 1 and 2). Where banks have changed their credit standards, they have

[7] A specimen questionnaire containing the exact questions can be downloaded from the CNB website: http://www.cnb.cz/en/bank_lending_survey/index.html.

CHART 1

STRUCTURE OF RESPONSES CONCERNING CHANGES IN CREDIT STANDARDS
(percentage share of responses)
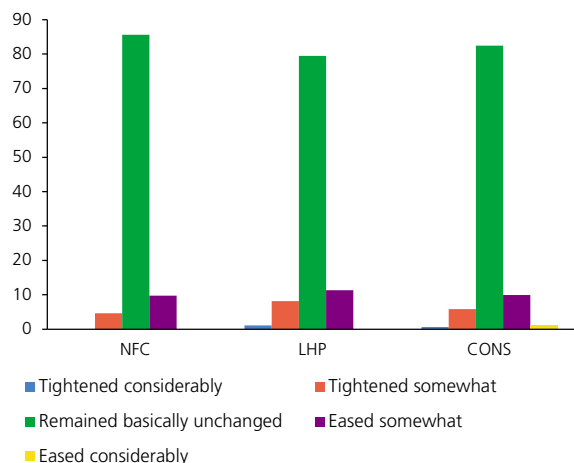
- Tightened considerably
- Tightened somewhat
- Remained basically unchanged
- Eased somewhat
- Eased considerably

Source: CNB, authors´ calculations
Note.:   NFC stands for non-financial corporations, LHP for loans for house purchase and CONS for consumer credit and other lending to households.

CHART 2

STRUCTURE OF RESPONSES CONCERNING PERCEIVED CHANGES IN DEMAND FOR LOANS
(percentage share of responses)
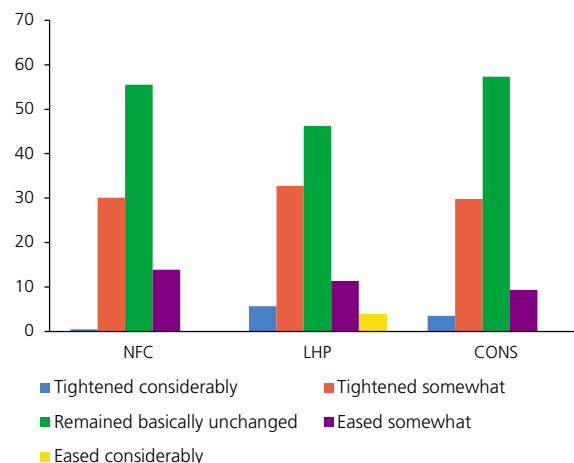
- Tightened considerably
- Tightened somewhat
- Remained basically unchanged
- Eased somewhat
- Eased considerably

Source: CNB, authors´ calculations
Note.:   NFC stands for non-financial corporations, LHP for loans for house purchase and CONS for consumer credit and other lending to households.

more often indicated a slight easing than a slight tightening. In the case of demand for their loans, banks have more often perceived a slight increase than a slight decrease. This is consistent with the fact that the Czech economy was in a growth phase of the credit cycle in the period under scrutiny. The proportion of the responses indicating considerable changes in credit standards or demand for loans has been minimal. For this reason, the following analysis does not distinguish between responses indicating slight changes and considerable changes in credit standards and demand for loans. For each type of question, the banks' responses were therefore aggregated into just three categories (increased/tightened – remained basically unchanged – decreased/eased).

3.2   Method for evaluating the aggregate survey results

The qualitative responses of banks are assessed at the aggregate level by means of net percentages. A net percentage is calculated for each sector as the difference between the market share of banks reporting a tightening of standards/conditions (or observing an increase in demand)[8] and the market share of banks reporting an

easing of standards/conditions (or observing a decrease in demand). A positive (negative) net percentage indicates an aggregate tightening (easing) of credit standards/conditions or an aggregate increase (decrease) in demand for loans.

Net percentages are calculated for factors affecting credit standards and demand for loans in the same way as for changes in credit standards and demand themselves. However, there is no formal relationship between the effects of the individual factors and changes in credit standards or demand for loans. A bank may thus, for example, report no change in credit standards yet identify factors that fostered a change in credit standards, or even identify factors that fostered an easing of credit standards even though it tightened credit standards. So, in the aggregated results presented in the form of net percentages, discrepancies can arise between changes in credit standards or demand for loans and in related factors fostering those changes.

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8   A net percentage assessment is performed in each round of the BLS, and time series summarising the aggregate results of all the rounds to date are published every quarter on the CNB website at http://www.cnb.cz/en/bank_lending_survey/index.html.

CHART 3

CREDIT STANDARDS APPLIED TO LOANS TO NON-FINANCIAL CORPORATIONS AND RELATED FACTORS
(net percentages)

- Risk perception
- Pressure from competition
- Cost of funds and balance sheet constraints
- Changes in credit standards (rhs)
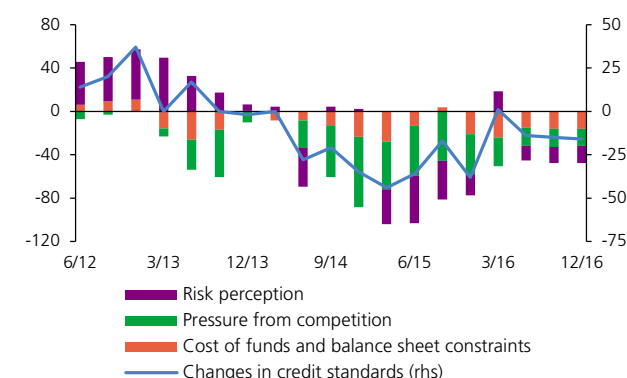
Source: CNB, authors´ calculations

CHART 4

DEMAND FOR LOANS TO NON-FINANCIAL CORPORATIONS AND RELATED FACTORS
(net percentages)

- Financing needs
- Use of alternative finance
- Changes in demand (rhs)
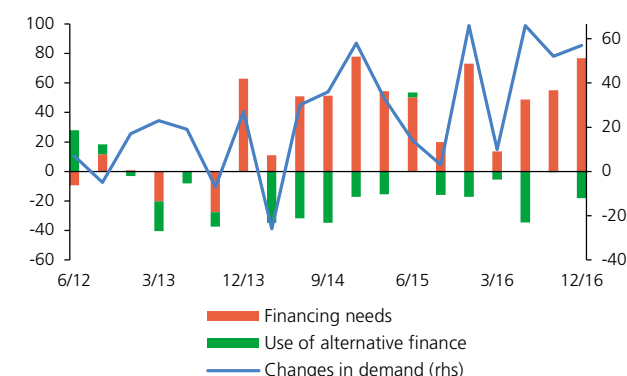
Source: CNB, authors´ calculations

CHART 5

CREDIT STANDARDS APPLIED TO LOANS FOR HOUSE PURCHASE AND RELATED FACTORS
(net percentages)

- Risk perception
- Pressure from competition
- Cost of funds and balance sheet constraints
- Changes in credit standards (rhs)
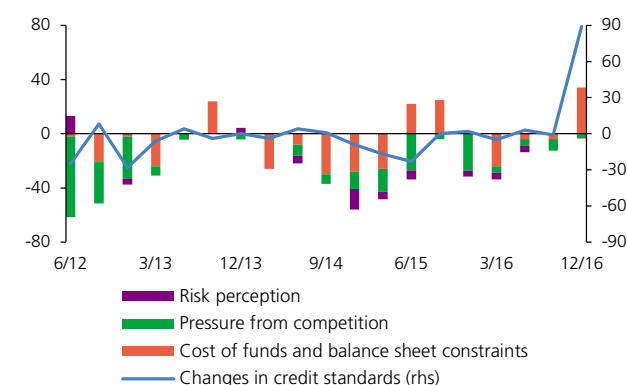
Source: CNB, authors´ calculations

3.3 Analysis of the aggregate survey results

Between 2012 and 2016, the changes in credit standards, demand for loans and related factors reported by banks were in line with the credit cycle and the observed market situation in all the sectors under review. From around 2014 onwards, there was stronger growth in demand on the credit market, risk perceptions changed, and pressure from competition strongly fostered an easing of credit standards. Regulatory and legislative interventions in the area of lending to households led to a sharp tightening of credit standards at the end of 2016.

In 2012 and 2013, non-financial corporations mostly experienced tightening credit standards linked with negative risk perception in the market (see Chart 3). From 2013 onwards, pressure from competition significantly fostered an easing of credit standards. As a result, credit standards eased continuously (with one exception) between 2014 Q2 and the end of 2016. Risk perception also recorded a turnaround in 2014 and mostly fostered an easing of credit standards from 2015 onwards. Cost of funds and balance sheet constraints had a smaller effect on credit standards in the period under review, mostly fostering an easing of credit standards. Demand for loans to non-financial corporations rose continuously from 2014 Q2 onwards (see Chart 4). Financing needs had a significant upward effect on demand, while use of alternative finance acted in the opposite direction to a lesser extent.

Until 2016 Q3, credit standards applied to loans to households for house purchase showed mixed movements, though with a moderate easing tendency, which was most apparent in late 2014 and the first half of 2015 (see Chart 5). In 2016 Q4, credit standards were tightened across the board by regulatory interventions.[9] Pressure from competition constantly fostered easier credit standards. Risk perception and cost of funds and balance sheet constraints acted more often towards an easing than a tightening of credit standards. Demand for loans for house purchase mostly increased, doing so sharply and continuously from the end of 2014 onwards (see Chart 6). Financing needs had a significant upward effect on demand for loans. Use of alternative finance had a mixed effect according to banks' responses.

Credit standards applied to consumer credit and other lending tended to get tighter until 2014 Q3, with risk

9 A new consumer credit law and CNB recommendations on the management of risks associated with the provision of retail loans secured by residential property were issued.

THE BANK LENDING SURVEY

perception fostering a tightening in several quarters (see Chart 7). Credit standards eased continuously from the end of 2014 until 2016 Q3. Credit standards were tightened in some banks in 2016 Q4 following the adoption of a new consumer credit law. Pressure from competition and risk perception both fostered an easing. Cost of funds and balance sheet constraints had no major effect on credit standards. Banks more often perceived a rise than a fall in demand for consumer credit and other lending to households. In five quarters, growth in demand was reported in a net percentage of more than 50% of the market (see Chart 8). In the period under review, demand was driven up predominantly by financing needs.

3.4 Relationship between the aggregate survey results and the dynamics of new loans

The statistical data on new bank loans can be used to carry out a basic aggregate-level analysis of the relationship between the results of the previous 19 rounds of the Czech BLS and the dynamics of new loans. Seasonally adjusted[10] percentage changes in the amount of new loans provided in each quarter were calculated for the set of banks participating in the BLS. They were compared with the net percentages for the responses to the BLS questions relating to credit standards and demand for loans.

In the case of non-financial corporations, the amounts of new loans went up in quarters when banks had indicated growth in demand and a simultaneous easing of credit standards in their responses (see Chart 9a). The dynamics of new loans between mid-2013 and the start of 2015 were similar to the dynamics of demand as perceived by banks. Between the end of 2015 and September 2016, the BLS results seem to precede the changes in new loans by one quarter.

The amount of new loans for house purchase mostly increased in the period under review. Likewise, banks most often perceived quarter-on-quarter increases in demand in this period in their BLS responses (see Chart 9b). In the first year under review, the dynamics of new loans were similar to those of demand as perceived by banks and partly also to those of credit standards. The graphical analysis also indicates that between September 2014 and December 2015, movements in demand for loans preceded actual movements in the amount of new loans by one quarter.

10 The BLS questionnaire instructs banks to take into account seasonal effects in their responses and not to report changes that occurred as a result of them. For this reason, the percentage changes in the amount of new loans are also seasonally adjusted.

CHART 6

DEMAND FOR LOANS FOR HOUSE PURCHASE AND RELATED FACTORS
(net percentages)

Financing needs — Use of alternative finance — Changes in demand (rhs)
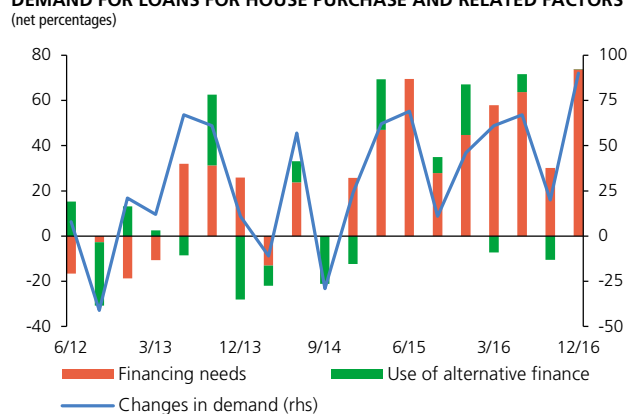
Source: CNB, authors´ calculations

CHART 7

CREDIT STANDARDS APPLIED TO CONSUMER CREDIT AND OTHER LENDING TO HOUSEHOLDS AND RELATED FACTORS
(net percentages)

Risk perception — Pressure from competition — Cost of funds and balance sheet constraints — Changes in credit standards
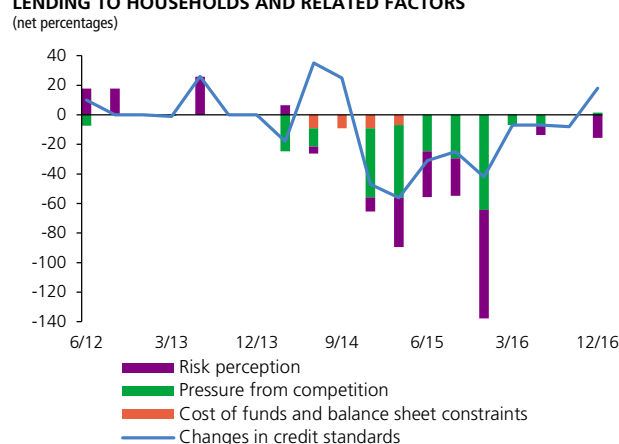
Source: CNB, authors´ calculations

CHART 8

DEMAND FOR CONSUMER CREDIT AND OTHER LENDING TO HOUSEHOLDS AND RELATED FACTORS
(net percentages)

Financing needs — Use of alternative finance — Changes in demand
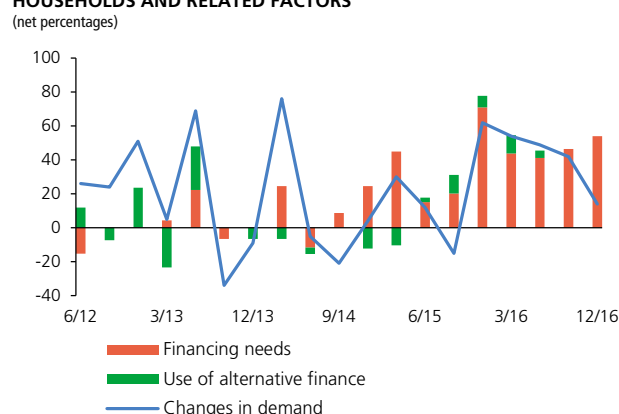
Source: CNB, authors´ calculations

CHART 9

DYNAMICS OF NEW LOANS AND BANKS' RESPONSES IN THE BLS
(%; rhs: net percentages)

a) Loans to non-financial corporations

b) Loans to households for house purchase

c) Consumer credit and other lending to households

— Seasonally adjusted percentage q-o-q change in amount of new loans
-- BLS – changes in credit standards (rhs)
-- BLS – changes in demand (rhs)
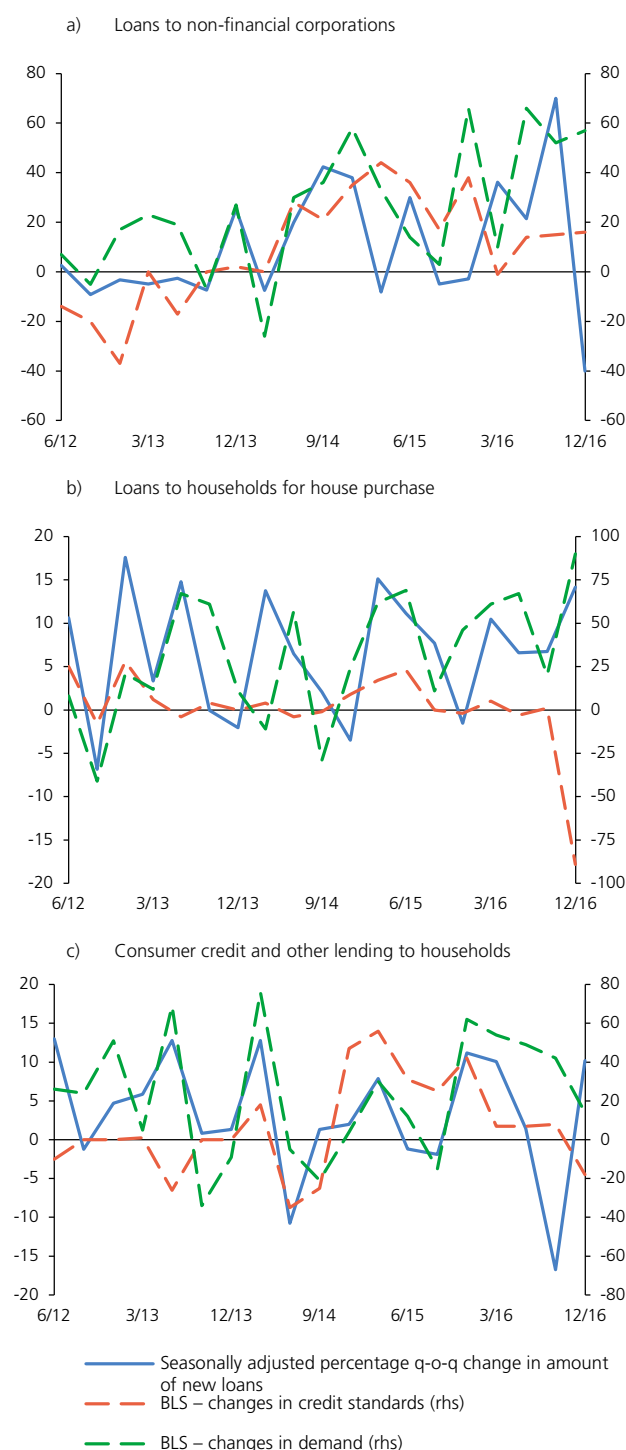
Source: CNB, authors' calculations
Note.: The aggregate BLS results are in the form of net percentages. For illustrative purposes, the net percentage changes in credit standards have been multiplied by a coefficient of -1. Positive values in Charts 9a–9c mean an easing of credit standards/growth in demand for loans.

The similarity between movements in the BLS results and the dynamics of new loans is most apparent for consumer credit and other lending to households (see Chart 9c). The changes in the amount of new lending to this sector were mixed, and so were those in credit standards and demand perceived by banks. The quarters with the strongest growth in new loans usually match those when banks perceived the biggest increases in demand for their loans. Some similarity can also be seen between the changes in credit standards and the dynamics of new loans between mid-2014 and mid-2016.

A correlation analysis revealed no significant relationship between the changes in credit standards and the dynamics of new loans at the aggregate level in the period under study. However, a relationship was identified between changes in demand as perceived by banks and the dynamics of new loans (see Table 3). A significant positive correlation was found between changes in demand and changes in new loans in both categories of loans to households (in the same quarter). In addition, a significant negative correlation between changes in demand (with a lead of one quarter) and the dynamics of new loans was found for consumer credit and other lending to households. A possible interpretation is that if demand for loans goes up in a quarter, for example as a result of advertising campaigns or special offers run by banks, customers who would otherwise not take out a loan until the next quarter will expedite their decisions. Fewer loans are thus provided in the following quarter.

4. ANALYSIS OF THE SURVEY RESULTS IN RELATION TO BANK-LEVEL CREDIT DYNAMICS

4.1 Methodology and data

In this section, we empirically analyse the effect of changes in credit standards and demand for loans (according to the BLS) on the dynamics of new loans in the three sectors under study. The analysis is performed on an unbalanced panel of the 21 banks[11] monitored in the 19 rounds of the BLS conducted in the period of 2012 Q2–2016 Q4. Given the nature of the data, we decided – in line with earlier studies (Blaes, 2011, Del Giovane et al., 2011, Bassett et al., 2014, and Pintaric, 2016) – to estimate a fixed-effects

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11 The number of banks differs depending on the sector analysed. There are 13 respondent banks in the non-financial corporations sector, 15 in the house purchase loans sector and 10 in the consumer credit sector. A number of banks with very small sector shares whose responses seemed heavily biased towards reporting no changes were excluded from the econometric analysis.

TABLE 3

CORRELATION ANALYSIS BETWEEN THE AGGREGATE BLS RESULTS AND THE DYNAMICS OF NEW LOANS

	Correlation between changes in credit standards according to BLS and dynamics of new loans			Correlation between changes in demand according to BLS and dynamics of new loans		
	Non-fin. corps	House purchase	Cons. and other	Non-fin. corps	House purchase	Cons. and other
Same quarter	0.25	0.00	0.10	0.27	**0.43***	**0.43***
Lead (one quarter)	0.33	-0.21	0.02	0.22	-0.13	**-0.45***

Source: CNB, authors´ calculations
Note.:   * denotes the 10% level of significance. The dynamics of new loans has been seasonally adjusted.

dynamic panel regression model for each sector of the market separately. The basic econometric model is expressed by the equation:

$$y_{i,t} = \alpha y_{i,t-1} + \beta BLS_{i,t-h} + \gamma X_{i,t} + F_i + F_t + \varepsilon_{it}, \qquad (1)$$

where $y_{i,t}$ is quarter-on-quarter logarithmic growth in new loans provided by bank i at time t, $BLS_{i,t-h}$ is a vector of survey responses with a lag of 0–1 quarters ($h = \{0,1\}$),[12] X_{it} is a vector of additional control variables, F_i is a bank fixed effect and F_t is a quarter fixed effect to control for seasonality in the data. The survey responses are qualitative, so in the regression we use vectors of binary variables where each vector corresponds to one option from a condensed range of possible responses in the BLS. Changes in credit standards and demand are captured in both directions – tightening and easing/increase and decrease. The relationship between the dynamics of new loans and the survey responses from the basic model specification can therefore be described as:

$$y_{it} = \alpha y_{i,t-1} + \beta_1 \text{ Standards eased}_{i,t-h} + \beta_2 \text{ Standards tightened}_{i,t-h} + \beta_3 \text{ Demand decreased}_{i,t-h} + \beta_4 \text{ Demand increased}_{i,t-h} + \gamma X_{it} + F_i + F_t + \varepsilon_{it}. \qquad (2)$$

The control variables used differ depending on the sector analysed and consist of the average interest rates on new loans provided by a given bank in a given sector, nominal quarter-on-quarter GDP growth,[13] gross fixed capital formation (GFCF) for non-financial corporations, unemployment for both categories of loans to households and the apartment price index[14] for loans to households for house purchase. As branches of foreign banks are

represented in the BLS and domestic banks did not have any problems with lending constraints due to capital shortages in the period under scrutiny, our analysis – in contrast to Blaes (2011) – does not contain bank capital variables.

The procedure for the econometric analysis was the following. First, a general model specification containing all the binary variables reflecting the survey responses and the significant control variables were estimated. The selected model specification was derived from the general specification, from which certain insignificant variables were removed so as to obtain the model with the highest possible explanatory power and efficiency as measured by the adjusted R^2. In all the specifications tested, we checked the stability of the coefficients by comparison with the original general model to ensure that the results were robust across the specifications tested. In this article, we present both the original general model and the selected adjusted-R^2-maximising specification.

4.2   Results
Table 4 shows the results of the generally specified model in the three sectors under analysis (columns 1, 2 and 3) and the results of the selected models with the highest explanatory power (columns 1a, 2a and 3a). In all sectors, some of the survey responses were found to have significant effects on credit growth. In the non-financial corporations sector, the responses relating to both credit standards and demand were found to have significant effects. Only demand was found to have effects for loans for house purchase, and only credit standards were found to have effects for consumer credit and other lending to households. To check the robustness of the results of the econometric analysis, we tested alternative specifications of the regression model and we found that the variables which significantly affect new loans are identical across specifications and their coefficients are stable.

12 Owing to the possible lag between changes in bank lending policies or demand for loans as perceived by banks and the manifestation of those changes in the amount of new loans provided, we also analyse the effect of the survey responses with a lead of one quarter. We also investigated a lag of two quarters, but this link was not significant in any model.
13 Nominal GDP was chosen because the dependent variable (changes in the amount of new loans) is also nominal in nature.
14 Source: CZSO.

TABLE 4

RESULTS OF THE PANEL REGRESSION FOR QUARTER-ON-QUARTER LOGARITHMIC GROWTH IN NEW LOANS IN THE THREE SECTORS UNDER STUDY

	Non-financial corporations		Loans to households for house purchase		Consumer credit and other lending to households	
	(1)	(1a)	(2)	(2a)	(3)	(3a)
Demand and standards (BLS)						
Demand increased	**31.144***	**30.026***	**10.225****	**9.853****	4.740	-
	(16.020)	(15.939)	(4.672)	(4.655)	(4.299)	
Demand increased (t – 1)	-9.072	-8.920	0.827	1.013	0.476	-
	(15.793)	(15.091)	(4.672)	(4.611)	(4.315)	
Demand decreased	5.459	3.977	0.867	0.798	-3.306	-
	(22.570)	(22.553)	(5.550)	(5.525)	(7.736)	
Demand decreased (t – 1)	6.638	-	-3.541	-3.516	8.217	-
	(21.487)		(5.600)	(5.568)	(7.736)	
Standards tightened	18.020	-	-6.169	-	-0.657	-
	(37.335)		(9.271)		(8.900)	
Standards tightened (t – 1)	36.988	33.689	-10.076	-	3.600	-
	(35.987)	(36.220)	(8.769)		(8.056)	
Standards eased	-22.037	-26.623	0.700	1.650	**23.356****	**21.376****
	(24.782)	(24.447)	(6.590)	(6.534)	(11.065)	(10.281)
Standards eased (t – 1)	**49.377****	**48.558****	-4.774	-4.205	1.260	-
	(23.010)	(22.817)	(6.048)	(5.999)	(7.422)	
Control variables						
Logarithmic growth in new loans (t – 1)	**-0.684****	**-0.685****	**-0.124***	**-0.127***	-0.061	-0.060
	(0.057)	(0.056)	(0.070)	(0.070)	(0.094)	(0.090)
GDP growth (qoq)	**29.041****	**31.415****	-	-	-	-
	(9.541)	(10.215)				
D.GFCF	-	-				
D.weighted interest	-	-	**-22.255****	**-21.155****	**-4.154***	**-4.200****
			(8.815)	(8.732)	(2.190)	(2.109)
D.apartment prices			-	-		
Constant	**-103.086***	**-95.808***	**-20.823****	**-21.222****	**-13.640****	**-11.773****
	(56.480)	(55.662)	(4.538)	(4.490)	(4.875)	(3.973)
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects for seasonality	Yes	No	Yes	Yes	Yes	Yes
R²	0.467	0.474	0.322	0.355	0.211	0.256
N	163	163	223	223	109	109

Source: CNB, authors´ calculations
Pozn.: D denotes difference. ***, **, and * indicates 1%, 5%, and 10% significance level. The symbol '-' denotes that the explanatory variable was tested in the given specification but not included in it. Standard errors of the estimates are reported in parantheses.

The effects found, and hence also the relevance of the banks' survey responses to the explanation of credit dynamics, are lower than in similar studies conducted in other countries. This may be because the Czech BLS data cover a relatively short time period and do not contain information from the crisis years. It may also be related to the tendency of some banks not to report changes in their lending policies or in demand for their loans even though small changes do occur. At the same time, the fact that the period under analysis only covers a growth phase of the credit cycle means that the responses in the BLS were found to have significant effects only for variables indicating an increase in demand or an easing of credit standards.

For loans to non-financial corporations, the results can be interpreted as meaning that credit growth is driven by both the supply side (the one-quarter-lagged positive effect of an easing of standards) and the rising demand. The positive correlation with GDP[15] indicates that demand is linked to the overall economic cycle. The dynamic correlation of loans between quarters is also statistically significant (a significant negative effect of the lagged dependent variable). This would correspond with the practice of balancing loan flows between accounting quarters. A possible interpretation based purely on time progression is a strong supply-side effect whereby an easing of standards in one quarter results in higher demand the following quarter, which, in turn, manifests itself later on in the amount of new loans provided.

In the case of loans to households, we can see a dichotomy between loans for house purchase and consumer credit and

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15 We address the possible endogeneity of GDP with respect to new loans in the estimates using instrumental variables – lagged values.

other lending. New loans for house purchase are driven primarily by demand, whereas consumer credit and other lending to households tend to be strongly affected by the supply side. In both cases, new loans react positively to a reduction in interest rates, though the reaction is stronger for loans for house purchase. The relationship between new loans for house purchase and the apartment price index was not found to be significant.

5. CONCLUSION

The bank lending survey provides the CNB with valuable information complementing the data it obtains from statistical reporting. The qualitative nature of the survey, verbal comments made by banks and regular meetings with representatives of participating banks greatly assist the CNB in forming a complete picture of the current credit market situation. CNB uses this information in making macroprudential and monetary policy and assessing its impacts. However, the analysis of the aggregate survey results and the econometric analysis of banks' responses contained in this article indicate that only some of the data gathered in the survey are statistically significant for explaining the data on new loans.

In the case of loans to non-financial corporations, the econometric analysis suggests that a perceived increase in demand and an easing of credit standards have significant effects (with a one-quarter lag). This result, however, is not supported by the analysis of the aggregate survey results. The results of the analysis of loans for house purchase confirm the general view about the market situation, namely that the credit growth recorded in 2012–2016 was driven mostly by demand stimulated by falling interest rates. This conclusion is confirmed both by the econometric analysis and by the analysis of the aggregate survey results. In the case of consumer credit and other lending to households, the econometric analysis finds that only the supply side has an effect, while the analysis of the aggregate survey results suggests that demand has a stronger effect.

The explanatory power of banks' survey responses for credit dynamics is lower than that in similar studies conducted in other countries. Some of the relationships between the survey results and credit dynamics indicated by the analysis of the aggregate results were not confirmed by the econometric analysis. This is mainly due to the still relatively short period of time over which the Czech BLS has been conducted, a period which only covers an upward and relatively calm phase of the financial cycle (with the

exception of the latest developments in loans for house purchase). The survey's ability to explain credit growth is thus currently limited.

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DECOMPOSITION OF THE CZECH GOVERNMENT BOND YIELD CURVE

Adam Kučera, Michal Dvořák, Zlatuše Komárková

The term structure of yields is an important source of information on market expectations about future macroeconomic developments and investors' risk perceptions and preferences. This article presents the methodology used by the CNB to obtain such information. It describes the decomposition of the Czech government bond yield curve into its components. The evolution of those components is interpreted in relation to the macro-financial environment. The practical use of the method in the financial sector stress tests conducted by the CNB is then presented.

1. INTRODUCTION

Yields on government bonds (GBs) have been falling across a wide range of countries for more than a decade. This trend is due to several common global factors: savings surpluses in emerging economies and a related build-up of foreign exchange reserves in central banks' balance sheets, global portfolio shifts towards safe assets, and a fall in nominal interest rates linked with the anchoring of inflation expectations at low levels. The decline in yields accelerated after the outbreak of the global financial crisis, when some central banks responded to the adverse economic outlook and deflation pressures by introducing unconventional measures targeted directly at lowering long-term yields.

Czech GB yields, too, have been on a downward trend on average since the global financial crisis started. They have been negative at maturities of up to six years since the beginning of 2016. This can hardly be explained solely by market expectations of continued low rates or by the lower Czech sovereign risk premium. One of the aims of this article is to explain the causes of this trend by decomposing the Czech GB yield curve into components determining the bond yields represented in the yield curve. Another aim is to analyse the behaviour of those components over time, as each component gains significance under different conditions. Last but not least, the aim is to share with the economic community the method used by the CNB to obtain information on the term structure of yields.

The term structure of yields, or the slope of the yield curve, is also an important indicator of the economic cycle. The yield curve aggregates market participants' expectations about the future development of short-term rates, economic activity, inflation and financial risks. Quantifying the effects of various factors on the shape of the yield curve allows us to better understand the extent of possible changes in yields if economic trends continue as they are or change direction and to better estimate the impacts of different economic scenarios on financial market participants. By decomposing the yield curve, the CNB gains an important source of information for monetary[1] and prudential policy purposes.

The article is structured as follows. Section 2 presents the method used to decompose yield curves. In section 3, the zero-coupon Czech GB yield curve is decomposed into four components and the factors that influence them are empirically analysed. In section 4, the analysis focuses on the use of the components to create scenarios for the CNB's macro stress tests of the financial sector. The final section concludes.

2. METHODOLOGY USED TO DECOMPOSE THE CZECH GOVERNMENT BOND YIELD CURVE

The yield curve is made up of yields on bonds with various residual maturities at a specific point in time. The shape of the curve is determined by its level (the position of the short end of the curve), its slope (the difference between yields on short- and long-maturity bonds) and its curvature (the maturity-yield relationship is not necessarily linear, but can be concave or convex). The relative level of short-term and long-term yields should depend on market expectations about the future path of short-term rates. According to the pure expectations hypothesis, a risk-neutral investor should attain the same yield from investing in a long-term bond as from a series of investments in a short-term bond over a period equal to the residual maturity of the long-term bond. The pure expectations hypothesis offers a simple and attractive interpretation of the yield curve. However, it does not hold in reality, as it does not take risk-averse investors into consideration. In other words, investors perceive long-term investment as uncertain and demand a risk premium.

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1 The use of Czech GB yield curve decomposition for monetary policy purposes is not covered in this article but does form part of research project C7/16 "Longer-term Yield Decomposition: The Analysis of the Czech Government Yield Curve", with an output scheduled for the end of 2017.

That premium consists of several sub-premia reflecting different sorts of risks having varying degrees of significance over time and for different maturities. So, to properly understand the evolution of the yield curve, we need to decompose it.

We decompose the Czech GB yield curve into four components (see Chart 1): a risk-neutral yield, a term premium, a credit risk premium and a portfolio effect. The first two components were obtained by decomposing the swap yield curve, as the rate of the interest rate swap is made up almost exclusively of the risk-neutral yield and the term premium (see section 2.1). The other two components correspond to the difference between the GB yield and the swap rate for the relevant maturity. The breakdown of this residual between the credit risk premium and the portfolio effect is based on the estimate of the credit risk premium.

CHART 1

COMPONENTS OF THE SWAP AND BOND YIELD CURVES
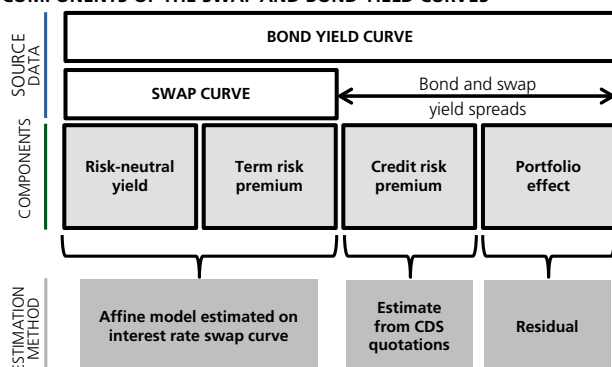
Source: Authors
Note.: CDS = credit default swap.

The *risk-neutral yield* reflects expectations about future monetary policy and economic developments. If investors expect the monetary policy rate to rise in the future, they also expect the rate of return on holding and regularly reinvesting short-term bonds to go up gradually. The *term premium* relates to the maturity of the bond and is compensation for interest rate risk. It takes into account investors' uncertainty about the future path of the short-term rate. Committing to long-term bonds will turn out to be relatively less (more) advantageous if future short-term rates are higher (lower) than originally expected. For the relevant maturities, risk-neutral yields and the term premia of bonds are identified with the risk-neutral yield and term premium obtained from the decomposition of the swap curve (see section 2.1), because for bond yields and swap

rates these two components are determined by the same fundamentals.

The *credit risk premium* is compensation for the risk that bond coupons and principal will not be paid on time and/or in full. This premium tends to increase with increasing maturity. The issuer's position can worsen significantly over time, so, for example, the one-year probability of default in five years' time (i.e. the probability of default between the fifth and sixth years) is usually higher than the current one-year probability of default, i.e. the probability of default between now and 12 months from now (Moody's, 2016). The credit risk premium was estimated from credit default swap (CDS) quotations for Czech GBs.[2] Month-end CDS quotations for maturities of 1–5, 10, 20 and 30 years were used in the estimation.[3] The volatility of the CDS quotations was reduced by smoothing them using the three-month moving average. From these averages, we estimated the Nelson-Siegel function (Nelson and Siegel, 1987) in each period of interest and in this way calculated the CDS spreads and the Czech GB credit risk premium for all the necessary maturities.[4]

The *portfolio effect* of the yield reflects demand for GBs as an investment asset. Many investors prefer GBs to other assets, mainly because of their low credit risk, their relatively high market liquidity, their low haircuts when used as financial collateral and their preferential regulatory treatment. The portfolio effect is calculated as the difference between the GB yield and the rate of an interest rate swap of identical maturity minus the credit risk premium. The average portfolio effect in the model therefore depends on the estimate of the credit risk premium. The portfolio effect can take positive (negative) values if the yield demanded by the investor for holding the bond is higher (lower) than the expected short-term rate plus the term premium and the credit risk premium.

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2   The advantages of this approach are the objective existence of quotations (which should represent the direct cost of hedging credit risk), its forward-lookingness and the availability of any periodicity. On the other hand, we also need to take into account certain sovereign CDS market anomalies that may limit the use of CDS quotations as a sovereign solvency indicator (see Komárek et al., 2013, Box 4 of FSR 2009/2010 and Box 4 of FSR 2011/2012). Short time series are another potential limitation for some maturities.

3   We included CDS quotations with 20-year and 30-year maturities in the estimation because of the absence of quotations for 15-year CDS.

4   CDS quotations for Czech public debt of shorter maturities are close to those of longer maturities. However, this was not reflected in the yields on Czech GBs of short maturities. The Nelson-Siegel function was therefore specified so that the credit risk premium converged to zero with decreasing maturity.

CHART 2

SCHEME OF SWAP CURVE DECOMPOSITION USING THE AFFINE MODEL
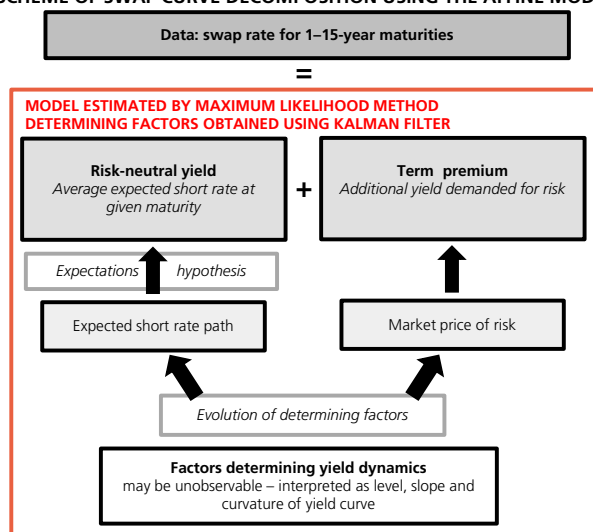
Source: Authors

2.1 Koruna swap yield curve decomposition methodology

The swap yield curve was decomposed using the affine model[5] (Duffie and Kan, 1996, or Málek, 2005), which belongs to the category of factor models. The basic building block of this model is its assumption that there are several factors that determine the entire term structure of yields. The model presented here uses three factors, in line with the standard approach employed in the literature (Litterman and Scheinkman, 1991). These factors can be either observable[6] – such as macroeconomic variables (Ang and Piazzesi, 2003) or yields on particular bond portfolios (Joslin et al., 2011) – or unobservable. For the purposes of the model presented here, we consider unobservable factors. The three factors are estimated within the model and,

depending on their dynamics, can be considered as the level, slope and curvature of the yield curve.

The relationship between the swap rate and the three unobservable factors runs via two fundamental variables (see Chart 2). The first is the short-term (instantaneous) risk-free rate and the second is the risk premium demanded by investors.

The short-term (instantaneous) risk-free rate[7] is determined in the model as a linear function of the three unobservable factors. The yields for longer maturities are then derived from it. If investors were risk-neutral, the expected average of the future short-term rate at a particular point in time would be equal to the present yield on a bond of corresponding maturity. We refer to long-term yields determined as the expected average of the future short-term rate as **risk-neutral yields** (see the left-hand side of Chart 2).

However, investors are usually risk-averse and therefore demand a risk premium. In the affine model, this is a function of the **market price of risk**, which expresses the uncertainty about the future evolution of the unobservable factors and is a linear combination of those factors (see the right-hand side of Chart 2). In the case of the swap curve, the risk premium takes positive values. Swap rates contain hardly any credit risk premium, as no principal is paid, coupon payments are netted and the way swaps are traded mitigates counterparty risk. A swap is meanwhile not an investment asset, because it cannot be used to deposit liquidity. The portfolio effect of a swap is therefore negligible. For these reasons, the model assumes that the risk premium of an interest rate swap is made up solely of the **term premium**.

The main reason for estimating risk-neutral yields and the term premium from the swap yield curve is the aforementioned absence of a credit risk premium and a portfolio effect. These two components can be affected in certain circumstances by specific market effects such as flight to quality, flight to liquidity, search for yield and various types of speculation caused, for example, by unconventional monetary policies. However, these specific effects could disrupt the affine model's assumption of market efficiency and the impossibility of arbitrage. The risk-neutral yield and the term premium estimated using the

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5   The name "affine model" reflects the fact that the short-term rate and the price of risk are both specified as affine transformations – with some simplification, linear combinations – of the determining factors. Consequently, the yields can also be expressed as a linear combination of the determining factors, which greatly facilitates the subsequent estimation of the model parameters. Another widely used model is the "LIBOR market model" (LMM; see, for example, Gatarek et al., 2006). The advantage of the LMM is its ability to price interest rate derivatives more accurately. On the other hand, it is more complicated and advanced numerical methods are needed to estimate it. Given our aim of analysing the yield curve for financial stability purposes, we therefore regard the affine model as more suitable.

6   Models with observable factors are technically simpler. They can often be solved using the least squares method. On the other hand, they involve making assumptions about macrofinancial relationships and specifically choosing the main determinants of yields. They are also associated with a risk of omission of important variables.

7   The short-term (instantaneous) risk-free rate is not observable in the market. However, it is linked to some extent with the overnight rate on the interbank market and the monetary policy rate.

affine model from government yield curves could thus be distorted.

In the affine model presented here, it is also necessary to consider the possibility of interest rates reaching their lower bound. This causes asymmetry in the future path of interest rates. If interest rates are already very close to their lower bound, the probability of them falling further is lower than the probability of them rising. To take this asymmetry into account, the model uses the concept of shadow rates (Krippner, 2013).[8] This concept is used not to extract the shadow rates for their own good, but to ensure that the model is internally consistent.

The model parameters are estimated by the maximum likelihood method using the Kalman filter to obtain the unobserved factors (Durbin and Koopman, 2012).

3. RESULTS OF THE DECOMPOSITION OF THE CZECH GOVERNMENT BOND YIELD CURVE

The yield curve is decomposed using the yields on zero-coupon bonds of relevant maturities, since those yields are not affected by the size and distribution of the coupons over the life of the bond and hence are an exact indicator of the rate of return demanded for investing for the relevant time period.[9] For this reason, a zero-coupon curve was constructed using Czech government bonds in Czech koruna. As the risk-neutral yield and the term premium are estimated using swap rates, it was also necessary to construct a zero-coupon koruna swap curve. The two zero-coupon curves were constructed for maturities of 1 to 15 years[10] as of the end of each month over the period of 7/2003–12/2016. The Fama-Bliss bootstrap method (Fama and Bliss, 1987), which assumes constant forward rates among the closest maturities, was used for the construction. The advantage of this method over the alternatives (such as Nelson and Siegel, 1987, or Svensson, 1994) consists in its

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8 In this concept, the yield on investing in a bond equals the sum of the yield on investing in a shadow bond whose yield is not bounded below by zero and the yield from the sale of an option to purchase that bond at a price equivalent to the yield at the lower bound. For details, see Krippner (2013).

9 The use of coupon bonds could potentially lead to underestimation of the yields demanded for a given maturity (Livingston and Jain, 1982).

10 The range of maturities considered was chosen with regard to data availability and quality. Bonds with maturities of less than one year are not used in such studies because their prices can be distorted by specific effects due to lower liquidity (BIS, 2005). In addition, koruna interest rate swaps are not available for maturities of less than one year. The time series for bonds and swaps with maturities of over 15 years are shorter and their prices may be less reliable due to their lower trading volumes.

CHART 3

RANGES FOR ZERO-COUPON CZECH GOVERNMENT BOND YIELDS AND KORUNA INTEREST RATE SWAP RATES
(%, ranges between 1Y and 15Y maturities)

Source: Bloomberg, PSE, MtS Czech Republic, Thomson Reuters, authors' calculations
Note: Vertical lines mark the last monthly observation before the event described. The start of the global financial crisis is related to the collapse of Lehman Brothers in September 2008. The start of the debt crisis is related to the negative assessment of Greek public finances by the IMF and the EC in February 2009.

ability to replicate any yield curve shape exactly, which eliminates problems with imperfect fit on some segments of the curve.

The maturity spreads for zero-coupon GB yields and swap rates in 2003–2016 show mixed developments (see Chart 3). Until the outbreak of the global financial crisis in September 2008, yields and rates followed similar patterns. From then until the second half of 2009, yields were affected by the fear of the emerging debt crisis in Europe. Owing to the responses of the various relevant authorities to the crisis, yields began to trend downwards in mid-2009 and a positive gap opened up between yields and rates at longer maturities. At the end of 2013, yields started falling faster than rates – until 2015 for long maturities and then exclusively for short maturities. It is clear from this simple historical excursion that yields and rates were affected by different factors with different intensity, including for individual maturities.

The zero-coupon Czech GB yield curve was decomposed into the four introduced components for one-year and ten-year maturities (see Charts 4 and 5). In the case of the one-year bond, it is clear that yield was made up predominantly of the risk-neutral yield until the global financial crisis broke out in 2008 (see Chart 4). From the end of 2008 onwards, the one-year bond yield declined due to a falling risk-neutral yield. The decline in this component was linked with market expectations that short-term rates would stay very low. In addition, starting in the second half of 2008, key central

Source: Bloomberg, PSE, MtS Czech Republic, Thomson Reuters, authors' calculations
Note.:   Reliable data on CDS quotations are not available until 2008. As a result, the difference between the bond yield and the swap rate could not be decomposed and is reported as *Unexplained*.

CHART 5

DECOMPOSITION OF THE 10-YEAR ZERO-COUPON BOND YIELD
(%)

Source: Bloomberg, PSE, MtS Czech Republic, Thomson Reuters, authors' calculations
Note.:   Reliable data on CDS quotations are not available until 2008. As a result, the difference between the bond yield and the swap rate could not be decomposed and is reported as *Unexplained*.

banks gradually released large amounts of liquidity as part of their monetary and lender-of-last-resort policies. For reasons of flight to quality and search for yield, Czech GBs represented an attractive opportunity for foreign investors. Owing to the negligible risk of sovereign default over such a short time scale, the credit risk premium was relatively low in the period under review. The negative portfolio component was linked with investors' preference for holding shorter-maturity bonds at a time of market stress. In 2015, the portfolio component exceeded all the other components combined for the first time and the one-year bond yield thus turned negative. Since then, the yield on short-maturity Czech GBs has reflected strong interest among foreign investors speculating on appreciation of the Czech koruna against the euro upon the exit from the CNB's exchange rate commitment (see section 2.1 of this Report).

The significance of the different components in the level of the ten-year Czech GB yield changed substantially over the 13 years under review (see Chart 5). Until the global financial crisis broke out, ten-year bond yields were almost equal to swap rates of the same maturity. The risk-neutral yield and the term premium each made up around half of the yield. When the US investment bank Lehman Brothers collapsed in mid-September 2008, the global financial market situation worsened sharply. Uncertainty and risk aversion increased, giving rise to higher market price volatility. Owing to the high level of global market integration, the market stress passed to the Czech GB

market, as evidenced by growth in the credit risk premium. In mid-October 2008, market liquidity on the Czech GB market dropped sharply as a result of excess supply of Czech GBs from foreign institutional investors. The CNB responded by introducing extraordinary liquidity-providing repo operations in which Czech GBs were accepted as eligible collateral for the first time. This fostered a slight reduction in the credit risk premium. For the same reasons as for the one-year bond, the risk-neutral yield and the term premium began to fall in mid-2008. The term premium increased in late May/early June 2013 in response to a change in market expectations about the timing of the tapering of bond purchases by the US Federal Reserve in the QE3 programme. This change in expectations triggered an unusually sharp price adjustment in a whole range of asset categories across global markets, accompanied by market turbulence. In November 2013, however, the ECB reduced its base rate and in June 2014 it announced the use of other unconventional instruments, including a plan to purchase euro area GBs. In November 2013, the CNB started to use the koruna exchange rate as an additional monetary policy instrument. This combination of measures led not only to a fall in the term premium of the ten-year bond, but also to a negative portfolio component. From 2011 onwards, the credit premium and the portfolio component were also affected by the debate about, and subsequent phasing in of, new financial market regulatory measures (Basel III, CRD IV/CRR). A signal of preferential treatment of GBs in the capital and liquidity requirements was sent out to the market.

COMPARISON OF THE 1-YEAR RISK-NEUTRAL YIELD WITH ANALYSTS' FORECASTS
(%)
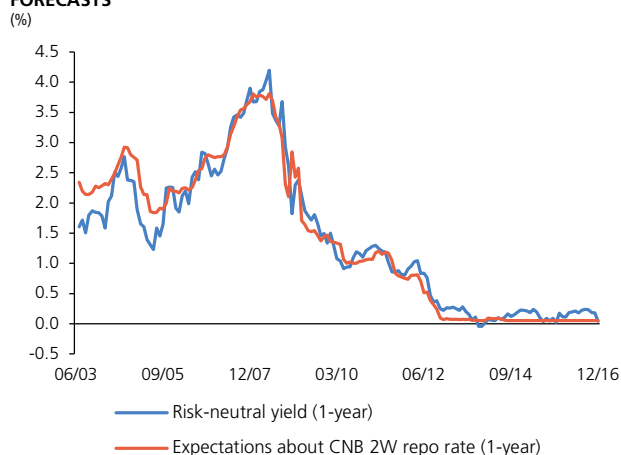
Source: CNB
Note: Expectations represents the average CNB 2W repo rate expected one year ahead at the given moment. It is calculated as 1/26 * current repo rate + 25/26 * (0.5 * repo rate expected one month ahead + 0.5 * repo rate expected one year ahead). The one-month-ahead and one-year-ahead expectations are the averages of the analysts forecasts taken from the CNB's Financial Market Inflation Expectations Survey for the given month.

THE CREDIT RISK PREMIUM AND THE CDS SPREAD
(left-hand scale: %, right-hand scale: bp)
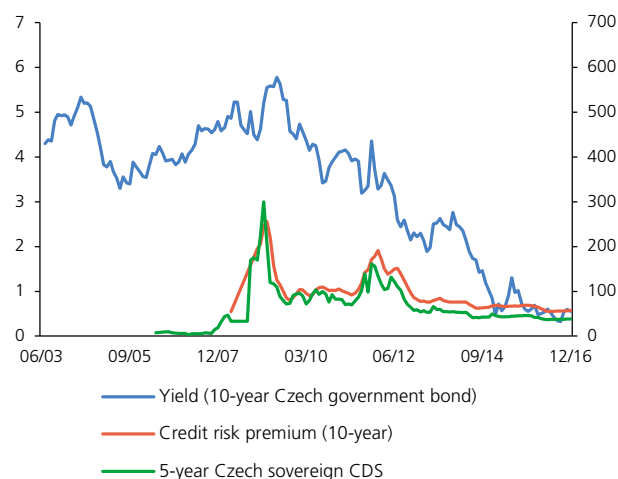
Source: Bloomberg, PSE, MtS Czech Republic, Thomson Reuters, authors' calculations
Note: The estimated credit risk premium for the 10-year bond. The difference between the 5-year CDS and the 10-year credit risk premium is due to the difference in maturities.

In order to confirm the theoretical interpretation of the estimated components, their profiles were compared with those of selected macroeconomic and financial variables with which they should theoretically be closely linked.

The *risk-neutral yield* should match market expectations about future short-term rates. A comparison with analysts' expectations about the CNB's two-week repo rate one year ahead confirmed this theoretical assumption (see Chart 6). The correlation between risk-neutral yields and expected rates also turned out to be higher than that between risk-neutral yields and actual rates (see Table 1).

The *term premium* should theoretically be closely correlated with the level of difficulty in forecasting future short-term rates at a given maturity horizon. Forecasting difficulty is hard to measure, so it was proxied by the variability of the last four monthly values of the forecasted variables. The correlation between the term premium and the variability of inflation, inflation expectations and expectations about the CNB's two-week repo rate was relatively low (see Table 1). This may have been caused by the backward-looking nature of these imperfect measures of forecasting difficulty. Conversely, a relatively strong correlation between the term premium and the present and expected interest late level lent some support to the theoretical assumption. Generally speaking, when interest rates are low, their volatility is also low. This enables investors to make better forecasts and demand a lower term premium.

The *credit risk premium* should be correlated with investor perceptions about Czech GB credit risk. Given the method for estimating the credit risk premium, the correlation between it and CDS spreads was very high (even with CDS spreads of other maturities; see Chart 7 and Table 1). Another market indicator of credit risk – the spread between Czech and German five-year GB yields – was also highly correlated with the credit risk premium. By contrast, a fundamental often used to express the level of sovereign credit risk – the ratio of GBs issued to GDP – had only a limited correlation with the credit risk premium. This may be due to the relatively low Czech public debt level. A closer relationship between the public-debt-to-GDP ratio and the sovereign credit risk premium does not usually surface until public debt exceeds a certain level. For many reasons, moreover, that level differs from country to country and for some countries is below the often cited 60% level (Banque de France, 2012).

The credit risk premium turned out to be closely correlated with short rates and market uncertainty indicators. Higher interest rates potentially push up the costs of government financing and hence also partially increase the probability of sovereign default. Global uncertainty as measured by the VIX index and uncertainty on the interbank market as measured by the difference between the three-month PRIBOR and the three-month koruna OIS rate were more significantly correlated with the credit risk premium. This was probably linked with the rising share of non-residents in

CORRELATION BETWEEN THE COMPONENTS OF THE 10-YEAR ZERO-COUPON BOND AND ECONOMIC AND FINANCIAL VARIABLES

Type of variable	Name of variable	Risk-neutral yield	Term premium	Credit risk premium	Portfolio effect
Macroeconomic	Inflation (CPI)	0.50	0.42	0.67	0.12
	GDP growth	0.27	0.15	-0.49	-0.54
	CZK/EUR exchange rate	0.29	0.45	-0.27	-0.53
Short interest rates and market expectations	CZEONIA index	0.86	0.73	0.69	0.38
	CNB 2W repo rate (current)	0.88	0.76	0.77	0.36
	3M PRIBOR	0.87	0.74	0.78	0.38
	3M OIS in CZK	0.88	0.76	0.74	0.37
	CNB 2W repo rate (1-year expectations)	0.95	0.79	0.57	0.53
	Inflation (1-year expectations)	0.75	0.65	0.39	0.40
Fluctuations in short interest rates and market uncertainty	Variability* of inflation	0.25	0.29	0.51	-0.01
	Variability* of 1-year inflation expectations	0.30	0.14	0.23	0.13
	Variability* of 1-year expectations about CNB 2-week repo rate	0.35	0.42	0.70	0.07
	VIX volatility index	0.14	0.17	0.72	0.13
Credit risk of Czech state and Czech interbank market	Czech GBs issued/GDP	-0.44	0.25	-0.02	0.37
	5-year CDS spread for Czech GB	-0.06	0.13	0.93	0.15
	Spread between 3-month PRIBOR and 3-month OIS	-0.14	0.01	0.59	0.24
	Spread between Czech and German 5-year GB yields	-0.13	-0.07	0.82	0.37
Investment flows	Czech GB trading volume	-0.05	0.11	0.28	-0.01
	Proportion of foreign holders of Czech GBs	-0.33	-0.73	-0.49	-0.62
	Profit on hedged investment in Czech GBs**	-0.45	-0.59	-0.38	-0.52
	Net portfolio and other investment in balance of payments	0.06	0.21	0.17	0.06

Colour scale for Pearson's correlation coefficient
-1 -0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8 1

Source: PSE, Bloomberg, CNB, MtS Czech Republic, Thomson Datastream, authors' calculations
Note: The explanatory power of the correlations may be limited by the short length and the existence of a trend for some of the time series.
* Variability is measured by the standard deviation of the last four monthly observations.
** The average profit on (1) an investment consisting in converting euros into korunas, depositing them at the CNB deposit rate and then converting them back into euros at the 3-month forward rate, and (2) an investment consisting in converting euros into korunas, buying a 2-year Czech GB and then converting it back into euros at the 2-year forward rate. The return that could have been achieved by depositing the funds for three months at the ECB deposit rate was deducted from the first investment and the 2-year German GB yield was deducted from the second.

public debt holdings and with the use and pricing of GBs as financial collateral on secured money markets.

The *portfolio effect* should theoretically be linked with investors' preference for Czech GBs over other assets – dominated in korunas or other currencies. We used four variables to express this preference. First, we looked at the correlations between the portfolio effect and the inflow of short-term foreign assets into the Czech economy and the Czech GB trading volume. In both cases, the correlation was low. Then we used the stock indicator of the proportion of Czech GBs held by non-residents. It was correlated strongly negatively with the portfolio effect. A stronger correlation was also found between the portfolio effect and the profit on investing in Czech assets with simultaneous exchange rate risk hedging (i.e. purchasing korunas on the spot market, depositing those korunas or buying a short-term bond and then converting back at the forward exchange

rate). Rising yields on this type of investment were associated with a lower portfolio effect. Both negative correlations can be interpreted as meaning that an inflow of foreign portfolio investment motivated by hedged profits boosts demand for Czech GBs as an attractive instrument, causing their yields to turn negative.

4. USE OF YIELD CURVE DECOMPOSITION IN FINANCIAL STABILITY ANALYSES

The yield decomposition described above can be used in financial stability analyses to identify potential market risks and to create scenarios for stress testing financial institutions. The Financial Stability Report regularly discusses the current level of interest rates and the risks associated with their future path. Knowledge of the individual components allows us to expertly assess the probability of

CHART 8

THE 10-YEAR BOND YIELD IN THE BASELINE SCENARIO
(%)

Source: Bloomberg, PSE, MtS Czech Republic, Thomson Reuters, authors' calculations
Note: The vertical line separates the historical values (solid lines) from the values simulated in the scenario (dashed lines).
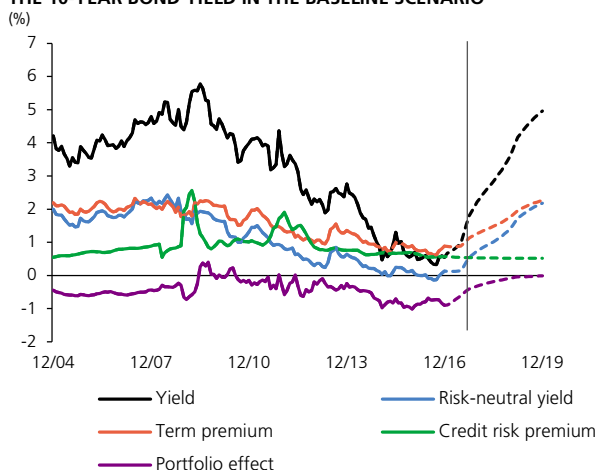
CHART 9

THE 10-YEAR BOND YIELD IN THE ADVERSE SCENARIO
(%)

Source: Bloomberg, PSE, MtS Czech Republic, Thomson Reuters, authors' calculations
Note: The vertical line separates the historical values (solid lines) from the values simulated in the scenario (dashed lines).
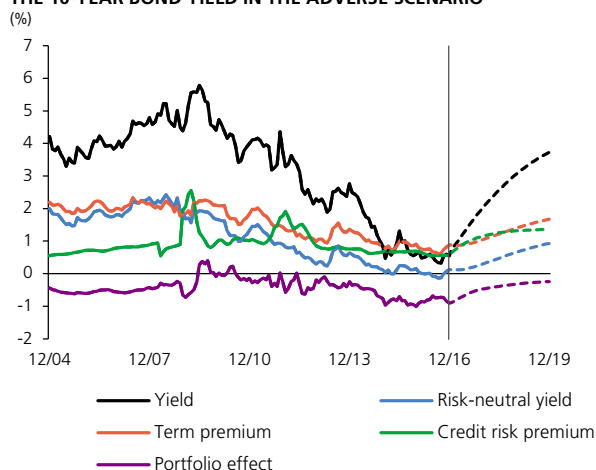
the current trends continuing or reverting and to monitor the interaction of components that ameliorate or multiply potential shocks (see section 2.1 of this Report).

Yield curve decomposition can also be used in simulation analyses, including stress tests. The impacts of changes in the Czech GB yield curve are analysed in the CNB's regular financial sector sensitivity analyses and stress tests (see section 4 of this Report). Previously, the CNB had simulated the evolution of ''only'' three yield curve maturities and had not linked them directly to the other macrofinancial variables used.[11] Decomposition of the yield curve into its components allowed it to calibrate the scenarios more accurately by linking yields to other variables entering the scenarios.

The yield for each maturity takes a unique value for each of the components. With 15 maturities and four components, this implies 60 variables. To use the components to forecast the behaviour of the yield curves in the stress scenarios, we had to reduce the number of variables. We thus used the Nelson-Siegel function to calculate the level and slope of the term structure (15 maturities) of each component. In this way, we replaced the term structure of each component with ''only'' two variables. The level and slope of each component are then inputted along with the economic and

financial variables into a dynamic factor model.[12] The model is used in conjunction with the scenario for the future evolution of macroeconomic variables (inflation, GDP growth, the exchange rate and the 3M PRIBOR) to predict the paths of the components (see section 4 of this Report). The bond yields (swap rates) are then calculated from the predictions of the components as the sum of all the components (the sum of the risk-neutral yield and the term premium respectively).

The use of this method in stress testing can be demonstrated on the example of the ten-year GB. To simulate its yields, we used the November 2016 *Baseline Scenario* and *Adverse Scenario* (CNB, 2016). The *Baseline Scenario* (see Chart 8) was associated with a rise in inflation, GDP growth and the 3M PRIBOR and with appreciation of koruna over a three-year horizon. Positive economic developments resulted in sharp growth in risk-neutral expectations about the short rate. Interest rates moved out of the narrow band near the lower bound, leading to expectations of greater volatility of the short rate and hence also to growth in the term premium. At the same time, the favourable economic conditions caused the credit risk premium to stay at a low level. By contrast, the portfolio effect had a large upward effect on yields, as non-resident speculators were expected to leave the market after the

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11 These variables are generated by the CNB's forecasting model (G3; Andrle et al., 2009; Brázdik et al., 2011).

12 This model is different from the affine model presented in section 3. The affine model generates the components, whereas this model produces an estimate of the common evolution of those components and the macroeconomic variables from the stress scenarios.

CNB's exchange rate commitment was discontinued. Over a three-year horizon, these factors combined caused the ten-year yield to rise to 5%, close to the levels recorded before the global financial crisis.[13]

In the *Adverse Scenario* (see Chart 9), which assumed a return to recession, the ten-year yield went up to around 3.7%. Owing to continued accommodative monetary policy, risk-neutral yields and the term premium increased very modestly. In line with the return to recession, the model expected credit risk to rise, although the credit risk premium reached lower values than it had during the debt crisis in Europe. Uncertainty on financial markets then led to an outflow of foreign investors, causing the portfolio effect to rise. This rise was moderate, however, as some investors (including domestic financial institutions) still saw Czech GBs as an attractive investment given their low risk level compared to alternatives in other countries.

5. CONCLUSION

The yield curve is an important indicator of the economic cycle, as it aggregates the expectations of market participants. The factors that affect the shape of the yield curve do so to different extents in different circumstances. To interpret the evolution of the yield curve correctly, it is therefore useful to decompose it. This article presented the method used by the CNB to decompose the Czech government bond yield curve.

We decomposed the Czech GB yield curve into four components: a risk-neutral yield, a term premium, a credit risk premium and a portfolio effect. The first two were obtained by decomposing the zero-coupon koruna swap curve using the affine model. The credit risk premium was estimated from credit default swap quotations for Czech GBs. The portfolio effect formed the residual.

A comparison of the four estimated components with selected macroeconomic and financial variables confirmed the strong theoretical interpretation of these components. As the theory had anticipated, for example, the risk-neutral yield matched analysts' expectations about future short-term policy rates, and the portfolio effect became highly negative as the removal of the CNB's exchange rate floor neared.

The above decomposition allowed for a more detailed interpretation of the level of Czech yields and associated risks for the purposes of financial stability analyses. The macroeconomic scenarios used by the CNB were calibrated more accurately by linking the individual components of yields to other macroeconomic and financial variables. The Czech GB yield curve decomposition method described in this article was used to create stress scenarios for the first time in the present Financial Stability Report.

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13 This trend is strongly affected by the Baseline Scenario's assumption of growth in the 3M PRIBOR to 3% at the three-year horizon.

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GLOSSARY

Balance-sheet liquidity
The ability of an institution to meet its obligations in a corresponding volume and term structure.

Balance-sheet recession
A situation caused by the efforts of market participants to reduce their debt, a resulting drop in demand for loans, and a limited ability to stimulate economic activity through monetary policy. The onset of a balance-sheet recession usually follows a sharp decline in asset prices, when the balance sheets of market participants can record negative equity, i.e. the value of assets is lower than that of balance-sheet liabilities. A typical example is the period following the bursting of the stock and property bubble in Japan during the 1990s.

Bank Lending Survey (BLS)
A survey of bank lending conditions for non-financial corporations and households in the Czech Republic, the pilot round of which took place in 2012 Q1. The survey aims to obtain qualitative information on current perceptions of the situation on both the supply and demand side of the credit market.

Basel III
A new regulatory framework issued by the Basel Committee on Banking Supervision in 2010 which sets standards for capital adequacy of banks and now also for their liquidity. Overall, Basel III introduces stricter rules than the previous framework and came into existence mainly as a reaction to the financial crisis.

Breakdown of banks by total assets
In some charts and tables in the FSR, banks are assigned to groups based on the amount of their total assets. The breakdown of banks into groups is revised at the end of each calendar year. In 2007 and 2008, banks having total assets of over CZK 150 billion were regarded as large banks, banks having total assets of over CZK 50 billion and up to CZK 150 billion were regarded as medium-sized banks and banks having total assets of less than CZK 50 billion were regarded as small banks. In 2009 the total amount of assets necessary for inclusion in the group of large banks was increased to CZK 200 billion and the range for medium-sized banks was changed to CZK 50 billion–CZK 200 billion. The range for small banks was unchanged. As from 2012, the breakdown of banks by total assets is as follows: large banks have total assets of over CZK 250 billion, medium-sized banks have total assets of over CZK 50 billion and up to CZK 250 billion and small banks have total assets of less than CZK 50 billion.

Capital ratio
The ratio of regulatory capital to total risk-weighted assets. The Tier 1 capital ratio is the ratio of Tier 1 capital to total risk-weighted assets (see also Tier 1).

Capital requirement
The capital requirement is the amount of capital a bank has to hold so as to cover all the risks it undertakes.

Collective investment funds (CIFs)
Mutual and investment funds whose sole business activity is collective investment, i.e. collecting funds from investors and investing them. CIFs are broken down by investor type into funds intended for the public (dominated by open-ended mutual funds) and funds for qualified investors, and by asset risk into money market, bond, equity, mixed and real estate funds and funds of funds. Sometimes the category of funds of funds is not listed separately, but is included in the other categories according to the type of funds in which they invest.

Common Reporting Framework (COREP)

A common reporting framework in the EU, prepared by the European Banking Authority (EBA) for data reporting in accordance with prudential requirements (under CRR). It covers the areas of capital, capital adequacy, risk exposures, operational risk, market risk and credit risk.

Countercyclical capital buffer

A macroprudential tool designed to increase the banking sector's resilience to cyclical risks associated with fluctuations in lending.

Debt deflation

A situation where the real value of the debt of corporations and households rises as a result of falling prices and incomes. This happens primarily in a situation where the decrease in nominal interest rates is insufficient to offset the fall in the rate of growth of incomes.

Debt-service-to-income (DSTI)

The ratio of debt service to the net income of the loan applicant.

Default

Default is defined as a breach of the debtor's payment discipline. The debtor is in default at the moment when it is probable that he will not be able to repay his obligations in a proper and timely manner, without recourse by the creditor to settlement of the claim from the security, or when at least one repayment (the amount of which deemed by the creditor to be significant) is more than 90 days past due.

Default rate

The 12-month default rate is the ratio between the volume of liabilities of debtors which defaulted over a 12-month reference period and the volume of liabilities of all entities existing at the start of that period. The default rate can also be defined analogously in terms of the number of entities which defaulted over the reference period.

Deleveraging

A process consisting in the reduction of leverage, i.e. the reduction of indebtedness, which decreases the profitability of economic agents, but also the degree of risk associated with them.

Eligible collateral

An asset accepted to ensure fulfilment of an obligation to the central bank.

Financial Reporting Framework (FINREP)

A common reporting framework in the EU, prepared by the European Banking Authority (EBA) for data reporting in accordance with prudential requirements (under CRR). It covers the area of financial data of individual institutions, in particular the balance sheet and the profit and loss account.

Gross government borrowing requirement

The net government borrowing requirement plus redemptions and repurchases of government bonds maturing in the given year, repayments of EIB loans, repurchases and exchanges of government bonds maturing in future years, and revaluation of funding reserves.

Herfindahl-Hirschman index (HHI)

The sum of the squares of the market shares of all entities operating on a given market. It expresses the level of concentration in the market. It takes values between 0 and 10,000. The lower the HHI, the less concentrated the market.

Household insolvency A situation where a household is unable to cover its current expenditures by its current income and the sale of its asset holdings. Insolvency is defined in legal terms in Act No. 182/2006 Coll., on Insolvency and Methods of Resolution Thereof.

Institutional investor Either (a) a bank executing trades in investment instruments on its own account on the capital market, a management company, an investment fund, a pension fund or an insurance company, or (b) a foreign entity authorised to carry on business in the same fields in the Czech Republic as the entities listed under (a).

Interest margin The difference between a bank's loan rate and its deposit rate.

Interest rate spread Also interest rate differential; the spread between the interest rate on a contract (deposit, security) and a reference interest rate.

Interest rate transmission channel
One of the channels of the monetary policy transmission mechanism. It acts such that, for example, an increase (decrease) in monetary policy interest rates leads first to an increase (decrease) in interest rates on the interbank market. Consequently, there is an increase (decrease) in the interest rates announced by banks for the provision of loans and the acceptance of deposits. The result is a downturn (upturn) in investment activity as a part of aggregate demand and ultimately a decrease (increase) in inflation pressures.

Leverage See Leverage ratio.

Leverage ratio The new CRD IV/CRR rules define the leverage ratio as capital to risk-weighted assets. The term leverage is also often used in financial economics. There, however, capital is the denominator in the ratio (e.g. assets/capital or debt/capital). When we say that a bank has high leverage, we generally refer to the definition consistent with the assets/capital ratio. However, such a bank has a low leverage ratio.

Loan-to-income (LTI) The ratio of the amount of a loan to the net income of the loan applicant.

Loan-to-value (LTV) The ratio of the amount of a loan to the value of collateral.

Loss given default (LGD) The ratio of the loss on an exposure in the event of counterparty default to the amount owed at the time of default.

Macroprudential policy A key component of financial stability policy. It focuses on the stability of the financial system as a whole. Its main objective is to help prevent systemic risk.

Market liquidity The ability of market participants to carry out financial transactions in assets of a given volume without causing a pronounced change in their prices.

Mortgage refinancing The process whereby a mortgage debtor accepts a new loan from a different lender than the one from which he received the original loan and uses it to repay the original loan. He thus becomes a debtor of the other lender, but usually under more favourable conditions. This is usually possible only at the end of the original loan's fixation period.

Mortgage refixation The process whereby at the end of the fixation period of a mortgage loan the debtor selects the length of the new fixation period and negotiates new conditions for this period with the creditor. In this case, the identity of the creditor does not change.

Natural population increase   The difference between the number of live births and the number of deaths in the same period of time in a given area.

Net financial assets   The difference between the sum of financial assets and the sum of liabilities.

Non-performing loans   A loan is non-performing if at least one of the following two situations occurs: a) the debtor is unlikely to pay its credit obligations in full without recourse to actions such as realising security, b) the debtor is past due more than 90 days on a credit obligation. For details, see Article 178 of Regulation (EU) No 575/2013 of the European Parliament and of the Council. Non-performing loans are broken down into substandard, doubtful and loss loans. Also called loans in default or default loans.

Pillar 1   The first part of the CRD directive, focused on the determination of minimum capital requirements for all credit institutions to cover credit, market and operational risks.

Pillar 2   The second part of the CRD directive, requiring credit institutions to assess whether the Pillar 1 capital requirement is sufficient to cover all the risks to which they are exposed. This assessment process is reviewed by the supervisory authority under the supervisory review and evaluation process (SREP). The supervisory authority then can apply a wide range of instruments, including setting an additional capital requirement, for example to cover concentration risk.

Prague InterBank Offered Rate (PRIBOR)
  The reference interest rate on the interbank deposit market for deposit sales. Reference banks quoting the PRIBOR must be important participants in the interbank market.

Price-to-income (PTI)   The ratio of the price of an apartment (68 m^2) to the sum of the annual wage in a given region over the last four quarters.

Price-to-rent (PR)   The ratio of the price of an apartment to the annual rent. The price-to-rent ratio is the inverse of the rental return.

Property asking prices   Property sale asking prices in estate agencies. Asking prices should be higher than transaction prices. Property asking prices in the Czech Republic are published, for example, by the CZSO and the Institute for Regional Information (which also publishes data on market rent supply prices).

Property developers/developments
  Companies/projects whose aim is to build a complex of residential and commercial property. Property developers' work includes choosing an appropriate site, setting up a project, obtaining the necessary permits, building the necessary infrastructure, constructing the buildings and selling the property. Developers also often organise purchase financing for clients and frequently lease or manage the property once it is built (especially in the case of commercial property). Given the combination of construction activity and speculative property purchases, developers' results are strongly dependent on movements in property prices.

Property price gap   The deviation of the price of property from its estimated equilibrium value.

Property transaction prices

  Prices of actual transactions on the property market, which should be the closest to actual market prices. The CZSO has been publishing two types of data on property transaction

prices since 2011. Prices based on Ministry of Finance statistics from property transfer tax returns and published by the CZSO are the older source. These data contain time series from 1998 and are available in a relatively detailed breakdown (by region, degree of wear and tear and type of property). On the other hand, they do not include transactions which are not subject to property transfer tax (i.e. primarily transactions in new property) and the index is published with a lag of at least half a year. The second, new source of data on property transaction prices is data from CZSO surveys in estate agencies. They cover new property, but are not available in such a long time series and such a detailed breakdown.

Quantitative easing A method for implementing monetary policy in a situation where the central bank is no longer able to lower its monetary policy rate because it has already reduced it almost to zero. Quantitative easing involves the central bank buying assets from commercial banks and thereby creating a sizeable stock of free reserves with those banks. The purpose of this type of policy is to strengthen the balance-sheet and market liquidity of the banking system and minimise the risk of growth in interest rates due to insufficient liquidity. In the past ten years, quantitative easing has been applied in Japan and the USA. A similar policy is now being pursued, for example, by the ECB.

Rental return The ratio of the annual supply rent to the asking price of the apartment. It is the inverse of the price-to-rent ratio.

Return on assets (RoA) The ratio of pre-tax profit and interest to total assets of a firm.

Return on equity (RoE) The ratio of net profit to equity of a firm.

Risk premium The risk premium an investor demands on investments in riskier financial instruments.

Search for yield A situation where economic agents attempt to make up for generally low asset yields by seeking riskier-than-usual investments that yield a premium in return for the increased risk. Such behaviour may increase the future risks to the financial system.

Secondary market The market on which existing securities are traded.

Solvency Solvency in the insurance sector is the ability of an insurer to meet its insurance obligations, i.e. to settle eligible insurance claims arising from insured losses. Solvency II – a new regulatory framework prepared by the European Commission – is a set of rules for European insurance companies and reinsurers laying down quantitative requirements, qualitative requirements, prudential rules, compliance with market discipline and disclosure duties.

Solvency ratio The ratio of the own funds of an insurance company to the minimum capital requirement necessary to cover all the risks it undertakes.

Sovereign risk The risk that a government will default on its obligations, leading to national bankruptcy or restructuring of government debt.

Systemic risk The risk of the entire financial system or market collapsing.

Technical interest rate The interest rate used by insurance companies to calculate premiums in life insurance. The technical interest rate represents the increase in the value of life insurance provisions to which the customer is entitled under the policy (the guaranteed share in the returns on financial investment). The maximum technical interest rate is laid down in a decree.

Tier 1

The highest quality and, for banks in the Czech Republic, also the most significant part of regulatory capital. The dominant components of Tier 1 are equity capital, retained earnings and mandatory reserve funds.

Yield spread

Also yield differential; the spread between the yield on a bond and the yield on a reference ("benchmark") bond.

ABBREVIATIONS

AFS	available-for-sale (financial assets in the "available for sale" accounting category)
ASF	available stable funding
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
BoE	Bank of England
BLS	Bank Lending Survey
bp	basis point
BRCI	Bank Register of Client Information operated by Czech Credit Banking Bureau
BRRD	Bank Recovery and Resolution Directive
CARW	critical average risk weight
CB	central bank
CBR	combined buffer requirement
CCoB	capital conservation buffer
CCyB	countercyclical capital buffer
CCR	Central Credit Register operated by the CNB
CDS	credit default swap
CEB	Czech Export Bank
CET1	common equity Tier 1
CMGDB	Czech-Moravian Guarantee and Development Bank
CNB	Czech National Bank
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
CZK	Czech koruna
CZSO	Czech Statistical Office
DSCR	debt service coverage ratio
DSTI	debt service-to-income
EA	euro area
EAD	exposure at default
EBA	European Banking Authority
EC	European Commission
ECB	European Central Bank
EGAP	Export Guarantee and Insurance Company
EIB	European Investment Bank
EIOPA	European Insurance and Occupational Pensions Authority
EME	emerging markets
ESA 95/2010	European System of Accounts (Eurostat methodology)
ESRB	European Systemic Risk Board
EU	European Union
EUR	euro
EURIBOR	Euro InterBank Offered Rate (reference interest rate on the interbank market)
FCI	financial cycle indicator
Fed	Federal Reserve System
FOMC	Federal Open Market Committee
FSB	Financial Stability Board
FSR	Financial Stability Report
GB	government bond
GDI	gross disposable income
GDP	gross domestic product
GFCF	gross fixed capital formation

G-SII	global systemically important institution
HB index	Hypoteční banka property price index
HBS	Household Budget Statistics
HHI	Herfindahl-Hirschman index
HP filter	Hodrick-Prescott filter
HTM	Held-to-Maturity
ICAAP	Internal Capital Adequacy Assessment Process
IL	Liquidity indicator
ILI	investment life insurance
ILO	International Labour Organisation
IMF	International Monetary Fund
IRB	Internal Rating Based Approach, an approach within the Basel II framework for capital adequacy of banks
IRF	impulse-response function
IRI	Institute for Regional Information
IRS	interest rate swap
ISR	sovereign risk indicator
LCR	liquidity coverage ratio
LGD	loss given default
LI	life insurance
LLP	loan loss provision
LR	leverage ratio
LTD	loan-to-deposit
LTI	loan-to-income
LTV	loan-to-value
MA	matching adjustment
MBs	mortgage bonds
MDA	maximum distributable amount
MF CR	Ministry of Finance of the Czech Republic
MRD	Ministry for Regional Development
MREL	minimum requirement for own funds and eligible liabilities
NACE	General Industrial Classification of Economic Activities
NBP	National Bank of Poland
NFCEL	non-bank financial corporations engaged in lending
NLI	non-life insurance
NPISH	non-profit institutions serving households
NPL	non-performing loan
NRCI	Non-bank Register of Client Information
NSFR	net stable funding ratio
OCR	overall capital requirement
OECD	Organisation for Economic Cooperation and Development
OFIs	other financial intermediaries
OLS	ordinary least squares
OPEC	Organization of the Petroleum Exporting Countries
O-SIIs	other systemically important institutions
p.a.	per annum
P2P	peer-to-peer lending
PD	probability of default
PMC	pension management company
pp	percentage point
PRIBOR	Prague InterBank Offered Rate (reference interest rate on the interbank market)
PSE	Prague Stock Exchange
PTI	price-to-income

QA	quick assets
QE	quantitative easing
rhs	right hand side
RoA	return on assets
RoE	return on equity
RSF	required stable funding
RW	risk weighting
RWA	risk-weighted assets
RWR	overall capital ratio
SII	Solvency II Directive
SILC	Survey of Income and Living Conditions
SMEs	small and medium-sized enterprises
SMP	Securities Markets Programme
SRB	systemic risk buffer
SREP	Supervisory Review and Evaluation Process
SSM	Single Supervisory Mechanism
STA	standardised approach to credit risk
TF	transformed fund
TLTRO	Targeted Longer-Term Refinancing Operations
TSCR	total supervisory capital requirement
UFR	ultimate forward rate
USA	United States
USD	US dollar
VA	volatility adjustment
VAR	vector autoregression
WB	World Bank
WGI	Worldwide Governance Indicators

COUNTRY ABBREVIATIONS

AT	Austria	IS	Iceland
AU	Australia	IT	Italy
BE	Belgium	JP	Japan
BG	Bulgaria	KO	Korea
BR	Brazil	LT	Lithuania
CA	Canada	LU	Luxembourg
CL	Chile	LV	Latvia
CN	China	ME	Mexico
CY	Cyprus	MT	Malta
CZ	Czech Republic	NL	Netherlands
DE	Germany	NO	Norway
DK	Denmark	NZ	New Zealand
EE	Estonia	PL	Poland
ES	Spain	PT	Portugal
FI	Finland	RO	Romania
FR	France	RU	Russia
GR	Greece	SE	Sweden
HR	Croatia	SI	Slovenia
HU	Hungary	SK	Slovakia
CH	Switzerland	TR	Turkey
IE	Ireland	UK	United Kingdom
IN	India	US	United States

FINANCIAL STABILITY INDICATORS – PART 1

		2011	2012	2013	2014	2015	2016	2017 Jan.	Feb.	Mar.	Apr.
Macroeconomic environment											
ME.1	Real GDP growth (year on year, %)	2.0	-0.7	-0.5	2.7	4.6	2.3				
ME.2	Consumer price inflation (average annual index growth, %)	1.9	3.3	1.4	0.4	0.3	0.7	2.2	2.5	2.6	2.0
ME.3	Public finance deficit / surplus / GDP (%)	-2.7	-3.9	-1.2	-1.9	-0.6	0.1				
ME.4	Public debt / GDP (%)	39.8	44.5	44.9	42.2	40.3	37.6				
ME.5	Trade balance / GDP (%)	1.9	3.0	4.1	5.1	4.1	5.3				
ME.6	External debt in % of banking sector external assets	165.8	162.6	149.4	152.7	137.0	121.3				
ME.7	Balance of payments current account / GDP (%)	-2.1	-1.6	-0.5	0.2	0.2	1.1				
ME.8	Monetary policy 2W repo rate (end of period, %)	0.75	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Non-financial corporations											
NC.1	Return on equity (%)	7.9	7.0	6.9	9.2	10.8	10.4				
NC.2	Debt (% of total liabilities)	54.7	55.0	56.7	56.9	56.2	56.7				
NC.3	Credit indebtedness (% of GDP)	50.4	50.1	51.8	53.9	50.4	52.1				
NC.4	– loans from Czech banks (% of GDP)	20.5	20.6	21.2	20.3	20.2	20.7				
NC.5	– loans from Czech non-bank financial corporations (% of GDP)	4.4	4.2	4.0	4.0	4.2	4.5				
NC.6	– other (including financing from abroad, % of GDP)	25.4	25.3	26.7	29.7	26.0	26.4				
NC.7	Interest coverage (pre-tax profit + interest paid/interest paid, %)	9.1	8.4	9.5	10.8	13.5	13.5				
NC.8	12M default rate (%)	3.0	1.9	1.9	1.6	1.5	1.7				
Households (including sole traders)											
H.1	Debt / gross disposable income (%)	54.2	55.7	57.7	56.5	57.9	59.7				
H.2	Debt / financial assets (%)	31.0	30.5	30.1	28.7	28.3	28.8				
H.3	Net financial assets (total financial assets – total liabilities, % of GDP)	63.1	66.9	69.8	72.4	73.9	75.1				
H.4	Debt / GDP (%)	29.7	30.7	31.5	30.3	30.4	31.5				
H.5	– loans from Czech banks to households (% of GDP)	25.0	25.7	26.7	26.5	27.1	28.2				
H.6	– loans from Czech non-bank fin. corporations to households (% of GDP)	1.7	1.7	1.6	1.6	1.1	1.1				
H.7	– loans from Czech banks to sole traders (% of GDP)	0.9	0.9	0.9	0.8	0.8	0.8				
H.8	– loans from Czech non-bank fin. corporations to sole traders (% of GDP)	0.3	0.3	0.2	0.2	0.2	0.2				
H.9	– other (including financing from abroad, % of GDP)	1.7	2.1	2.1	1.3	1.2	1.2				
H.10	Net interest expenses / gross disposable income (%)	1.9	1.9	1.9	1.7	1.9	1.9				
H.11	12M default rate (%, excluding sole traders)	4.4	3.9	3.6	3.3	2.8	2.3				
Financial markets											
FM.1	3M PRIBOR (average for period, %)	1.2	1.0	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3
FM.2	1Y PRIBOR (average for period, %)	1.8	1.5	0.7	0.5	0.5	0.5	0.4	0.4	0.4	0.5
FM.3	10Y government bond yield (average for period, %)	3.7	2.8	2.1	1.6	0.6	0.4	0.5	0.6	0.9	1.0
FM.4	CZK / EUR exchange rate (average for period, %)	24.6	25.1	26.0	27.5	27.3	27.0	27.0	27.0	27.0	26.8
FM.5	Change in PX stock index (% year on year, end of period)	-25.6	14.0	-4.8	-4.3	1.0	-3.6	1.2	11.2	9.0	10.0
Property market											
PM.1	Total change in residential property prices (transaction prices, % year on year)	0.9	0.4	1.1	1.5	3.1	11,0*				
PM.2	Change in apartment prices (asking prices according to CZSO, % year on year)	0.2	-1.4	0.8	2.1	4.8	14,5**				
PM.3	Apartment price / average annual wage	4.0	3.8	3.9	3.9	3.9	4.3				
PM.4	Apartment price / annual rent (according to IRI)	21.7	21.3	21.6	20.7	21.5	21.4				

* Estimate based on CZSO transaction prices and house price index.

** Estimate based on CZSO transaction prices.

Note: Owing to data revisions, some historical values of the indicators may not be comparable to those published in previous FSRs.

FINANCIAL STABILITY INDICATORS – PART 2

		2011	2012	2013	2014	2015	2016	2017 Jan.	2017 Feb.	2017 Mar.	2017 Apr.
Financial sector											
FS.1	Financial sector assets / GDP (%)	142.3	148.0	160.5	160.0	158.0	163.3				
FS.2	Shares of individual segments in financial sector assets (%)										
FS.3	banks	78.1	77.2	78.1	77.8	77.4	77.4				
FS.4	credit unions	0.5	0.7	0.5	0.5	0.5	0.4				
FS.5	insurance companies	7.6	7.8	7.3	7.1	6.8	6.4				
FS.6	pension management companies and funds	4.3	4.6	4.7	4.9	5.3	5.2				
FS.7	investment funds*	2.9	3.6	3.8	4.3	4.8	5.2				
FS.8	non-bank financial corporations engaged in lending	6.2	5.8	5.3	5.2	5.0	5.0				
FS.9	investment firms	0.5	0.4	0.4	0.3	0.3	0.3				
Banking sector											
BS.1	Bank assets / GDP (%)	111.3	114.6	126.1	124.6	122.3	126.4				
BS.2	Assets structure (%, end of period)										
BS.3	loans to central bank	8.7	8.3	12.9	8.8	11.6	12.5				
BS.4	interbank loans	9.8	9.6	9.1	6.4	4.5	3.8				
BS.5	client loans	51.1	50.5	50.0	50.7	51.8	50.8				
BS.6	bond holdings	22.2	24.1	21.7	22.8	21.0	18.2				
BS.7	– government bonds	16.5	18.3	15.8	16.3	14.1	11.4				
BS.8	– Czech government bonds	15.3	16.9	14.6	14.8	12.5	10.0				
BS.9	other	8.3	7.5	6.3	11.3	11.1	14.8				
BS.10	Liabilities structure (%, end of period)										
BS.11	liabilities to central bank	0.1	0.2	0.0	0.1	0.2	0.2				
BS.12	interbank deposits	11.0	8.9	11.3	10.5	7.6	10.2				
BS.13	client deposits	67.1	69.1	67.8	66.9	66.4	65.3				
BS.14	bonds issued	8.5	8.1	8.3	8.6	11.9	11.5				
BS.15	other	13.3	13.7	12.5	13.9	13.8	12.9				
BS.16	Client loans / client deposits (%)	76.2	73.1	73.8	75.8	78.0	77.8				
BS.17	Sectoral breakdown of total loans (%)										
BS.18	non-financial corporations	35.9	35.4	34.5	33.2	33.1	33.1	32.8	32.8	33.0	
BS.19	households	43.8	44.3	43.4	43.3	44.4	45.1	44.6	44.5	44.5	
BS.20	sole traders	1.7	1.5	1.5	1.3	1.3	1.2	1.2	1.2	1.2	
BS.21	others (including non-residents)	18.6	18.8	20.6	22.1	21.2	20.6	21.4	21.5	21.3	
BS.22	Growth in loans (%, end of period, year on year):										
BS.23	total	6.0	2.4	6.5	4.8	5.6	6.0	7.0	7.2	7.3	
BS.24	non-financial corporations	6.1	0.9	3.8	0.9	5.3	6.0	5.2	5.9	4.7	
BS.25	– real estate activity (NACE L)	11.5	0.7	6.3	3.6	5.6	12.1	11.5	12.8	9.7	
BS.26	households	5.0	3.6	4.5	4.5	8.2	7.7	8.3	8.2	8.7	
BS.27	– loans for house purchase	6.1	4.8	5.2	5.6	8.0	8.4	9.1	9.2	9.4	
BS.28	– consumer credit	-1.6	-0.7	0.4	-0.6	8.9	4.5	4.6	3.8	5.0	
BS.29	sole traders	-5.5	-5.0	1.0	-4.0	0.0	4.4	4.4	4.7	5.4	
BS.30	Non-performing loans / total loans (%):										
BS.31	total	6.0	6.0	5.9	6.1	5.8	4.8	4.7	4.7	4.5	
BS.32	non-financial corporations	8.2	7.4	7.2	6.7	5.7	5.1	5.2	5.2	5.0	
BS.33	households	4.9	5.1	5.0	4.7	4.0	3.2	3.1	3.1	2.9	
BS.34	– loans for house purchase	3.2	3.4	3.3	3.1	2.6	2.0	2.0	1.9	1.9	
BS.35	– consumer credit	11.3	12.3	12.2	12.0	11.1	8.9	8.8	8.8	7.8	
BS.36	sole traders	12.4	13.7	13.0	12.6	11.0	8.6	8.6	8.3	7.5	
BS.37	Coverage of non-performing loans by provisions (%)**	51.5	53.8	55.0	55.6	54.6	56.3	56.4	55.7	55.2	
BS.38	Aggregate LTV for housing mortgages	57.0	58.7	59.4	54.6	55.8	55.8				
BS.39	Capital ratio (%)	15.3	16.4	17.1	18.0	18.4	18.4				
BS.40	Tier 1 capital ratio (%)	13.9	15.7	16.5	17.5	17.9	17.9				
BS.41	Leverage (assets as a multiple of Tier 1)	14.3	13.7	13.1	12.4	12.1	12.6				
BS.42	Leverage ratio (approximation of Basel III definition, Tier 1 / exposures)	n.a.	n.a.	n.a.	7.2	7.6	7.2				
BS.43	Return on assets (%)	1.2	1.4	1.3	1.2	1.2	1.3	0.8	0.9	1.1	
BS.44	Return on Tier 1 (%)	19.8	21.8	18.6	16.8	16.7	17.9				
BS.45	Quick assets / total assets (%)	26.9	29.1	30.6	31.0	32.0	34.4	38.1			
BS.46	Quick assets / client deposits (%)	40.8	42.5	45.6	46.4	48.3	52.8	60.6			
BS.47	Net external position of banking sector (% of GDP)	3.9	6.1	3.1	1.6	-1.0	-7.5				
BS.48	Banking sector external debt / banking sector total assets (%)	12.1	10.1	12.2	13.9	15.3	18.7				

* Act No. 240/2013 Coll., on management companies and investment firms, which introduced the term investment funds, was passed in 2013.

Investment funds comprise collective investment funds and funds for qualified investors.

** The calculation does not include CEB and CMGDB loans.

Note: Owing to data revisions, some historical values of the indicators may not be comparable to those published in previous FSRs.

FINANCIAL STABILITY INDICATORS – PART 3

		2011	2012	2013	2014	2015	2016	Jan.	2017 Feb.	Mar.	Apr.
Non-bank financial corporations												
NI.1	Share in financial sector assets (%)	21.1	21.7	21.0	21.5	21.9	21.8				
	Insurance companies*										
NI.2	Premiums written / GDP (%)	3.8	3.8	3.8	3.7	3.4	3.2				
NI.3	Equity / Technical provisions (%)	28.3	30.8	30.3	28.8	29.4	30.4				
NI.5	Change in financial investment of insurance companies (%)	1.2	4.8	0.7	2.6	-2.8	-0.2				
NI.6	Return on equity of insurance companies (%)	12.4	14.7	13.0	7.6	9.3	13.1				
NI.7	Claim settlement costs / net technical provisions (life, %)	16.0	16.4	17.7	20.0	17.8	15.1				
NI.8	Claim settlement costs / net technical provisions (non-life, %)	61.7	60.8	67.9	64.1	66.2	72.1				
	Pension management companies (PMCs) and PMC funds										
NI.9	Change in assets of funds managed by PMCs (%)	6.5	10.4	8.4	14.1	10.0	7.8				
NI.10	Nominal change in value of assets of PMC funds**	0.8	7.0	-0.1	3.3	1.0	0.3				
	Investment funds										
NI.11	Growth in net assets (= equity; year on year, %)	-3.1	17.1	19.4	19.0	17.8	17.4	19.7	21.6		
	Non-bank financial corporations engaged in lending										
NI.12	Growth in loans from non-bank financial corporations engaged in lending (%):***										
NI.13	total	1.5	-3.6	-4.1	3.3	0.8	8.6				
NI.14	households	6.5	-2.5	-2.3	5.0	-26.4	4.1				
NI.15	non-financial corporations	0.5	-3.1	-4.4	3.7	11.4	10.8				

* The indicators cover domestic insurance companies and branches of foreign insurance companies.

** Change in the assets of pension funds adjusted for contributions and benefits.

*** The change in the amount of loans provided to households by non-bank financial corporations engaged in lending in 2015 was due to the conversion

Note: Owing to data revisions, some historical values of the indicators may not be comparable to those published in previous FSRs.

INDICATORS ENTERING THE MACROPRUDENTIAL DASHBOARD

(distance from benchmark expressed as number of standard deviations)

SOURCES OF RISKS
1. MACRO-ENVIRONMENT
1a. Economic activity
Real GDP growth (year on year, %)
Inflation volatility*
Consumer confidence indicator (2005 average=100)
1b. Sovereign sector
Share of government debt held by non-residents (%)
Share of foreign currency government debt in total government debt (%)
CDS spread for CZGBs (pp)
Average maturity of government debt (in years)
Share of short-term government debt (%, end of period)
1c. External sector
Current account/GDP (%)
External debt in % of external assets of banking sector
2. CREDIT CONDITIONS AND DEBT
1a. Non-financial corporations
Net interest payments of NFCs/gross operating surplus (%)
Growth in new loans to NFCs (year-on-year; %)**
Debt of non-financial corporations/gross operating surplus (%)
1b. Households
Interest payments of households/nominal gross disposable income (%)
Growth in new loans for house purchase (year-on-year; %)**
Household debt/nominal gross disposable income (%)
3. MARKET RISKS
3a. Residential property prices
Total growth in residential property prices (according to transaction prices; %)
Estimated overvaluation of apartment prices (%)
Apartment price/average annual wage (%)
Apartment price/annual rent (according to IRI; %)
3b. Interest rate risk
Bank maturity mismatch (client loans > 1 year/client deposits > 1 year; %)
Interest margin (new loans vs. deposits; %)
Interest margin (stock of loans vs. deposits; %)
4. LIQUIDITY AND INTERBANK CONTAGION
4a. Market liquidity
Daily government bond trading volume/government debt (%)
Daily government bond trading volume/government debt held by non-residents (%)
4b. Balance-sheet liquidity
Interbank financing/total bank liabilities (%)
Quick assets/total bank assets (%)
4c. Interbank contagion
Interconnectedness of banking sector (%)
Concentration of bank claims (5 largest/CET1 capital; %)
Concentration of bank liabilities (5 largest/CET1 capital; %)

RESILIENCE OF FINANCIAL SECTOR
1. BANKING SECTOR
Capital in excess of total capital requirement (pp)
Bank leverage ratio (%)
NPL coverage of banks (provisions/NPLs; %)
2. PENSION MANAGEMENT COMPANIES AND INSURANCE COMPANIES
Ratio of own funds to assets of pension management companies (%)
Ratio of own funds to assets of insurance companies (%)
Coverage of technical reserves by assets of insurance companies (investments/technical reserves; %)
3. OTHER NON-BANKS AND CREDIT UNIONS
Loans accepted/assets of investment funds (%)
Quick assets/total assets of collective investment funds (%)
Leverage of NFCELs (assets/own funds; %)
Short-term loans accepted and bonds issued/external funds of NFCELs (%)

Note: Unfilled (filled) values are for 2015 (2016). Green (red) indicates a need to consider looser (tighter) macroprudential policy; grey signifies no clear indication in either direction in the current situation. The benchmarks for the indicators are estimates of the trend values or the averages since 2002 (or later, depending on data availability). The indicators are unweighted, so the same values for different indicators can mean different contributions to total systemic risk. The dashed lines denote distances of 1, 2 and 3 standard deviations from the average.
* Standard deviation of year-on-year changes in CPI inflation on a three-year moving window
** 3M moving average