FINANCIAL STABILITY REPORT

2011 / 2012

CNB CZECH NATIONAL BANK

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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) In accordance with its primary objective, the Czech National Bank shall

.....

d) supervise the activities of entities operating on the financial market, analyse the evolution of the financial system, see to the sound operation and development of the financial market in the Czech Republic, and contribute to the stability of its financial system as a whole.

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 leading 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. 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 not only to a strengthening of the importance of the objective of financial stability, but also to the institution of macroprudential policy designed to maintain financial stability. The main aim of macroprudential policy is to mitigate systemic risk, i.e. the risk of instability of the financial system as a whole. An intensive 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) was established at the European level at 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 can issue 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, and CNB experts participate in its working groups. As from 2011, the CNB is also 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 every six months with experts from key sections at regular meetings on financial stability issues. A wide range of information on developments 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 macroprudential instruments or recommendations for the use of regulatory, supervisory and other economic policy tools to suppress such risks or their potential effects.

LIST OF BOXES

The Czech National Bank is pleased to present its eighth 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 Report focuses mainly on the risks that may arise in connection with the possible renewal of recession and the difficult situation in euro area countries.

The Report is based on an advanced analytical and modelling framework and contains stress tests of the key segments of the financial sector (i.e. banks, insurance companies and pension funds) as well as a stress test of households. The testing methodology was further refined compared to the previous Report. In the case of the banking sector, the horizon was extended to three years and the potential risks now include domestic banks' exposures to their parent companies. The stress tests of insurance companies and pension funds make increasing use of individual data for individual tested institutions. The main improvement to the household stress test is more detailed monitoring of the labour market position of households.

The financial sector's resilience is tested by means of an alternative macroeconomic scenario. The *Europe in Depression* scenario assumes a longer-term downturn in economic activity accompanied by a sizeable fall in real household income and a concurrent rise in commodity prices. The alternative stress scenario is compared with the *Baseline Scenario*, which is based on the CNB's official May forecast. 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 Report is newly divided into four main sections followed by thematic articles. The *Real economy* section deals with the external and domestic macroeconomic environment and analyses the financial situation of households and non-financial corporations. The section entitled *Asset markets* analyses risks in the financial markets and the property market in more detail. The section called *The financial sector* describes key trends in the financial sector and the main sources of potential risks. The final section contains an overall evaluation of financial stability indicators and presents the results of stress tests of banks, insurance companies and pension funds. The Report now contains macroprudential recommendations relating to the risks identified.

The thematic articles react to selected topical financial stability issues. The article *How to Identify Systemically Important Financial Institutions* draws attention to the risks associated with the existence of systemically important financial institutions and discusses methods for identifying them. The article *Early Warning Indicators of Economic Crises* sets out to find a set of indicators to identify financial crises with regard to both their timing and the intensity of their adverse impact on the economy. The article *Impacts of the Sovereign Default Crisis on the Czech Financial Sector* discusses the channels of contagion of sovereign default risk to the financial system and analyses the significance of these channels in the Czech economy. The article *Contingent Claims Analysis and the*

Inter-sector Transmission of Credit Risk maps the network of financial linkages in the Czech economy and studies to what extent mutual financial exposures contribute to the spread of credit risk across the financial system.

This Financial Stability Report was approved by the CNB Bank Board at its regular meeting on financial stability issues on 10 May 2012 and was published on 19 June 2012. It is available in electronic form at http://www.cnb.cz/.

PART I

OVERALL ASSESSMENT

The crisis in the global economy will enter its sixth year this summer, but still cannot be said to be at an end. By contrast, some European countries are becoming increasingly exposed to the impacts of risks that arose in the pre-crisis period and have deepened during the crisis owing to inadequate or incorrect economic policy reactions. The current situation in Europe, and particularly in the euro area, is therefore very fragile and the crisis may re-emerge at virtually any time. The risks to financial stability in Europe remain high and tilted to the downside. By contrast, the Czech financial sector remained highly resilient to external risks in 2011, with some of its parameters becoming even more robust. The domestic economy was therefore affected by the euro area crisis to a limited extent, via weakening economic activity. However, developments in the euro area are generating numerous risks to future financial stability in the Czech Republic.

The main risk scenario for the Czech economy over the next two years remains a sharper contraction of economic activity due to the crisis in its external environment. Further development of the negative feedback between public finance, the real economy and the financial sector is a threat stemming from the euro area. This feedback, which was identified as one of key risks in FSR 2010/2011, started to develop quickly in 2011 H2. Although the measures implemented by euro area authorities in late 2011/ early 2012 stopped this development, the probability of it re-emerging is not low. One of the reasons is the strong procyclicality of economic policies, consisting not only in the forced fast reduction of public budget deficits, but also in regulatory pressures for an immediate strengthening of the capital and liquidity buffers of banks operating in the euro area, which are increasing regulatory uncertainty and speeding up the deleveraging process. Last but not least, commodity and energy prices, which reflect the geopolitical uncertainty and dynamic growth in emerging economies, are also having procyclical effects on European economies.

DEVELOPMENTS IN 2011 AND 2012 Q1

Both the global and the Czech economy recorded a slowdown

Following quite a robust recovery in 2010, the global economy recorded a modest slowdown in 2011. However, the economic growth was very uneven across regions and the gaps between countries increased. Some euro area countries with high private sector or government debt, weak economic growth and high unemployment are in a vicious circle from which it will be difficult to escape. The Czech Republic maintained positive economic growth in 2011, but this growth gradually slowed and was driven solely by net exports and change in inventories.

Monetary policies remained easy

Given the absence of demand-pull inflation pressures, the CNB, like the world's major central banks, kept its monetary policy rates at historically low levels. In addition to standard monetary policy instruments, the major central banks continued their quantitative easing policies. At the end of 2011, the ECB introduced extraordinary three-year liquidity-providing operations (LTROs), which have similar effects as quantitative easing.

Domestic exporters improved their financial position, but the situation in sectors dependent on domestic demand worsened

The non-financial corporations sector recorded comparable financial results in 2011 as in 2010, mainly thanks to the good performance of export-oriented manufacturers. Sectors linked to domestic demand, particularly construction, real estate and services, posted noticeably worse financial results. However, the NPL ratio in the corporate sector as a whole declined gradually during the year.

The worse income situation of households has yet to affect their debt repayment ability

Despite a decline in the unemployment rate, the income situation of households deteriorated. Real wage growth was among the lowest in recent history, and the real disposable income of households decreased year on year. This unfavourable situation has so far affected the credit risk of households only moderately, thanks, among other things, to low lending rates. The share of overindebted households continued rising, especially in the low-income category. However, the impact of the high overindebtedness of such households on banks' balance sheets was offset by a low absolute amount of loans provided.

The situation in global financial markets is being affected by euro area developments...

Global financial markets continue to be subject to a high degree of uncertainty, increased risk aversion and volatility in reaction to policy measures adopted in the euro area. The ECB's long-term liquidity-providing operations in late 2011/early 2012 calmed the extremely volatility in European markets, but the long-term effectiveness of the non-standard policy measures is uncertain, as credit and liquidity risk in financial systems has remained elevated.

...and is also having an adverse effect on Czech financial markets

Czech financial markets continue to be affected by developments abroad, although with less intensity than in previous years. A lack of counterparty confidence and low market liquidity persist on the interbank market. Despite its low volume and liquidity, the Czech government bond market is still recording slightly higher yields than those in countries with similar or worse public finance positions and outlooks. The Czech government bond market is vulnerable to aggregate market risks and contagion risks, even though the Czech Republic was one of only two EU countries to have their ratings upgraded last year amid mass downgrades.

Falling property prices prompted a decline in the number of transactions and a reduction in housing construction

Residential property prices continued to decline in 2011. This was chiefly due to the worse income situation of households and worse demographic determinants. The number of property market transactions also fell, housing construction decreased significantly, and there was a further increase in the time it takes to sell residential developments. On the other hand, property price sustainability indicators improved, opening up the possibility of speculative property purchases thanks to low interest rates on loans for house purchase. Signs of a modest market recovery in the commercial property sector – in particular a pick-up in mortgage loan growth and a recovery in investment activity – also started to emerge in 2011 H2.

The starting position of the financial system, and particularly of the banking sector, remains very good for future years

2011 was a favourable year for the Czech financial sector. The banking sector as a whole maintains a good starting position in terms of capital adequacy, profitability and balance-sheet liquidity and, as a whole, remains independent of external financing. Its exposures to parent

groups are stable over time and are being monitored by the CNB. The market share of building societies recorded a decline. The riskiness of the credit union segment decreased from the previous year, but the sector still cannot be regarded as resilient to increased risks. Insurance companies have solid capitalisation, but their profitability decreased. The pension fund segment remains stable and is strengthening its position in the allocation of household savings. It will be affected by the reform of the pension system. The market shares of collective investment funds and, as in the previous year, of non-bank financial corporations engaged in lending decreased slightly.

Credit risk stabilised and the share of government bond holdings increased

Credit risk in the banking sector improved slightly in 2011 and the non-performing loan (NPL) ratio stabilised at around 6%. At the aggregate level, credit risk can be regarded as sufficiently covered by provisions, but there are quite large differences in NPL coverage across domestic banks. Loan portfolio concentration is falling steadily, but the collateralisation of the largest loans is declining. Domestic banks increased their holdings of government bonds, which accounted for 15% of total assets at the end of 2011 (compared to 11% in 2008 and to lower levels usually recorded in European countries). The off-balance-sheet activities of banks remain significant, despite decreasing since the start of the crisis. The profitability of the banking sector remains above average by international comparison. From the short-term perspective, it may be jeopardised by adverse financial market developments, and from the long-term perspective it may be reduced by structural changes such as stronger competition in both the deposit and loan segments and reorientation of depositors to non-bank investment products, for example in connection with the pension reform.

RISKS TO FINANCIAL STABILITY

The balance of risks is unchanged, but their intensity has increased and real economy-related risks have moved to the centre of attention

The balance of risks is little changed from the previous FSR 2010/2011, and downside risks prevail. The intensity of those risks has increased mainly as a result of adverse economic developments, which may seem almost impossible to resolve in some euro area countries. The structure of risks is also similar to that recorded a year ago, although analysts' and authorities' perceptions of the intensity of individual risks have changed. The assessment of the significance of sovereign risk has decreased and risks relating to weak economic growth are now at the centre of attention.

The Czech economy will switch to stagnation in 2012 and start to recover in 2013

The CNB's May forecast expects annual GDP growth to switch to stagnation this year owing to lower economic growth abroad and in connection with slowing domestic demand reflecting continued public finance consolidation. GDP growth is expected to increase to 1.9% in 2013, thanks mostly to a recovery in external demand. The difficult labour market situation and the need to implement further fiscal measures to reduce the structural public budget deficit will be obstacles to a faster recovery in domestic demand in the near future.

The possibility of balance-sheet recession remains a risk to a recovery in external demand

The possibility of "balance-sheet recession", caused by reduction of the high indebtedness of economic agents, is a risk to a recovery in external demand. In this context there are concerns that the deleveraging

process in the euro area will be accompanied by a sharp tightening of credit conditions and worse availability of loans for the private sector. This could endanger production in the corporate sector. Advanced economies will also be adversely affected by global asymmetries in the geographical distribution of economic growth. Dynamic growth in emerging economies is being reflected in continuing growth in commodity prices, which, in turn, is creating a negative supply-side shock in advanced countries, further weakening their economic activity.

The dependence of non-financial corporations on external developments increased

In the non-financial corporations sector, a strengthening of the export sector led to a further increase in the Czech economy's dependence on the euro area. Construction and real estate activities will remain subject to risks arising from low demand, particularly in the area of large engineering projects and housing construction. Similarly, the fiscal austerity measures may endanger the profitability of the transport industry, which will also be affected by rising fuel prices and higher tolls accompanied by an expansion of the toll road network.

Unfavourable income developments are the main risk in the household sector

The main risk in the household sector is unfavourable income developments, which will also be characterised by a diminishing ratio of gross disposable income of households to GDP. Real household income will also be adversely affected by rising energy prices and indirect tax increases. Households' income will also reflect the labour market situation, which will remain quite difficult. Total income growth will thus be subdued for some time to come. This will negatively affect the economic situation of households and their ability to repay loans.

Amid weak economic growth, the ability to repay loans will depend on low lending rates

In most advanced countries, including the Czech Republic, maintaining credit risk at an acceptable level is conditional on real lending rates staying at their current relatively low levels, which are consistent with slow growth in the real income of both households and corporations. This fragile stability may be threatened in individual countries by a rise in risk premiums, due, for example, to a loss of confidence in their public finance sustainability, a lack of confidence in the reported quality of banks' balance sheets, an adverse trend in economic activity, or combinations thereof. By contrast, a global increase in interest rates remains unlikely despite governments' high debt financing requirements, thanks to favourable trends in the global supply of savings compared to demand for savings.

The credit risk of loans for house purchase may be adversely affected by large fluctuations in nominal interest rates

In addition to new mortgages, low interest rates fostered continued growth in the number of refinanced loans in 2011. A further pick-up in the refinancing volume can be expected in 2012. In the current low interest rate environment, refinancing and rate refixation are enabling debtors to switch to a lower interest rate level. This is leading to a reduction in servicing costs and is having a positive impact on credit risk. In this regard, however, a scenario where most loans for house purchase are refixed and refinanced at a low interest rate level in future years and where a long period of significantly higher rates follows, may give rise to some concerns. However, the risks of this scenario are limited to a situation where rate increases are not accompanied by a recovery in wage and disposable income growth. This might arise primarily as a result of a loss of confidence in public finance sustainability.

Deficit financing from abroad could become a risk to Czech public finance

If one compares public budget flows and stocks with the advanced European economies, the position of the Czech economy looks relatively good. According to the CNB's May forecast, the public finance deficit should decrease to 3% of GDP in 2012, which is considered a safe limit. A gradual stabilisation of public budgets is vital because the Czech economy – unlike some other advanced countries – does not have a significant private sector savings surplus. If the Czech government were to obtain funds for potential fiscal expansion from abroad, the Czech economy's international position would worsen further. This would later be reflected in an increase in the sovereign risk premium and a rise in lending interest rates, as is currently happening in the euro area. From a longer-term perspective, the increase in the foreign currency component of Czech public debt can be regarded as a risky trend.

High volatility may transmit from foreign markets to the domestic bond market despite continued stabilisation of Czech public finance

Despite the low sovereign risk of the Czech state and the relatively resilient financial sector in the Czech Republic, renewed high volatility in foreign financial markets may have sizeable impacts on prices of domestic financial assets. The euro area debt crisis has shown that in small countries such as the Czech Republic an effort to stabilise public finances is not enough to prevent the transmission of risks from foreign markets. In this situation, it is better not to reduce the share of the long-term component in Czech public debt, as this ensures predictable repayment amounts and to some extent protects the debt against the market tension and random volatility typical of times of crisis.

The high degree of uncertainty necessitates continued central bank supportive policies

The none-too-optimistic expectations regarding economic growth and the persisting high credit and liquidity risk in the financial system are increasing uncertainty, with serious implications for economic policies. The impacts of the materialisation of systemic risks that accumulated in the global financial system in the past are still so strong that they require continued supportive economic policies. A premature exit from such policies might put the fragile financial market at risk. A potential risk is that politicians and the public are becoming increasingly reliant on central bank actions.

Negative real returns on safe assets are motivating investors to search for short-term yield

The loss of top ratings and doubts about the medium-term public finance sustainability of some large advanced countries are causing investors to fly to perceived "quality", as represented by government bonds of countries that still have the top rating. A combination of very low nominal yields on the remaining highly safe assets and elevated market volatility is putting long-term investors, such as pension funds and insurance companies, at a disadvantage. The excessively high price of relatively good-quality assets, whose real returns are often negative, may motivate these institutions to search for yield and prefer riskier asset categories. This, in turn, will foster increased volatility and may also have a negative effect on the real economy. One consequence could be a decline in interest rates in such countries to levels that are not necessarily consistent with maintaining price and financial stability in the long term.

The domestic financial system was exposed to strong shocks in stress tests

The main risk to the Czech banking sector remains a potential increase in credit losses should the real economy take a turn for the worse. Such losses could materialise not only from loans held in banks' balance

sheets, but also from off-balance-sheet credit facilities and guarantees. Another significant risk to the banking sector would be the collapse of the largest debtors of each bank, as these loans are often not sufficiently secured.

The impact of a potential rise in market volatility should not be underestimated despite the relatively low significance of market risk in banks

Renewed volatility in the financial markets combined with potential write-downs of claims on indebted EU countries (as in the case of Greece in 2011) might also have significant adverse effects. Market volatility could particularly affect banks that have larger open positions in trading derivatives. Unfavourable market developments would also hit the other segments of the financial sector, particularly insurance companies and pension funds.

Credit losses would rise sharply if the stress scenario were to materialise

It can be deduced from the stock of NPLs and the relating provisioning that the inflow of new NPLs has gradually slowed in recent quarters and – in combination with the write-off of default loans – growth in total NPLs has halted. However, the slowdown in economic activity and in particular the unfavourable evolution of household income may reverse the current positive trend. Loans provided after the economy started to recover following the 2009 recession might then become non-performing to an increasing extent. If the *Europe in Depression* scenario materialises, the NPLs and provisions could increase again significantly.

Domestic banks' exposures to foreign parent companies may also pose a risk

Foreign analysts have started to identify the potential losses arising from domestic banks' exposures to their foreign parent groups as a potential risk. Although the probability of a collapse of the European banks that are present in the Czech Republic as owners of domestic banks can be assessed as extremely low, it is a risk, which, combined with unfavourable macroeconomic developments and market losses, could affect the domestic banking sector. This is one of the reasons why this risk was assessed in stress tests.

The residential and commercial property markets may remain a source of risk

Given the current macroeconomic outlook, apartment prices can be expected to be flat or falling slightly in the period ahead. Potential foreclosures of apartments used as collateral for loans to households and developers, together with the aforementioned worse income situation of Czech households, remain a downside risk to prices. The property development sector itself saw a rise in the NPL ratio, and progress with the sale of residential developments may slow further as the one-off effect of the increase in the reduced VAT rate subsides. On the other hand, an increase in the profitability of speculative property purchases may sow the seeds of a short-term speculative bubble. An upturn in investment activity in the commercial property area, which is being driven by foreign investors, could also lead to an overheating of this market segment and to a rise in the vacancy rate.

ASSESSMENT OF THE FINANCIAL SECTOR'S RESILIENCE

The main risk to the banking sector is an increase in credit losses combined with market losses

With regard to the risks identified above, the resilience of the domestic financial system was assessed as usual by means of stress tests on banks, insurance companies and pension funds using a *Baseline Scenario*

and a *Europe in Depression* stress scenario. The *Baseline Scenario* is considered by the CNB to be the most probable. The stress scenario describes the risk of a prolonged contraction in economic activity and a related sharp fall in property prices, a rise in NPLs and a drop in operating profits of financial institutions. This scenario is supplemented in sensitivity analyses with other shocks, e.g. the assumption of adverse financial market developments, write-downs of claims on indebted EU countries, losses on domestic banks' exposures to foreign parent companies and the collapse of the largest debtors of each bank.

Banks and insurance companies showed sufficient resilience to various significant risks in the stress tests, but pension funds remain sensitive to market shocks

The stress test results confirm that banks and insurance companies are highly resilient to adverse economic and market developments. This is due not only to their high initial capital buffer, but also to their ability to generate income even in an adverse scenario. The same conclusion applies to the sensitivity analysis in which the banking sector writes off a substantial proportion of its exposures to foreign parent banks. Even in this case, the aggregate capital adequacy ratio of the banking sector would remain above the 8% regulatory minimum. The pension fund sector remains sensitive to greater volatility in securities prices.

Liquidity tests confirm that the banking sector is highly resilient to a wide range of liquidity shocks

Using the *Europe in Depression* scenario, a banking sector liquidity stress test was applied at the one-month and three-month horizons for the first time. The test as usual involved a first round of shocks, consisting mainly in a bank run, increased use of credit facilities and a reduction in the value of market assets, and a second round of shocks capturing the additional reduction in the liquidity buffer stemming from the rise in reputational and systemic risk caused by banks' efforts to close the liquidity gap. Although the conditions of the scenario were relatively tough, the banks tested withstood the simulated shock and would be able to close the potential liquidity gap within one month or three months even under worse market conditions.

SYSTEMIC RISKS AND MACROPRUDENTIAL POLICY

No new sources of systemic risk were identified

Analyses of the connections between institutions and sectors, which focus on network links and therefore on the cross-sectional dimension of potential systemic risk, indicate still only low risk in this area. Indicators of the cyclical component of systemic risk, such as credit growth, credit conditions and margins, property prices, and liquidity in the banking sector, suggest that the Czech financial system is entering a phase of modest post-crisis recovery in lending. However, an increase in the cyclical component of systemic risk in the coming years will be prevented by pessimistic expectations among economic agents. They are now aware of a risk of renewed recession, the potential continuation of the property price decline, and the generally increased probability of default.

The lending conditions of Czech banks are stable and their interest rate component is easing

The domestic financial sector is currently in a phase of the financial cycle that is still subject to risks that originated in the pre-crisis years. Unlike in the euro area, however, these risks are materialising largely

because of the situation in the Czech Republic's external environment. At the same time, the Czech financial cycle is not very synchronised with the euro area cycle. The lending conditions of Czech banks stabilised in 2011 and the interest rate component of these conditions eased in late 2011 and in the first months of 2012 for loans to corporations and to households for house purchase. Interest margins on new loans fell to historical lows.

Loans for house purchase require increased attention

In connection with the rapid growth in new loans for house purchase observed in 2011 H2 and the fall in interest rates on these loans, media commentators began to speak of a mortgage boom. If one compares the growth in the total stock of loans for house purchase and new loans for house purchase, it is clear, however, that the month-on-month increases in the stock of loans for house purchase are low from the long-term perspective. The explanation is that a large proportion of new loans are existing loans that have been refinanced with other banks at the end of the interest rate fixation period. Nonetheless, it is legitimate to ask whether the current growth in loans for house purchase and the interest rates in this segment are consistent with appropriate risk assessment given the existing uncertainties. This is particularly true in a situation where no improvement in clients' creditworthiness is apparent. In the period ahead, the CNB will therefore focus not only on credit risk in this market segment, but also on the sensitivity of mortgage portfolios to interest rate growth.

Banks must maintain a high ability to absorb potential credit and market losses

To maintain high public and investor confidence in the stability of the Czech banking sector, banks must maintain a high ability to absorb potential credit and market losses. In the near future, the CNB's macroprudential policy strategy will thus consist mainly in regular monitoring of the capital adequacy of banks on both a solo and consolidated basis. When managing risks, banks themselves should consider scenarios containing long-term adverse trends in the macroeconomic environment showing up as flat or slow income growth.

Credit risk monitoring will be the CNB's priority in the period ahead

In a situation where risks relating to weak economic growth and the potential return of recession have taken centre stage, the CNB will pay increased attention to the quality of the credit portfolios of banks and credit unions in the period ahead. The main emphasis will be put on prudential categorisation of claims, sufficient provisioning and correct collateral valuation. Increased attention will also be paid to the links between domestic banks and their parent groups.

The CNB has amended the rules applying to credit risk and exposures to parent companies abroad

On the basis of credit risk analyses, the CNB is also taking regulatory measures. In April 2012, the CNB decree on prudential rules for banks, credit unions and investment firms was amended to tighten the qualitative requirements for the lending activities of banks and credit unions. In addition, the CNB is issuing official information describing its procedures for assessing the sufficiency of provisioning. An amended decree also halved the limit on the exposures of banks in the Czech Republic to parent or affiliated companies abroad. An information duty to the CNB regarding the assumption of credit risk exceeding 1% of total assets from a group member was also introduced.

2 THE REAL ECONOMY

2.1 THE MACROECONOMIC ENVIRONMENT

The world economy entered 2011 with optimistic expectations. However, economic growth in advanced countries weakened as the year progressed, mainly because of the euro area debt crisis, and this trend looks set to continue in 2012. In response to this, monetary policies remain very loose, suppressing potential growth in credit risk due to the elevated real costs of servicing the accumulated debt. This applies above all to households, which are facing an adverse labour market situation and worse labour income dynamics. Negative supply-side shocks in the form of rising energy prices and taxes are also adversely affecting household income. From the perspective of the Czech economy, the main risk scenario remains a sharper economic contraction in Germany and other countries that are major trading partners of Czech corporations. The weakening international position of the Czech economy, due largely to growth in domestic public debt, may become a risk factor in the longer term.

Global economic growth was slower than expected…

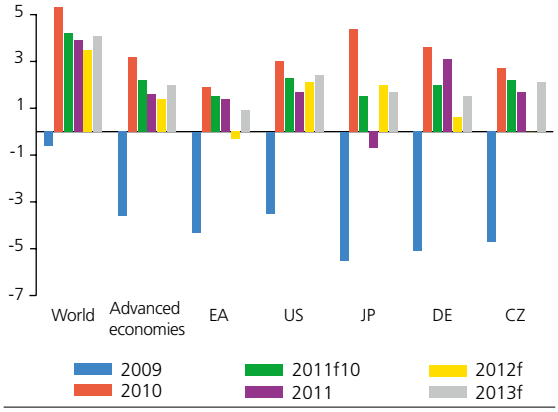
Following a relatively robust recovery in 2010, the global economy recorded a modest slowdown in 2011, although the outcomes were very uneven across regions and countries. The year-on-year decline in GDP growth was larger than expected (see the third and fourth columns in Charts II.1 and II.2). Globally this was partly due to falling output in Japan linked with the natural disaster there. The overall situation in the euro area was a positive surprise, with actual economic growth in Germany significantly exceeding forecasts. However, growing differences emerged across the euro area member countries.

…and the prospects for the next two years remain unfavourable

A further slowdown of global economic growth is expected for 2012. Some institutions, for example the IMF[1], even expect a slight decline in euro area output. The euro area should return to modest economic growth in 2013 provided that households stop creating additional precautionary savings and increase their consumption. The high debt burden of the private and public sectors is reducing consumption, and the uncertainty surrounding future developments is limiting investment in fixed capital. The emerging economies are also expected to slow slightly. Despite weak demand pressures, inflation all over the world remains slightly elevated owing to rising commodity and energy prices. The escalation of the debt crisis in the euro area in 2011 H2 led to a sharp increase in financial market volatility, and the *Asymmetric Developments* stress scenario contained in FSR 2010/2011 gradually materialised. Some elements of this scenario were therefore used in the *Europe in Depression* stress scenario in this Report (see the end of section 2.1).

CHART II.1

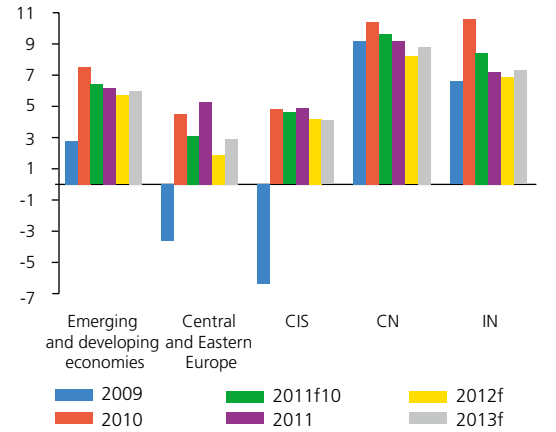
Economic growth worldwide and in the advanced economies
(year-on-year growth in %; outturns and October 2010 and April 2012 forecasts)



Source: IMF (World Economic Outlook, April 2012) and CNB (May 2012 macroeconomic forcast)
Note: 2011f10 is the October 2010 forecast for 2011.

CHART II.2

Economic growth in emerging and developing countries
(year-on-year growth in %; outturns and October 2010 and April 2012 forecasts)



Source: IMF (World Economic Outlook, April 2012)
Note: 2011f10 is the October 2010 forecast for 2011.

1 In its May forecast the CNB predicts that effective GDP growth in the euro area will stay positive in 2012 (at 0.5%).

The domestic economic recovery gradually halted

Czech economic growth also slowed gradually during 2011 and the domestic economy started to stagnate at the year-end. The real GDP growth figure of 1.7% recorded for the year as a whole was due solely to external demand. The current CNB forecast expects GDP to stay at the previous year's level in 2012. Net exports will be the main driver of growth, amid subdued aggregate domestic demand. In connection with the expected more marked recovery of economic growth abroad, the forecast foresees growth of 1.9% in 2013. Average annual CPI inflation should increase to 3.6% in 2012 as a result of an increase in the reduced VAT rate, whereas monetary-policy relevant inflation (i.e. inflation adjusted for the first-round effects of changes to indirect taxes) should stay in the upper half of the tolerance band around the inflation target. Both inflation rates are expected to be slightly below the target in 2013.

Monetary policies remain easy…

Central banks in advanced countries continue to pursue easy monetary policies. Monetary policy rates remain at minimum levels, with only the ECB lowering its main refinancing rate back to 1% after raising it temporarily to 1.5%. The CNB has held its two-week repo rate at 0.75% since May 2010. Maintaining easy monetary conditions is consistent with the absence of demand-pull inflationary pressures resulting from weak economic activity and difficult labour market conditions. In addition to standard monetary policy instruments, the Federal Reserve and the Bank of England continued their quantitative easing policies (see the Glossary and also FSR 2010/2011, Box 1). At the end of 2011, the ECB complemented its instruments with extraordinary three-year liquidity-providing operations (long-term refinancing operations, LTROs), through which the balance-sheet liquidity of euro area banks obtained from central banks was increased by about EUR 500 billion on a net basis, representing 1.5% of euro area bank liabilities (see section 3.1). The effects of these operations are similar to those of quantitative easing. The aim of the easy monetary policies is to keep money market rates, and subsequently also rates on loans and other sources of external financing, at low levels (see Chart II.3). This should stabilise the balance of cash flows of corporations and households, allowing them more easily to reduce the considerable debt they racked up in the pre-crisis years.

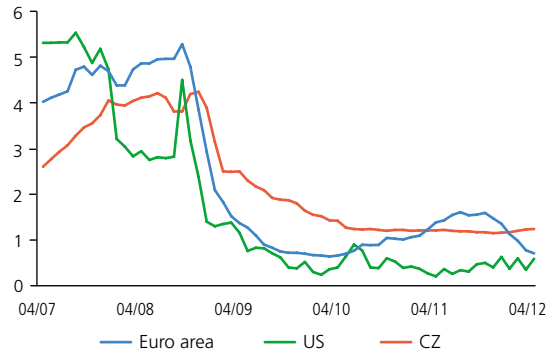
…but growth in lending is subdued

Thanks to the economic recovery, loans to the private sector rose slightly in 2011 and the first months of 2012 in the Czech Republic and most other EU countries (see Chart II.4). However, the situation often differs significantly across economies. Lending growth is still relatively strong in Scandinavia, for example, but the total stock of loans is gradually falling in many of the countries hit by the financial crisis (e.g. Ireland and Spain). The subdued lending reflects not only high debt ratios in most advanced countries, but also pessimistic expectations regarding macroeconomic developments in the years ahead. Countries in which households and corporations are highly indebted are seeing a sharp fall in credit demand and subsequently also in consumer and investment

CHART II.3

Three-month interbank market rates since the start of the financial turbulence

(%)

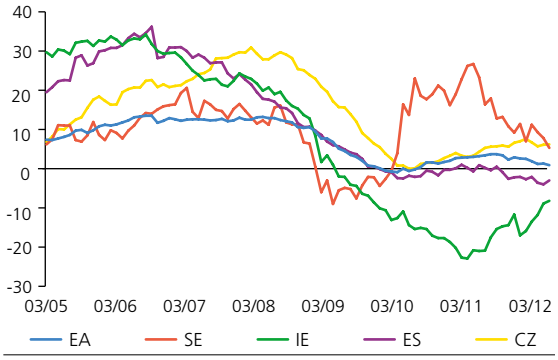


Source: Thomson Datastream

CHART II.4

Year-on-year growth in loans to the private sector

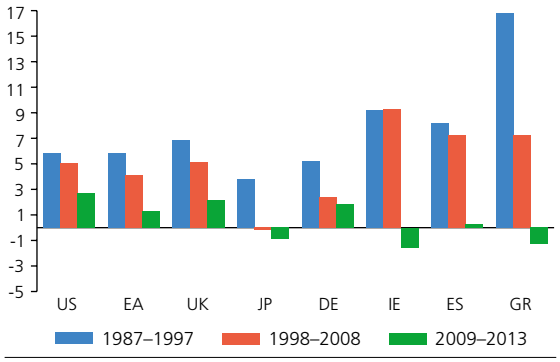
(%)



Source: Thomson Datastream, CNB

CHART II.5

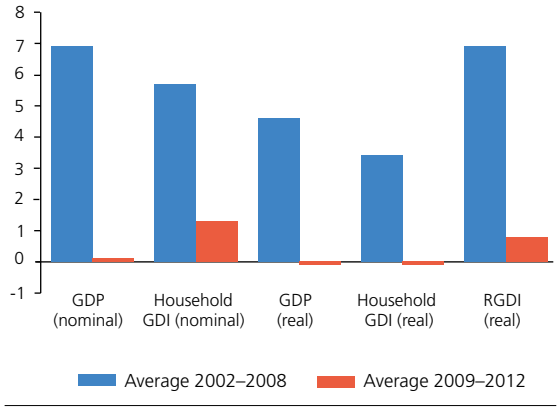
Nominal GDP and nominal GDP forecasts for selected countries
(average year-on-year growth in %)



Source: OECD

CHART II.6

Macroeconomic income aggregates in the Czech Republic
(average year-on-year growth in %)



Source: CZSO and CNB forecast
Note: GDP – gross domestic product, GDI – gross disposable income, RGDI – real gross domestic income (GDP adjusted for change in terms of trade).

demand. Elevated credit risk on the part of financial institutions and concerns of their clients about their debt repayment ability are negatively affecting both the demand and supply sides of the loan market. At the end of 2011, concerns arose in the euro area that the deleveraging process (see Box 1 and section 5.1) would be accompanied by a sharp tightening of credit conditions and worse availability of loans for the private sector, which would adversely affect economic growth. These concerns were exacerbated by a virtual halt of growth in lending to the euro area private sector at the end of 2012 Q1. In the first few months of 2012, deleveraging in the euro area began to be seen as a major risk to financial stability in Europe.

Debtors face a sharp change in the macroeconomic environment

The drastic change in the macroeconomic environment is becoming an increasingly significant factor affecting growth in both the real economy and the financial sector. Economic agents in advanced economies are starting to accept that weak economic growth may – despite supportive macroeconomic policies – be a long-term phenomenon. Expectations regarding future corporate and household income have been revised quite markedly. This in itself represents a strong shock. The pre-crisis growth in nominal income – approximated by nominal GDP growth of 5–10% a year – has been replaced by a period of very low to slightly negative growth (see Chart II.5). Real income growth, however, is also undergoing a fundamental change. The real GDP growth expectations of corporations, households and governments were at historical highs before the crisis. For several years now they have been confronted with much lower real output and income levels. Overall, current nominal and real income in most advanced countries is well below the levels expected in the pre-crisis period, during which economic agents quickly ran up big debts. Given this unexpectedly adverse trend, many agents may have problems paying their debts, and creditors may be exposed to much higher credit risk.

Indebted households are being hit hardest

The "jobless recovery" hypothesis, i.e. the assumption that the financial condition of corporations will soon improve after the crisis while the labour market situation will remain unfavourable for a long time, especially in Europe, was confirmed in 2011.[2] Firms have optimised their operations, cut their personnel expenses and thereby increased their profitability (see section 2.2). Given the sluggish economic growth, however, investment is flat, new jobs are being created to a minimum extent, and employees' wages are rising – in the better case – very slowly. The upshot of this is that credit risk is stabilising in the case of corporate loans while rising in the segment of loans to households (see also sections 2.3 and 4.1).

2 According to the April 2012 IMF economic outlook, the unemployment rate at the end of 2012 will be 2 pp above the 2008 level in advanced countries (up from 5.8% to 7.9%) and a full 3 pp above the 2008 level in the euro area (up from 7.7% to 10.9%).

The difficult income situation is increasing credit risk in the Czech Republic as well

Despite a partial recovery of the real economy and some improvements in the labour market, the Czech economy was exposed to the consequences of adverse income trends (see Chart II.6). Although the registered unemployment rate fell from 9.3% to 8.7% during 2011, households' real disposable income decreased by 1.8%. The CNB's May 2012 macroeconomic forecast assumes that the real disposable income of households will continue declining in 2012 (-0.6%) and return to growth in 2013 (1.5%). On the one hand, the subdued income growth is preventing unit labour costs from rising and is therefore maintaining the price competitiveness of Czech output, but on the other hand it is being reflected in the credit risk of the household sector, which recorded a further increase in non-performing loans in 2011 (see section 2.3). However, the credit risk of corporations and the government may also start rising again in the coming quarters. Czech economic agents which, for example, borrowed money immediately after EU entry on the assumption that potential real GDP would rise by 5% a year on average are facing the consequences of a dramatically different situation. If real GDP grows in future years according to the *Europe in Depression* stress scenario (see the end of section 2.1), the gap between actual and originally estimated potential GDP will reach a full 23% by the end of 2013 (see Chart II.7).

Rising real debt servicing costs still pose a risk

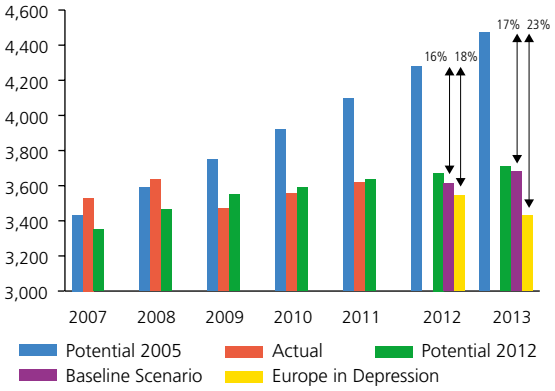
Loan interest rates in advanced countries have remained low in the last two years, thanks to sufficient or even surplus global savings, loose monetary policies and stabilisation measures in banking sectors. The same goes for both the main bank loan categories in the Czech Republic, i.e. loans to households for house purchase and corporate loans (see Chart II.8). If, however, debtors were exposed to a sharp fall in income growth, the increased real debt servicing costs could become too high. Particularly in the housing loan segment, even a small change in the parameters affecting the debt burden could – given a combination of falling property prices and decreasing wages – have a relatively large effect on debtors' ability and motivation to service their debts. This also applies, however, to corporate loans, as the feasibility of investment projects depends on the existence of low interest rates given the declining rate of return caused by slowing economic growth. In the current economic situation, a large proportion of potential investment projects could – in some countries – make sense only with significantly negative real interest rates (see Box 1).

Households and corporations may also be hit by the sovereign debt crisis

Besides the fact that long-term loans are gradually being renewed and refinanced at the new interest rate level, interest rates on new loans are an important factor of debt servicing costs (see Chart II.9). These rates have been falling constantly in the Czech Republic over the last two years. The lower debt servicing costs may moderate the adverse trend in nominal disposable income growth and become a stabilising factor of credit risk in the domestic economy (see section 2.3). By contrast, loss

CHART II.7

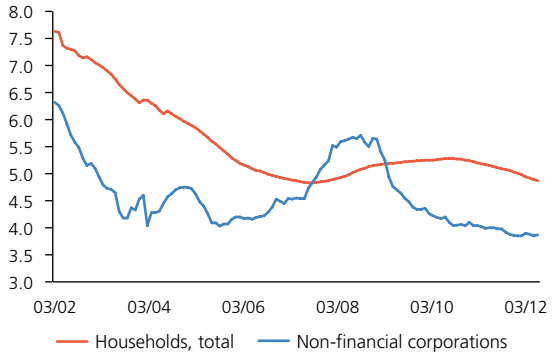
Potential GDP according to 2005 expectations and current predictions and real GDP compared with alternative scenarios
(CZK billions; constant prices)



Source: CNB

CHART II.8

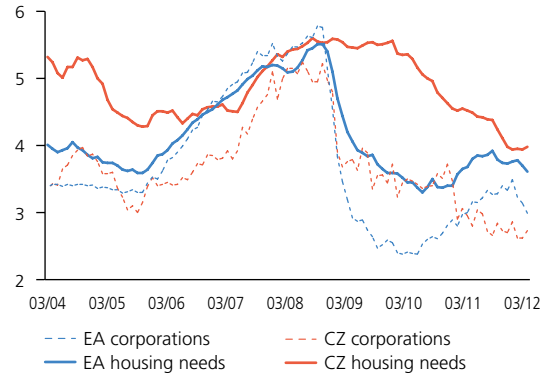
Interest rates on loans
(% p.a. on total stock of loans)



Source: CNB
Note: Interest rates on overdrafts are not included in the case of households.

CHART II.9

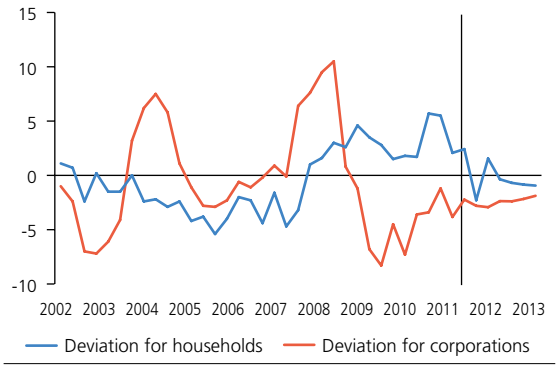
Interest rates on new loans in the Czech Republic and the euro area
(% p.a.)



Source: ECB, CNB
Note: Bank overdrafts and revolving loans are excluded.

Chart II.10

Approximation of the deviation of real debt servicing costs from the long-term average
(% p.a.)



Source: CNB
Note: The vertical line separates past values from CNB predictions.

of confidence in public debt sustainability may become a destabilising factor. The crisis in the euro area led to a rise in interest rates on new loans in 2011 (see Chart II.9), creating an adverse procyclical effect at the least opportune moment. If this trend persists, some economies could ultimately be exposed to the danger of debt deflation and balance-sheet recession (see Box 1).

Owing to the developments in 2011, the interest rate conditions of Czech households converged to those of corporations

The sizeable fall in interest rates on new and refinanced house purchase loans (see section 2.3) caused nominal and real interest rates in this segment to converge towards the corporate loan category. An approximation of real debt servicing costs (i.e. real interest rates[3] on corporate loans[4] and on loans for house purchase) suggests that the costs in both segments converged towards their long-term averages in 2011 and will continue to do so in the next two years (see Chart II.10).

BOX 1:
BALANCE-SHEET RECESSION – A LIKELY SCENARIO FOR THE CZECH REPUBLIC TOO?

One of the pessimistic scenarios for future development that was frequently discussed in the European context in 2011 is an adverse interaction between the macroeconomic environment, credit growth and credit risk. Besides debt deflation, representing growth in the real value of existing debts due to falling nominal income, this type of scenario also includes balance-sheet recession. This term was popularised by Richard Koo, chief economist at the Nomura Research Institute, in publications focused on developments in Japan after the bubble burst in the 1980s.[5] The attribute "balance-sheet" is meant to distinguish recession accompanied by deleveraging efforts among economic agents from an ordinary – cyclical – recession.

3 Real interest rates are approximated for the two main categories of loans of Czech banks (loans to households for house purchase and loans to corporations). Interest rates on loans for house purchase are adjusted for year-on-year growth in households' gross disposable income, which approximates wage inflation. Interest rates on loans to corporations are adjusted for industrial producer price inflation. The average is calculated for 2002–2011 and the outlook for 2012–2013 is created by using *Baseline Scenario* data by keeping interest rates constant at the December 2011 level.

4 Real interest rates calculated as the difference between current rates on loans to corporations (or corporate bond yields) and current producer price inflation are, as in previous years, a very rough approximation of real corporate debt costs and are not fully comparable with real rates for households. In economies that import energy commodities, an increase in the prices of these commodities can favourably overstate the actual growth in producers' selling prices. This increase is reflected most of all in prices of producers at the early stages of the production chain, whereas other producers at subsequent stages may not be able to offset the rise in input prices by increasing their output prices. This effect may be quite sizeable in the Czech Republic, where manufacturing is an important sector.

5 Particularly popular is his book Koo, R. (2009): *The Holy Grail of Macroeconomics: Lessons from Japan's Great Recession*, John Wiley & Sons, 2008. Koo (2011) repeatedly gave a presentation on *The World in Balance Sheet Recession: What Post-2008 U.S., Europe and China Can Learn from Japan 1990–2005*. He also gave a lecture on *How to Avoid a Third Depression* in the US House of Representatives.

A Japanese-style balance-sheet recession happens after a debt-financed bubble bursts and prices of property and assets traded on the capital market collapse. In this situation, many economic agents record a drastic deterioration of the ratio between the market prices of assets and liabilities (asset prices fall while the original debts used to purchase them remain unchanged). The agents react to this balance-sheet disequilibrium by trying to quickly repair their balance sheets by paying down debt instead of by maximising profits. This increases the supply of savings but is not accompanied by any rise in investment demand. If this rational reaction is adopted simultaneously by a large number of economic agents, it will lead to surplus savings and a sharp contraction of aggregate demand. Under such conditions, monetary policy has limited options for compensating for the reduction in aggregate demand, as overindebted agents are not interested in obtaining new loans even if nominal interest rates are very low and instead focus on repaying their old debts. Such a recession can be protracted. Some economists (for example Paul Krugman[6]) therefore recommend that governments of advanced countries should compensate for the surplus supply of private savings in a period of deleveraging by maintaining high public finance deficits.

In his articles and public presentations Koo tries to demonstrate that after the collapse of Lehman Brothers a whole range of symptoms characteristic of Japan in the 1990s can now be seen in other countries, including some European ones. Although the balance-sheet recession hypothesis ignores many aspects of economic growth, a more detailed look at relative demand for savings may be beneficial in the Czech case as well. Here, however, the main incentive to save more would be a worse ratio of the discounted value of future debt payments to the discounted value of future income rather than a bursting of the bubble.[7] If they expect this ratio to worsen, economic agents will be motivated to reduce their liabilities even though the present evolution of their net financial assets does not indicate unsustainable balance-sheet imbalances and the debt of households and non-financial corporations is not too high by international comparison (see the Annex: Selected Indicators).

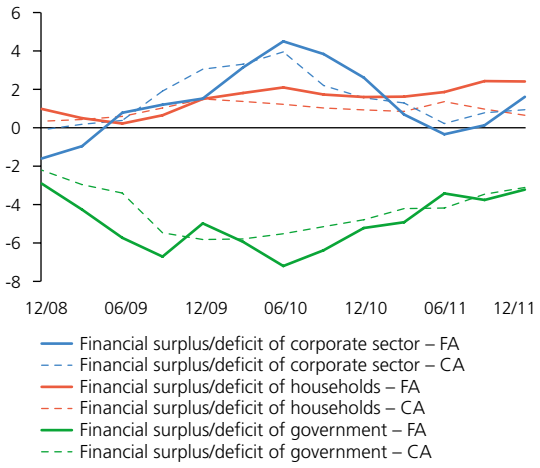
Data on quarterly financial surpluses/deficits are used to identify the signs of balance-sheet recession (as in Koo, 2011). These show the amount of surplus funds that each sector is able to lend in the given period or, conversely, the amount it has to

6 See, for example, Eggertsson, G., Krugman, P. (2012): *Debt, Deleveraging, and the Liquidity Trap: A Fisher-Minsky-Koo Approach,* New York Fed.

7 The share of financial assets traded on the capital market in total assets is relatively low in the Czech private sector, and the fall in property prices was not dramatic by international comparison. A worse outlook for the ratio of the discounted value of future income to the discounted value of future debt payments therefore represents a potential source of a more moderate type of balance-sheet recession.

CHART II.1 BOX

Financial surpluses/deficits by sector
(annual moving totals as a ratio to GDP, %)



Source: CNB, CZSO
Note: FA and CA refer to the balancing item on the financial account and capital account respectively.

borrow to fully cover its consumption and acquire non-financial assets. In national accounting terms this variable can be identified with the financial account balancing item, net lending/net borrowing, or with the capital account balancing item of the same name.[8] The above data suggest that from the start of the financial crisis until mid-2010 the corporate sector (non-financial corporations and financial institutions) recorded quite strong increases in financial surpluses, which, to some extent, truly reflected a reduction in debt or at least a reduction in the growth rate of liabilities (see Chart II.1 Box). However, the period of deleveraging was then replaced by a similarly fast decline in the financial surpluses of corporations. This is consistent not with sustained conditions characterising balance-sheet recession, but rather with a traditional cyclical recession, with the onset of economic recovery being accompanied by a gradual reversal in the saving rate and investment rate. The financial surplus of the household sector is relatively stable over time, while the general government deficit practically mirrored the net lending/borrowing of the corporate sector. This implies that the corporate and household sector surpluses were sufficiently used by the general government via deficit[9] financing, hence there were no falls in aggregate demand beyond the framework of a cyclical recession.

The above results therefore do not show that the balance-sheet recession scenario materialised in the Czech Republic. An excess supply of funds is not observed in the long run, and any financial surpluses are spent by the general government. This also means that from the point of view of the domestic supply of savings there is no room in the economy for increased public finance deficits if a crowding-out effect is not to occur via rising interest rates or if external government debt is not to increase. Given the uncertain economic outlook, however, the future emergence of financial surpluses – which could reduce aggregate demand – cannot be ruled out. For this reason it is necessary to continue to monitor balance-sheet balances.

8 The two balancing items should be equal in theory, as they track the same thing from different perspectives. Whereas the capital account balancing item can be viewed in a very simplified way as the difference between saving and investment rates, the financial account balancing item shows how this difference will manifest itself in a rise or decline in financial instruments. The differences between the balancing items are due solely to statistical discrepancies.

9 The government deficit is defined here as net borrowing of the general government, so it is not equal to the officially reported EDP deficit, which excludes some financial instruments transactions.

The rise in commodity prices coupled with the VAT rate increase is a negative supply shock

Economic growth and financial stability can also be adversely affected by other external factors. The renewed economic growth in 2011 gave rise to a further increase in commodity prices. The average year-on-year change of the GSCI Total Return index was 16.5%, compared to just 9.6% in 2010. This rise was due, among other things, to strong growth in economic activity in Asian emerging economies, where economic development is still unfolding largely in commodity-intensive industries (see section 3.1 for more details). The current increases in the VAT rate on some consumer basket items represent a similar negative supply shock for the Czech economy and for other European countries. Growth in electricity prices resulting from the large-scale support of photovoltaic projects is a supply shock specific to the Czech economy. The CNB's May 2012 forecast is based on the assumption that negative supply shocks will be present also in 2012.

The risk of fundamentally unjustified appreciation of the koruna has decreased

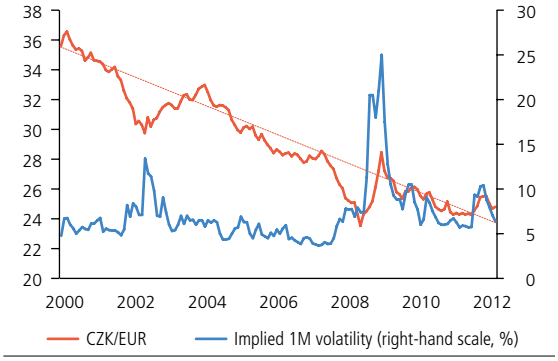
In connection with investors' search for yield, potential strong pressures for fundamentally unjustified appreciation of the koruna were identified as one of the risks in previous Financial Stability Reports. In 2011 and the first few months of 2012, the koruna's exchange rate was relatively stable at somewhat weaker levels (see Chart II.11). According to prevailing market expectations, the koruna will remain stable in the period ahead, with a very modest appreciation tendency. A survey of forecasts of world analysts and forecasters published in Foreign Exchange Consensus Forecasts in April 2012 revealed that the koruna-euro exchange rate is expected to be 24.62 at the end of April 2013 and 24.34 at the end of April 2014 (and the koruna-dollar exchange rate 19.11 and 19.02 respectively). Given these expectations, the above risk can be assessed as low at present. This is chiefly due to improved awareness among analysts and investors of the characteristics of the Czech economy and a better ability to assess the risks of individual economies in the region on the basis of fundamentals.

Czech economy's external balance indicators are sending out signals of deterioration

By international comparison, the Czech economy still has quite a strong external position, but its gradually weakening tendency should not be ignored. The characteristics of the investment position and balance of payments mostly deteriorated in 2011. The long-term trend of a worsening investment position continues. The investment position excluding foreign direct investment is still positive, but remains on a downward trend (see Chart II.12). The external debt-to-GDP ratio also increased noticeably (see Chart II.13). At the end of 2011, it was close to 50% of GDP and was only 53% covered by banking sector assets, compared to more than 57% coverage at the end of 2010. A similar deterioration was recorded for the ratio of the net external assets of the financial sector to external debt. The increase in external debt and the deterioration in the investment position are largely due to a rise in Czech government debt to non-residents. It increased from CZK 289 billion

CHART II.11

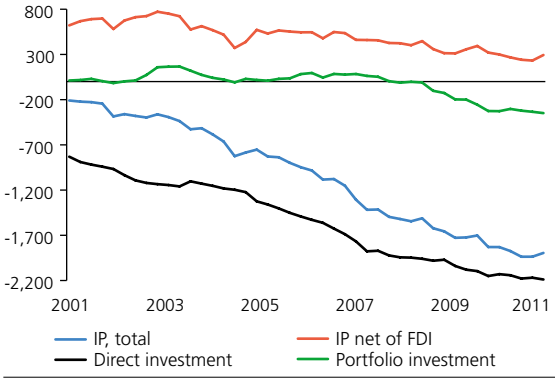
The koruna exchange rate and its volatility



Source: CNB calculation based on CNB data
Note: The dotted line shows the long-term trend.

CHART II.12

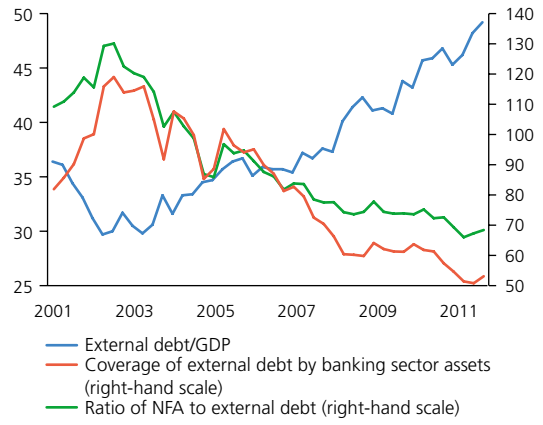
The investment position of the Czech Republic
(CZK billions)



Source: CNB

CHART II.13

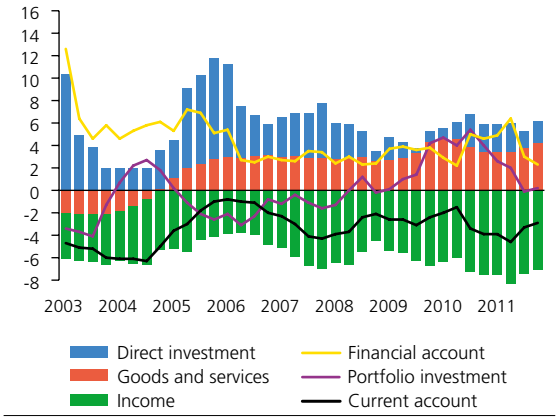
Ratio of the gross external debt of the Czech Republic to GDP and its coverage by the external assets of financial institutions
(%)



Source: CNB
Note: External assets of the banking sector (including the CNB) from the balance of payments statistics and net external assets of MFIs from the monetary survey.

Chart II.14

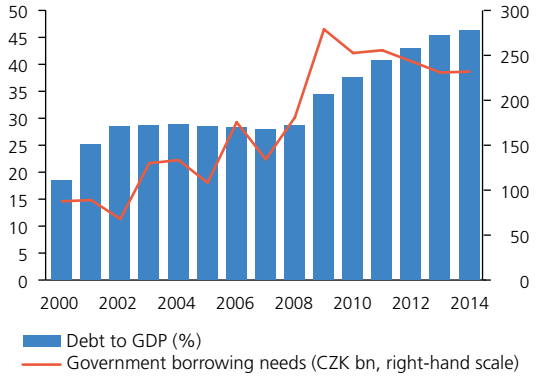
The balance of payments
(% of GDP)



Source: CZSO, CNB
Note: Annual moving totals of balance of payments components and nominal GDP.

Chart II.15

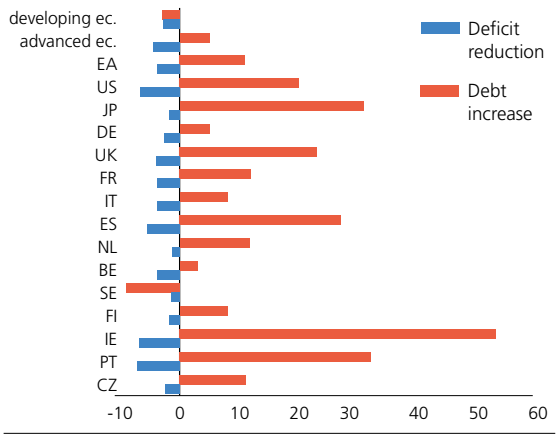
Government debt-to-GDP ratio and gross government borrowing needs



Source: CZSO, CNB, MF CR
Note: CNB estimates used for the debt-to-GDP ratio for 2012–2014 and MF CR estimates used for central government borrowing needs.

Chart II.16

Change in fiscal deficits and public debt in selected countries
(2009–2013; % of GDP)



Source: IMF (Fiscal Monitor, April 2012)

(almost 8% of GDP) at the end of 2008 to CZK 474 billion (almost 12.5% of GDP) at the end of 2011. In 2012, this debt component will increase by further tens of billions of koruna.[10] The balance of payments sub-indicators also worsened (see Chart II.14). The current account recorded a year-on-year deterioration and the goods and services surplus was not sufficient to cover the income deficit. The financial account surplus was broadly the same as last year, but the balance of foreign direct investment (FDI), which is part of the financial account balance, was flat year on year at much lower levels than before the crisis. This was predominantly due to a change in the Equity capital and reinvested earnings item on the asset side of the FDI account, which dropped by CZK 40.6 billion year on year.

The risks related to Czech public finance are rising only slowly

Thanks to still positive, albeit very subdued, GDP growth and measures taken on both the expenditure and revenue sides of public budgets, the Czech public finance deficit recorded a year-on-year decline from 4.8% to 3.1% of GDP in 2011. According to the CNB's May forecast, the continuing fiscal consolidation should deliver a further deficit reduction to 3% of GDP in 2012. Under these assumptions, the public sector debt-to-GDP ratio should reach 45.2%. This means an increase of almost 17 pp compared to the start of the financial crisis (see Chart II.15). The gross government borrowing need was CZK 256 billion in 2011, but is expected to decline slightly in 2012 and 2013 according to Finance Ministry data. Like the Czech Republic, other advanced countries are gradually reducing or will reduce their budget deficits compared to the crisis period (see Chart II.16). Despite this, the public debt ratios of most of these countries will continue to go up in the next two years (see Chart II.16). In some highly indebted countries this may generate an unfavourable financial market reaction and continued manifestations of debt crisis (see section 3.1 and the thematic article *Impacts of the sovereign default crisis on the Czech financial sector*).

If one compares public budget flows and stocks with the advanced European economies, the position of the Czech economy looks relatively good. The share of short-term government debt, which is generally regarded as being more difficult to refinance than long-term debt, is low as well. The tolerance of investors in government bonds is, however, generally higher for large and advanced economies than it is for smaller and less advanced ones, among which foreign investors usually rank the Czech Republic. Investors may thus assess the public debt as unfinanceable even at a level of, say, 50% of GDP.[11] The still relatively high cyclically adjusted primary public budget balance and

10 In February 2012, the Ministry of Finance issued a sixth publicly syndicated euro-denominated issue of EUR 2 billion (roughly CZK 50 billion). This accounts for 68.6% of the maximum foreign issuing activity within the financial programme for 2012.

11 The debt limit of 60% of GDP contained in the Maastricht criteria cannot be regarded as a reliable measure of public finance sustainability. The economists Rogoff and Reinhart have documented in detail that sovereign bankruptcies usually occur below the level of 60% of GDP. Numerous countries have run into difficulties at the 40% level. For details see Rogoff, K., Reinhart, C. (2009): *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press.

the large and rising share of mandatory expenditures, which prevent flexible management of public finances over the business cycle, indicate the presence of structural problems in domestic public finance.

Financing the Czech public finance deficit abroad is no solution

A gradual stabilisation of public budgets is vital also because the Czech economy – unlike some other advanced countries – does not have a structural savings surplus at present (see the last paragraph of Box 1). If the Czech government were to obtain funds for fiscal expansion from abroad, the Czech economy's international position would worsen further (see Chart II.13). This would later be reflected in an increase in the sovereign risk premium and a rise in lending rates, as is currently happening in the euro area (see Chart II.9). Fiscal expansion would thus ultimately be counterproductive. Being aware of such risks, the Czech Ministry of Finance has long preferred the conservative option of public debt financing on the domestic market and in the domestic currency. The share of Czech government debt held by foreign entities is currently less than 30%, whereas in the original euro area countries the figure ranges between 40% and 70%. Foreign currency debt accounted for around 11% of the total debt in 2012 Q1, and a strategic limit of 15.0% has been declared for 2012. Nonetheless, this ratio has been creeping up from the level of 4.6% recorded at the end of 2008. A continuation of this trend could pose significant risks in the longer term.

Alternative economic scenarios

Potential alternative future macroeconomic paths together with the risks identified became the basis for alternative economic scenarios. These scenarios are used mainly in section 5.2 to test the resilience of the Czech financial sector. The paths of key variables in each scenario are shown in Charts II.17A–D.[12] The evolution of other variables relevant to the stress tests in relation to the evolution of the macroeconomic environment (credit growth, the default rate, the NPL ratio[13] and property prices) is presented in the following sections of this Report.

The *Baseline Scenario* is based on the CNB's official May macroeconomic forecast published in Inflation Report II/2012.[14] It predicts that the Czech economy will switch to stagnation this year. In 2013 it will recover, showing growth of almost 2%. The general unemployment rate will rise slightly during 2012, reaching 7%, and then fall slightly in 2013 in line with the gradual economic recovery. The forecast also expects headline inflation to be well above the inflation target this year owing to changes to indirect taxes. Monetary policy-relevant inflation is expected to be

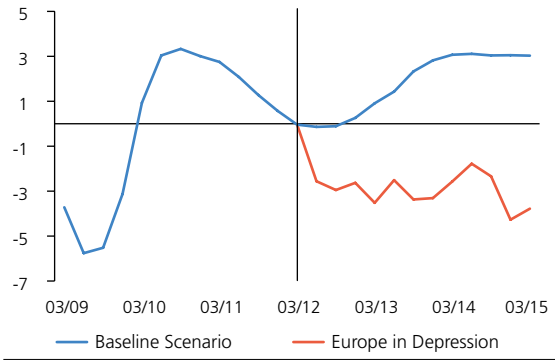
12 The paths for the *Baseline Scenario* in the first two years are based on the CNB's official prediction; beyond this horizon they are extended towards the assumed long-term equilibrium values.

13 Both the default rate and the NPL ratio relate to an identical event, i.e. a breakdown in a debtor's payment discipline. Whereas the default rate is a (usually forward-looking) flow indicator focused on a particular time interval (see the Glossary), the NPL ratio is a stock indicator describing the level of NPLs at a given point in time.

14 The paths of the variables in the *Baseline Scenario* in the first two years are based on the CNB's official prediction. Beyond this horizon they are extended towards the assumed long-term equilibrium values.

CHART II.17A

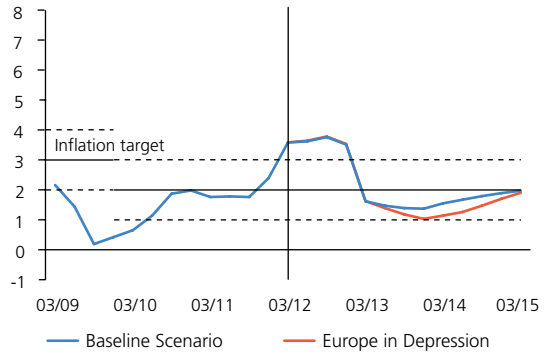
Alternative scenarios: real GDP growth
(%)



Source: CNB

CHART II.17B

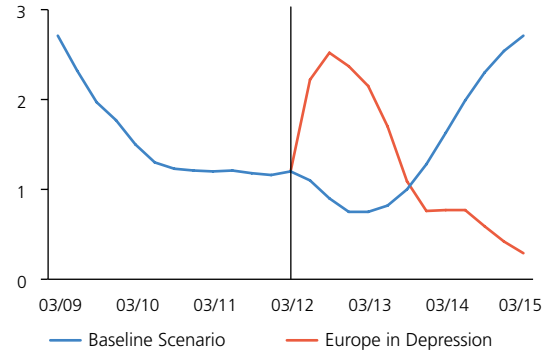
Alternative scenarios: inflation
(%)



Source: CNB

CHART II.17C

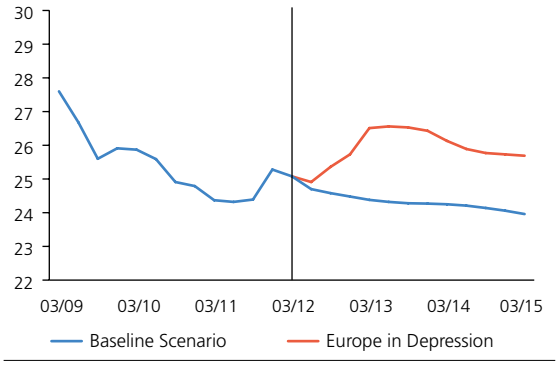
Alternative scenarios: 3M PRIBOR
(%)



Source: CNB

CHART II.17D

Alternative scenarios: exchange rate
(CZK/EUR)



Source: CNB

in the upper half of the tolerance band around the target. In 2013, after the strong effects of the indirect tax changes made at the start of 2012 subside, both headline and monetary policy-relevant inflation will be slightly below the target. The current inflationary pressures from import prices will subside gradually over the forecast horizon. By contrast, gradual wage growth amid the currently subdued demand will lead to a gradual resurgence of domestic inflationary pressures. However, these pressures will remain contained over the entire forecast horizon. Consistent with this CNB forecast is a decline in interest rates in the remainder of this year, followed by a modest rise in rates as from 2013 H2.

The *Europe in Depression* stress scenario assumes a long-lasting adverse trend in economic activity in Europe as a result of persisting uncertainty regarding a credible resolution of the debt crisis in the euro area, intensive deleveraging, and new regulations curbing the credit supply of the banking sector. In this scenario, the environment of high uncertainty is exacerbated by a surge in oil and energy commodity prices and, last but not least, by a rise in consumer prices as a result of escalating geopolitical uncertainty and continuing growth in demand from Asian economies, to which supply does not react quickly enough. On the other hand, slowing growth in China and the other BRIC countries reduces investment demand for imports from Europe, further weakening its economic activity. The combination of these factors will generate a strong and persistent recession that will also affect the Czech economy.

The adverse international situation will manifest itself in the Czech Republic as a sustained decline in GDP over the entire three-year time scale of the scenario. Households are hit hardest by the adverse developments. Their wages are flat and their real income decreases because of the rising prices generated by the external developments, depreciation of the exchange rate and a further increase in indirect taxes. Rising unemployment and the difficult income situation of households lead to substantial loan repayment problems. The deterioration in household and corporate solvency will cause the banking sector to suffer considerable losses.

2.2 NON-FINANCIAL CORPORATIONS

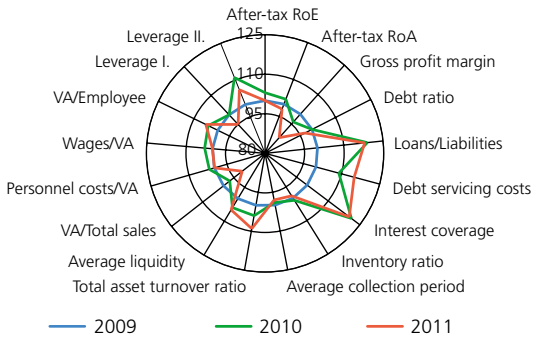
The non-financial corporations sector recorded comparable financial results in 2011 as in 2010, despite signs of a slowdown in H2. A gradual increase in risks reflecting the uncertainty regarding future demand is complicating further investment decision-making and leading to the postponement of investment projects. The sector's relatively satisfactory results primarily reflected the good performance of export-oriented manufacturers, as corporations dependent on domestic demand faced considerably worse economic conditions. Branches funded from public budgets remain exposed to the risk of subsidy cuts or deferred implementation of investment as a result of continued fiscal consolidation. Branches which face price-elastic demand and whose performance is determined by the income situation of households can also be expected to stagnate. Given the persisting dependence on exports, a deterioration of the economic situation in EU countries remains the main risk factor going forward. If the debt crisis was to escalate, the credit market situation was to worsen and economic activity was to fall, financial indicators would deteriorate significantly and credit risk would increase sharply. The large share of trade credits in the sector's balance sheet and sizeable intra-sectoral exposures would then foster a further deterioration of the situation, resulting in an increase in secondary insolvency.

Corporations' financial results in 2011 suggest stagnation ahead…
The post-crisis economic recovery started to falter during 2011 and the favourable results of non-financial corporations observed in the first half of the year gradually deteriorated. Nevertheless, the monitored indicators recorded similar levels for 2011 as a whole as they did in the previous year (see Chart II.18). Weak domestic demand and slowing export growth dragged down profit margins, resulting in a slight decline in profitability and a fall in the share of value added in total sales. Uncertainty regarding future developments and low investment returns are currently the key risk factors affecting corporations' investment decisions.[15] In this situation, corporations are expecting investment cutbacks accompanied by a slight reduction in the number of jobs in 2012. In addition, wage growth will probably remain flat. Corporations held wage growth at low levels already in 2011. This was reflected in a decline in the share of wages and total personnel costs in value added. Labour productivity edged up in parallel.

Despite some recovery in bank lending, the debt ratio of corporations was broadly unchanged year on year and remains relatively low by international comparison. It was affected by a decline in intra-group loans from foreign corporations and a decrease in domestic inter-company loans.[16] The debt ratio may to some extent reflect efforts

CHART II.18

Key financial indicators for non-financial corporations
(2009 = 100; increase in index means improvement)



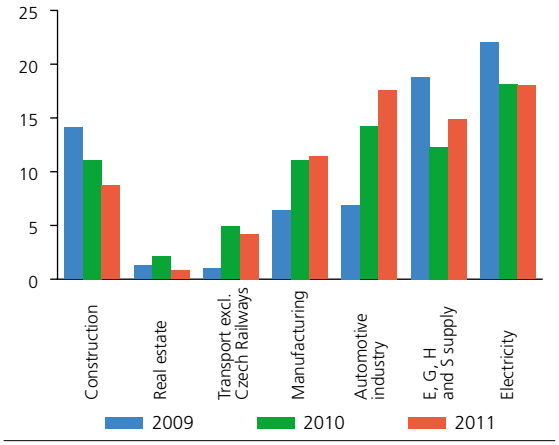
Source: CZSO, CNB

15 These results are in line with the quarterly survey of non-financial corporations conducted by the Czech National Bank together with the Confederation of Industry. The survey results show that the weak domestic demand is being felt most strongly by construction firms, while the uncertain export outlook is primarily affecting manufacturing. The pilot round of the Bank Lending Survey produced similar results.

16 However, inter-company loans do not include trade credits arising from current trade (deferred maturity after delivery of goods, payments on account), which by contrast recorded an increase in the period under review.

Chart II.19

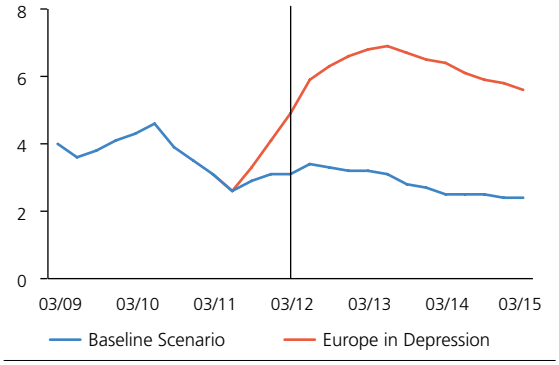
After-tax RoE in selected branches of activity
(%)



Source: CZSO, CNB
Note: E, G, H and S are electricity, gas, heat and sewerage.

Chart II.20

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



Source: CNB

by non-financial corporations not to take on more debt (see Box 1). However, the main determining factors are weak demand, uncertainty regarding future developments and thus also very low demand for investment. A positive difference between the gross saving rate and gross investment fostered some reduction in liquidity risk and an improvement in the liquidity position of corporations. Declining interest rates were reflected in lower debt servicing costs.

…but there are large differences in profitability across industries

The sustained modest growth in value added was due mainly to export-oriented manufacturing. Within this branch of activity, manufacturers of cars, spare parts and accessories recorded surprisingly good results thanks to successful expansion on European and non-European markets. The automotive industry's contribution to total value added in the sector and to Czech exports rose further, increasing the economy's sensitivity to cyclical developments in this industry in the longer term.

Unlike manufacturing, construction recorded a further contraction; its performance is being undermined by a downturn in demand for large civil engineering structures and for home ownership (see section 3.2). The situation in construction is also associated with one of the largest declines in jobs in the non-financial corporations sector. In addition to construction, low domestic demand is affecting the service sector, which also recorded a year-on-year fall in sales. This fall was most visible in architectural and engineering services, i.e. services dependent on the construction industry.

The varying economic condition of individual industries was reflected in different levels of profitability (see Chart II.19). Profitability in the automotive industry rose significantly year on year, contributing to the solid result of manufacturing as a whole. The electricity, gas and water supply industry has long maintained high profitability due to its low-competition environment, the single European energy market and price inelastic demand. The transport industry has so far maintained a satisfactory level of profitability, aided by subsidy programmes in addition to rising sales. However, rising fuel prices and higher tolls, accompanied by an expansion of the toll road network, represent a source of potential problems in this industry. Given its high reliance on subsidies, the risks may intensify as a result of fiscal austerity measures. Although developments in the construction industry heralded a further decline in the sector's profitability, it remained relatively high and the sector as a whole generated a profit. The real estate sector again seems to be in the worst condition in terms of profitability, having recorded the lowest return on equity in three years. Property rental and management revenues declined. Estate agents and developers also recorded year-on-year falls in sales related to a decline in apartment prices and a further deterioration in sales of residential development projects (see section 3.2).

Credit risk is currently falling, but may see a reversal in the near future

After peaking in early 2010, the 12-month default rate gradually declined and fluctuated around 3% during 2011 (see Chart II.20). Nevertheless, the latest (estimated) values of this indicator are showing the first signs of an interruption of the favourable trend, signalling possible stagnation or a slight increase of credit risk during 2012 in line with the expected economic slowdown. A partial improvement in the level of credit risk is evidenced by a declining NPL ratio (see Chart II.21); in contrast to the default rate, however, any negative signs will emerge with a lag due to the inertia of this indicator. A significant rise in the two monitored indicators would be triggered by fulfilment of the conditions of the *Europe in Depression* scenario. If this scenario were to materialise, credit risk would surge in 2012 and start to edge down only in 2013 H2 with the onset of the economic recovery.

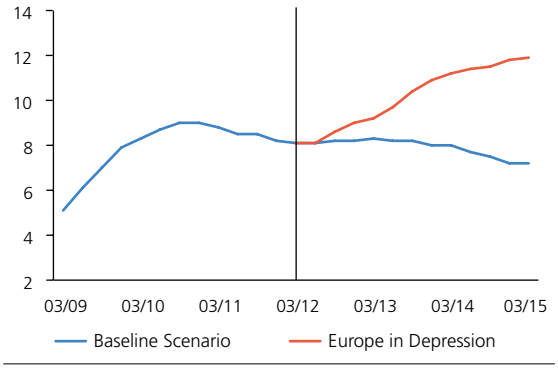
Despite the generally favourable evolution of credit risk in 2011, the hardest hit industries recorded growth in such risk (see Chart II.22). This goes especially for construction, but a further deterioration was also observed in the real estate segment. Compared to other industries, there was also a noticeable increase in credit risk in mining and quarrying firms, but the overall result may have been affected by the relatively low number of units in this sector.

The level of credit risk vis-à-vis banks does not give full information on the riskiness of all the debt exposures of corporations. Other accounts payable, whose share in liabilities recorded a year-on-year rise, remain a key form of financing for the sector in the long term. The rise in other accounts payable was due largely to their key component – trade credits and advances received.[17] With economic growth virtually flat, this can be explained by banks' declining willingness to provide operating loans, which subsequently spills over to worsening payment discipline vis-à-vis suppliers and to late payments (see Table II.1). On the other hand, it may also reflect signs of secondary insolvency risk, corresponding to a steadily rising number of insolvency petitions and bankruptcy declarations. Despite the stable level of credit risk vis-à-vis banks, these variables are at record levels and represent an additional source of information about the riskiness of the sector's debt exposures. Notwithstanding the above trend, secondary insolvency risk was not mentioned by corporations as a serious risk in the survey and obtained below-average marks in the assessment of current risk factors. Lengthening payment periods and signs of secondary insolvency cannot yet be traced in liquidity risk either. Nevertheless, the importance of this factor is steadily increasing over time in exposed industries (see Table II.1) and, should the trend continue, may pose serious risks for the entire sector in the future.

17 The issue of inter-sector financial exposures and the simulation of shocks in the form of default on trade credits is described in more detail in the thematic article *Contingent claims analysis and the inter-sector transmission of credit risk* in this Report. Although direct credit risk is relatively low, contagion arising from inter-sector exposures (e.g. in the form of secondary insolvency risk) might significantly increase this risk.

CHART II.21

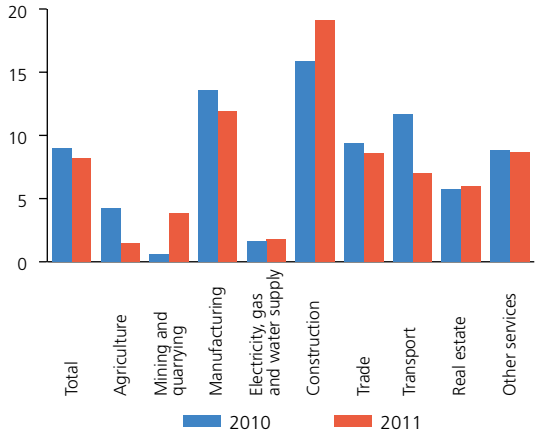
NPL ratio for bank loans in the non-financial corporations sector
(%)



Source: CNB

CHART II.22

NPL ratios in selected branches of activity
(%)



Source: CNB

TABLE II.1

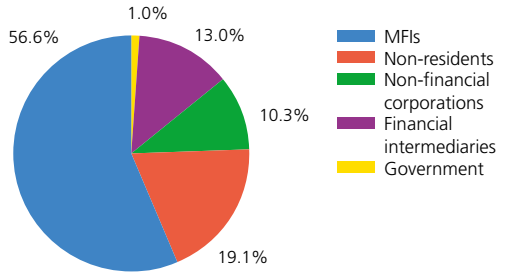
Payment discipline and insolvency from the perspective of suppliers

	03/11	06/11	09/11	12/11	03/12
Trade payables paid within 10 days after due date (%)					
All branches	52%	50%	49%	49%	46%
Limiting factors of firm – secondary insolvency (1–5)					
All branches	2	2	2	2.1	2.2
Construction	2	2.7	2.3	2.6	2.7
Manufacturing	2.1	2	2	2.1	2.3
E, G, H and S supply	1.3	1.8	1.6	2.1	2.1
Mining and quarrying	1.6	1.9	1.9	1.5	1.5
Transport and storage	2.3	1.9	2.2	2.2	1.9

Source: CNB
Note: E, G, H and S are electricity, gas, heat and sewerage. In the assessment of the importance of limiting factors, 1 is the minimum score and 5 is the maximum score.

CHART II.23

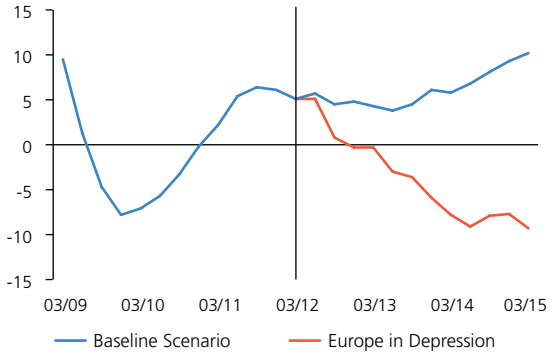
Loans granted to non-financial corporations by creditor
(%, stock as of 31 December 2011)



Source: CNB

CHART II.24

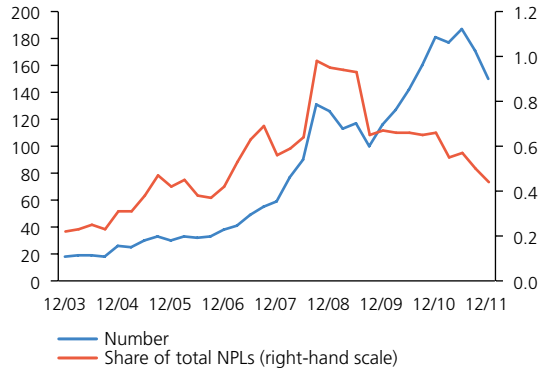
Year-on-year growth in bank loans to non-financial corporations
(%)



Source: CNB

CHART II.25

NPLs with extended maturity
(number; right-hand scale in %)



Source: CNB
Note: Number calculated as 20% truncated moving 12M average.

The structure and amount of the debt seem acceptable

The creditor and maturity structure of corporate debt still seems sustainable and is currently not generating visible causes for the formation of systemic risks. Most loans are obtained from the domestic banking sector, whose role strengthened in 2011 at the expense of the other creditor sectors (see Chart II.23). Although the share of foreign currency bank loans edged up, the risks associated with the exchange rate and its impact on the value of the debt remain low, since these loans continue to be drawn mainly by exporters. By contrast, foreign currency loans provided by foreign parent companies and affiliates recorded a decline as a result of faster repayment. This was partly motivated by the liquidity difficulties of foreign companies within groups, which, if the liquidity problems intensify, may convert this type of credit exposure into a risk channel leading to the siphoning-off of a large proportion of funds from domestic corporations. The maturity structure of corporate debt was favourable, with the debt again being restructured slightly towards more stable long-term financing.

Loan availability is good, interest rates are at historical lows

Renewed growth in new loans to non-financial corporations can be observed in year-on-year comparison, but the credit recovery is not likely to gain much momentum despite the continuing decline in interest rates (see Chart II.24). Lending to corporations is currently being affected mainly by demand for loans, reflecting the low rate of investment and flat financial performance. This is in line with the results of a survey of non-financial corporations signalling good availability of bank loans and an absence of credit-supply constraints. By contrast, corporations expect some change in banks' behaviour in the next 12 months owing to expected economic developments, which will lead to a tightening of credit standards. This was already visible in 2011, when there was a decline in the number of non-performing loans for which the debt was restructured and the original maturity extended (see Chart II.25). The change in credit conditions is not likely to take the form of significantly higher interest rates and the cost of debt financing will therefore remain low.

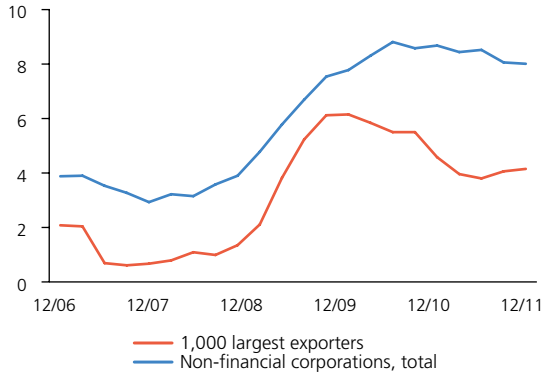
The sector remains dependent on the situation in the euro area

The export segment achieved above-average financial results compared to other non-financial corporations and kept the overall performance of the Czech economy in positive territory. The return on equity of the 1,000 largest exporters was around 3 pp above the sector average, and their credit risk indicator was significantly better as well (see Chart II.26). On the other hand, this may further increase the Czech economy's dependence on the economic situation in trading partner countries. This situation may become a source of acute risks, since future developments in the euro area, where more than 80% of total exports go, are subject to great uncertainty. The risk of excessive orientation on the markets of EU countries was reduced only marginally in year on year terms. Exporters achieved some success on Russian and Chinese markets, for which a significant increase in export growth was recorded. However, the overall value of exports outside the European

market remains low. The level of exchange rate risk can be assessed as fairly stable in terms of the hedging behaviour of exporters. The share of exports hedged by derivatives is broadly constant over time and the indicator of natural hedging (the share of foreign currency loans) is also steady.

CHART II.26

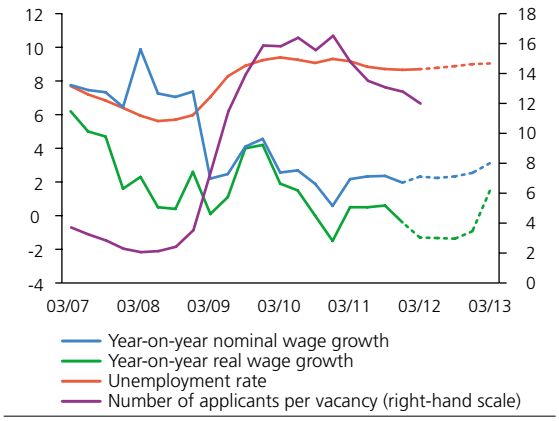
Non-performing bank loans ratio for the 1,000 largest exporters
(%)



Source: CNB

CHART II.27

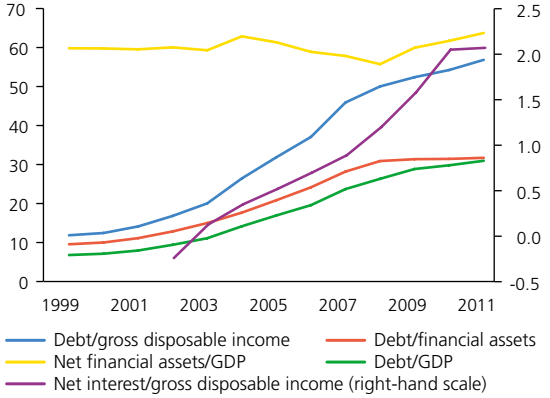
Nominal and real wage growth, the unemployment rate and the number of job applicants per vacancy
(% on left-hand scale; number of persons on right-hand scale)



Source: CNB
Note: The unemployment rate and the number of applicants per vacancy are seasonally adjusted. Dashed lines indicate CNB predictions. The number of applicants per vacancy in 2012 is only approximate.

CHART II.28

Household debt ratios
(%)



Source: CNB, CZSO
Note: The net interest payments data do not cover non-bank financial intermediaries.

2.3 HOUSEHOLDS

The economic recovery and decline in unemployment did not improve the income situation of households much in 2011, since real wages rose very slowly. The credit risk of households broadly stabilised for both consumer credit and loans for house purchase. This was aided by exceptionally low interest rates. The household debt ratio increased further, albeit only moderately. Owing to expected weaker economic growth, a rise in the overindebtedness of low-income households can be expected in 2012. If the economy were to develop in line with the Europe in Depression *scenario, the rise in overindebtedness might be significant. However, given the low absolute indebtedness of low-income households, the impact on the balance sheets of financial institutions should be limited even in this scenario.*

The income situation of households deteriorated despite a fall in the unemployment rate

Despite a fall in the registered unemployment rate in 2011, the income aggregates of households developed unfavourably. Although wages rose by 2.2% in nominal terms, the real growth of 0.3% was among the lowest in recent history (see Chart II.27) and was accompanied by a decline in real money income of 2.2%.[18] Growth in both the nominal and real income of households is likely to remain very subdued in 2012 given the expected growth in the unemployment rate (see Chart II.27). The difficult situation on the labour market is also evidenced by the number of job applicants per vacancy, which recorded a decrease but is still more than four times higher than before the crisis.

Household indebtedness continues to rise slowly

Household indebtedness, as measured by the value of loans from financial institutions, rose by 4.9% year on year (see Chart II.28). This is very sluggish growth compared to the pre-crisis period. Households with loans account for 38% of the total number of households. This is quite a low level in the European context. Higher-income households have a loan more frequently (see Chart II.29). The ratio of household debt to financial assets was virtually unchanged. The ratio of debt to gross disposable income increased from 54.2% to 56.8% (see Chart II.28). This is also slow growth relative to the long-term trend. The debt-to-GDP ratio increased by less than the debt-to-gross disposable income ratio. This is because the gross disposable income of households was flat in 2011 (up by 0.03% year on year), while nominal GDP increased (by 0.9%). As household consumption also rose in nominal terms in 2011 (by 1.4%) despite the unfavourable trend in disposable income, households recorded a lower saving rate than in 2010 (9.1%).

The adverse income trend is becoming a major risk

The ability of households to meet their obligations might be worsened by an adverse trend in their income rather than by a high debt level. This will be linked not only with weak economic growth, but also

18 Source: CZSO 2011 Household Budget Statistics.

with a falling ratio of gross disposable income of households to GDP. A possible future increase in interest rates is also a risk if it is not accompanied by a recovery in wage and disposable income growth. The low interest rates (especially on loans for house purchase) resulted in an only negligible rise in the ratio of net interest paid to gross disposable income[19] (see Chart II.28), fostering a stabilisation of credit risk. The structure of households' financial assets was little changed from 2010. Currency and deposits remained the dominant item, accounting for 56.8% of total financial assets. It is worth mentioning that households used part of their assets to purchase government saving bonds and also converted part of their time deposits into current deposits for precautionary reasons.

Loans from non-banks stopped declining, but are getting more risky

Having declined by almost one-half over the previous three years, loans to households from non-banks fell only slightly in 2011 (see Chart II.30). The stagnation of loans from non-banks can be assessed as a positive trend in terms of financial stability, as these institutions generally focus on less creditworthy clients with a higher probability of default and subsequent seizure of property.

Credit growth was driven by mortgages and their refinancing…

Growth in loans to households was driven by continued interest in house purchase loans. Thanks to favourable lending conditions, demand was concentrated mainly in mortgages.[20] In addition to new mortgages, low interest rates fostered a further increase in the number of refinanced loans in 2011. The share of refinancing in new mortgages was around 20%[21] (see Chart II.31) and that in contracts with terminating fixations was around 30%.[22] A further pick-up in the refinancing volume can be expected in 2012 thanks to a record-high number of mortgages with terminating fixations. Their estimated value (CZK 145 billion) will be about 40% higher than that of loans with terminating fixations in the previous year. As regards refinanced loans, banks have more information about clients relative to new applicants and are thus able to assess credit risk more precisely. Moreover, in the current low interest rate environment, refinancing – and rate refixation in general – is happening under more favourable terms, giving successful applicants greater scope for creating repayment reserves than in previous years. This can be assessed as a stabilising factor fostering lower interest expenses and subsequently also lower credit risk. If the current favourable lending

19 The ratio of net interest paid to gross disposable income showed a significant change in trend in 2011. In previous years it had gone up on the back of growing indebtedness and partly also rising interest rates, whereas in 2011 it was little changed despite a slight rise in indebtedness, thanks to favourable interest rates.

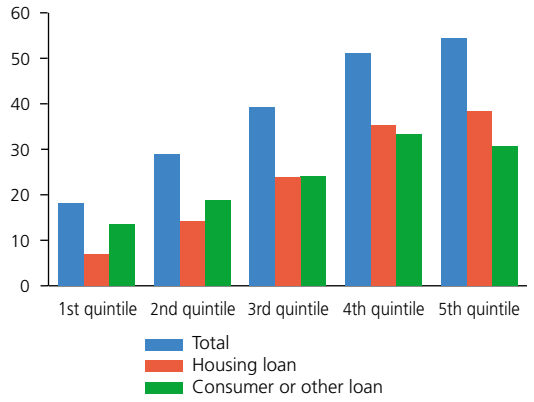
20 Around 21% of households have a mortgage, although low-income groups have almost no mortgages.

21 The CNB's internal estimate is at the lower bound of the range determined in the pilot round of the Bank Lending Survey, based on which the share of refinanced loans can be estimated between 20% and 50%. The presented estimate is therefore quite conservative and the true share may be higher.

22 This estimate is based on CNB and Fincentrum (Hypoindex) data. The evolution of contracts with terminating fixations is proxied by the value of mortgages signed *i* years ago, where *i* denotes individual fixation periods. This value is reduced by the predicted amount of principal repaid.

CHART II.29

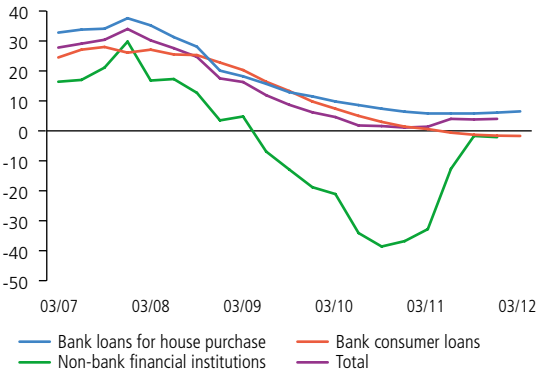
Shares of households with loans by income quintiles
(%)



Source: CZSO Household Budget Survey 2010

CHART II.30

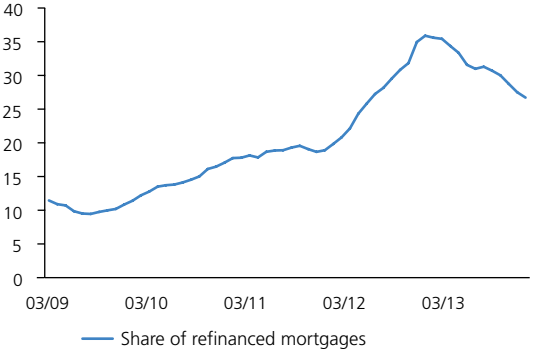
Year-on-year growth in loans to households
(%)



Source: CNB

CHART II.31

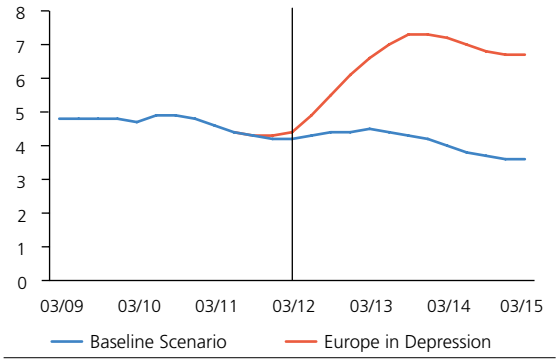
Estimated share of refinanced mortgages in new mortgages
(%)



Source: CNB, Hypoindex, CNB calculation
Note: Share calculated as 6M moving average from estimated values.

Chart II.32

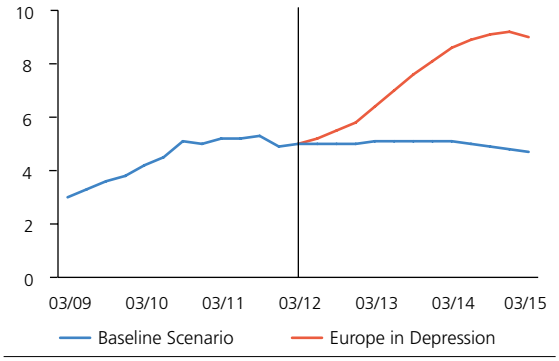
12-month default rate on bank loans to households
(%)



Source: CNB

Chart II.33

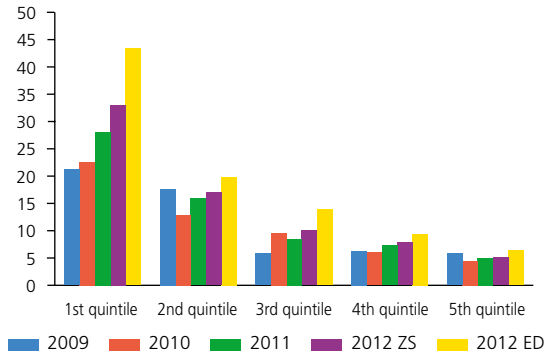
NPL ratio: households
(%)



Source: CNB

Chart II.34

Shares of insolvent households in total number of indebted households broken down by income category – simulation results
(%)



Source: CZSO Household Budget Survey, CNB calculation
Note: The figures for 2011 and 2012 are based on estimates. BS means *Baseline Scenario* and ED *Europe in Depression* scenario.

conditions are maintained, a rate as much as 1.5 pp lower on average than that before the expiration of the current fixation, and interest savings of around CZK 3.5 billion, can be expected in 2012–2013. On the other hand, a scenario where most loans for house purchase are refixed at a low interest rate level in future years and where a period of significantly higher rates follows after the fixation period expires, may give rise to some concerns. However, the risks of this scenario are limited to a situation where the elevated interest rate level does not reflect higher wage inflation. This might arise primarily as a result of a loss of confidence in public finance sustainability (see the *Loss of Confidence* scenario in FSR 2009/2010 and partly also the *Europe in Depression* scenario in this Report), which would lead to an increase in credit premiums and interest rates even in a situation of adverse developments in economic activity and income (see the euro area interest rates in Chart II.9).

… amid an increasing frequency of variable rate mortgages

In addition to the growing interest in refinancing, the popularity of mortgages with variable interest rates is on the rise. This option is relatively advantageous for high-income households, since the expected mean interest payment is usually lower in a situation of relative stability than for loans with longer rate fixations and such households are able to cover temporary upward fluctuations in the variable rate from their reserves. However, variable rates pose certain risks to low-income households, since such households may not be able to cope with a sharp rise in repayments and often assess the affordability of a mortgage only in terms of the amounts of the next few repayments. An increase in this risk in 2011 is evidenced by a gradual decline in the spread between the fixed and variable rate, which might narrow further or even reverse as a result of an increase in variable rates if the risks of the *Europe in Depression* scenario materialise. The risk is reduced to a certain extent by the possibility of switching to a fixed rate, although the fixed rate may be considerably higher than its current level at the time of the change. Given the still very small share of variable mortgages in the total value of mortgage loans (around 1%), the current situation poses no serious threat to banks.

Permanent life insurance, permanent disability insurance and loss of employment insurance are ways of mitigating credit risk for variable and other mortgages. The share of loans secured in this way is growing over time and is currently around 30–40%. Households increasingly make use of mortgage insurance, since a large proportion of the cost of the insurance is offset by a lower interest rate due to better collateral. However, it should be noted that loss of employment insurance covers fewer cases than loan applicants generally assume. This may give a false sense of security, which is not positive for future stability.

The credit risk of households has stabilised

The adverse income situation of households in 2011 has not yet affected credit risk, the level of which has stabilised. This goes for both the 12M default rate and the NPL ratio (see Charts II.32 and II.33). If the *Baseline Scenario* materialises, the NPL ratio should be 5.0% and

the 12M default rate 4.4% at the end of 2012. The predicted increase in credit risk can generally be assessed as moderate, with a negligible impact on banks' balance sheets. However, the conditions in the *Europe in Depression* scenario could take the two indicators to levels of around 7% in mid-2013, which would have a significant effect on banks' financial condition (see section 5.2).

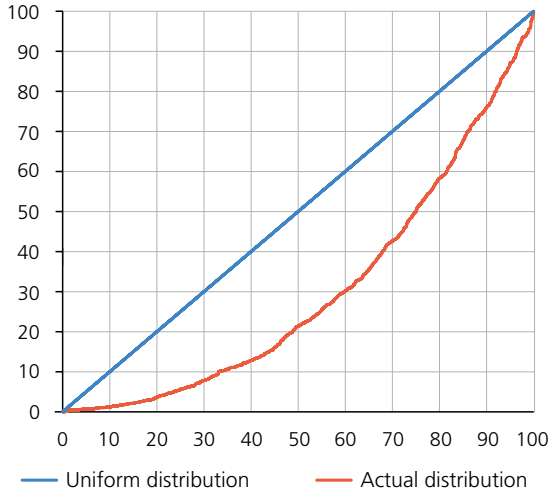
BOX 2:
HOW HOUSEHOLDS ARE STRESS-TESTED[23]

The aim of the stress tests is to examine households' ability to meet their obligations in the exceptionally adverse economic situation given in the *Europe in Depression* stress scenario, which is described in section 2.1. The overindebtedness ratio is used to examine whether a household is overindebted and therefore potentially unable to meet its obligations. This is defined as the ratio of the amount of repayments of the household to its income net of essential expenditure on food, housing, energy, health and transport. A household is classified as overindebted if this ratio exceeds 50%. The evolution of all the above variables is simulated on the basis of the stress scenario. The modelled changes in households' labour market position (a head of household may be employed, unemployed or outside the labour market) are a very important channel for estimating changes in overindebtedness. These positions will change with a certain probability on the basis of "transition matrices". To estimate them, data on previous labour market developments are used. The transition matrix values differ according to the education level of the head of household. The stress scenario assumes a rise in unemployment of 1.4 pp in 2012. In order to better identify weak spots in the household sector, a rise in the unemployment rate of 2.8 pp was assumed. This is roughly equivalent to growth in the unemployment rate of heads of households of 2.0 pp, since heads of households are usually less likely to lose their job than other members of the household. Other things being equal, the modelled rise in unemployment implies a decline in net income. It is assumed that essential expenditure falls with net income, but not to the same extent. This means that the overindebtedness ratio goes up. In line with the scenario's assumption of a 0.6% decline in nominal wages, the simulation included a corresponding average decrease in the net income of households of 1.7%. The overall across-the-board growth in essential expenditure was 3.4% on average. This includes the effects of the increased VAT rate on some consumer basket items, and rent deregulation. Given the assumptions of approximately constant interest rates and constant household debt (in the above scenario), the same repayments were assumed as in 2011. The input data were

23 Preliminary results of CNB Research Project C1/11 (Galuščák, Hlaváč, Jakubík).

Chart II.35

Lorenz curve: income distribution of repayments
(% on both axes)



Source: CZSO Household Budget Survey 2010, CNB calculation
Note: The x-axis shows the cumulative share of households arranged in rising order of income and the y-axis shows the cumulative share in repayments.

the data on around 2,900 households included in the CZSO's 2010 Household Budget Statistics. The results of the test for 2011 were generated by applying the changes in the aggregate variables reported for 2011 to the CZSO's 2010 Household Budget Statistics. The results for 2012 were then generated by the above simulation applied to the 2011 results.

Low-income households show high sensitivity to the stress scenario

To better account for income structure, households were divided into income quintiles in the stress test. Three basic facts can be determined from the stress test results: in general, low-income households are more overindebted, the overindebtedness has a rising tendency across the quintiles over time, and the sensitivity of households' overindebtedness to the stress scenario is the greatest for the lowest-income households (see Chart II.34). The average overindebtedness in the stress scenario increased from 10.3% in 2010 to 14.9% in 2012.

Overindebtedness depends not only on income

The overindebtedness of households depends not only on their income, but also on demographic characteristics. The more overindebted groups currently sensitive to adverse economic developments include young families, whose overindebtedness rose from 11.3% to 16.3% between 2010 and 2012 in the stress scenario. The simulation results also indicate that the stress scenario would be reflected in an increase in overindebtedness from 9.1% in 2010 to 15.8% in 2012 among people with secondary education without a school leaving certificate. Households headed by an unemployed person are also at risk. Were the stress scenario to materialise, the groups affected would also include the self-employed, a category that contains a large proportion of less-qualified workers who would have great difficulty finding full-time employment. Generally, sensitivity to the stress scenario increases as overindebtedness rises.

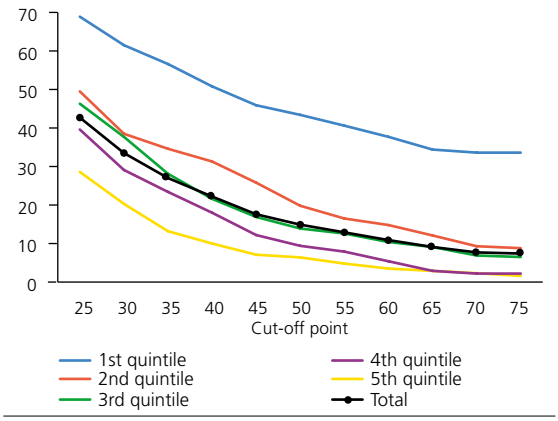
The impact of high overindebtedness of low-income households on banks' balance sheets would be mitigated by a low absolute amount of loans granted

The overindebtedness of low-income households, which would exceed 40% in the stress scenario, signals a risk of a further significant deterioration in their current financial situation. However, the impact on the financial sector would be mitigated by the fact that low-income households owe far less than other households in absolute terms. The uneven income distribution of households' repayments is shown by the Lorenz curve (see Chart II.35). It tells us that the 20% (50%) of households with the lowest income will have to repay only 3.5% (21.3%) of the sector's repayment sum. Another reason why

the possible impact of the potentially high share of overindebted low-income households can be viewed in a rather more sober light is the high degree of arbitrariness in the selection of the cut-off point indicating overindebtedness for the overindebtedness ratio.[24] A sensitivity analysis (see Chart II.36) reveals that if this cut-off point was moved from 50% to 60%, the proportion of overindebted households in the 1st quintile would fall by 5.7 pp. Despite that, the risk of rising overindebtedness needs to be constantly monitored in the current phase of the economic cycle.

Chart II.36

Share of overindebted households in relation to overindebtedness cut-off point
(% on both axes)

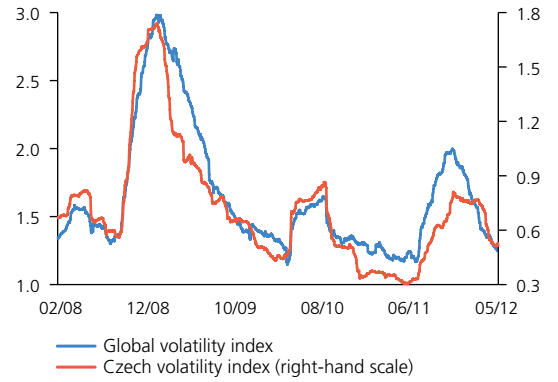


Source: CZSO Household Budget Survey, CNB calculation
Note: Figures apply to *Europe in Depression* scenario.

24 In Bičáková, A., Prelcová, Z., Pašaličová, R. (2010): *Who Borrows and Who May Not Repay?* CNB Working Paper 10/2010, the authors derived a cut-off point of 29%. However, when calculating the overindebtedness ratio, they deducted the living minimum, not essential expenditure, from net income. The value derived in this manner is in line with our cut-off point on average.

CHART III.1

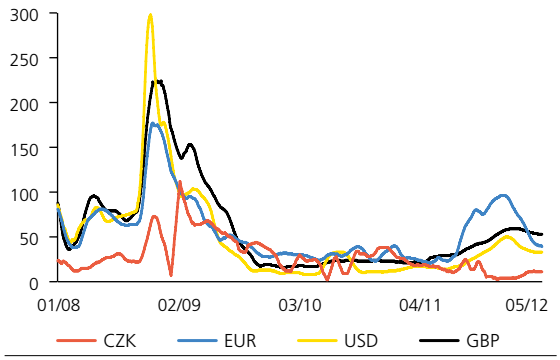
Volatility on domestic and foreign financial markets
(historical volatility for last 90 days)



Source: Thomson Reuters, CNB calculation
Note: The Czech volatility index is the sum of the historical volatility of the PX, the CZK/EUR rate, the 10Y government bond yield and the 3M PRIBOR. The global volatility index is the sum of the historical volatility of the S&P500, the DJ Stoxx50, the USD/EUR and JPY/USD rates, and 10Y DE and US government bond yields.

CHART III.2

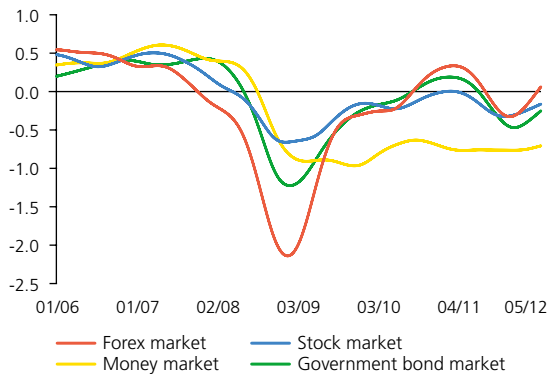
Risk premiums in the interbank market
(bp; 1M moving average)



Source: Thomson Reuters, CNB calculation
Note: Difference between the 3M interbank rate and the 3M OIS of the relevant currency.

CHART III.3

Market liquidity indicators for individual Czech markets



Source: Bloomberg LP, CNB, CNB calculation
Note: See FSR 2007, Box 4 for the calculation of the indicators.

3 ASSET MARKETS

3.1 THE FINANCIAL MARKETS

International financial markets continue to be subject to a high degree of uncertainty, increased risk aversion and volatility in reaction to the waves of policy measures adopted in the euro area. The ECB's longer-term refinancing operations in late 2011 and early 2012 calmed the extreme volatility in European markets on both the short and long-term funding market and the equity market. However, the longer-term effectiveness of the unconventional policy measures is uncertain, as credit and liquidity risk in financial systems has remained elevated. The fluctuations observed in European financial markets affected the Czech financial market to a limited extent in 2011. However, despite the low sovereign risk of the Czech state and the robust Czech financial sector, larger impacts on prices of domestic financial assets cannot be ruled out if the high volatility in foreign financial markets is renewed.

Short-term financing conditions are not improving…

Considerable uncertainty continued to prevail in financial markets in 2011, and the situation worsened even further in the second half of the year. This can be seen in sharply rising aggregate volatility of domestic and foreign financial markets (see Chart III.1). Short-term and long-term credit markets in euro area countries recorded the highest tension. The risk premium in the advanced countries' interbank market reached its highest levels since the 2008 financial crisis (see Chart III.2). The main factors of this rise were a decrease in bank balance-sheet assets eligible as collateral for secured markets, expected large-scale refinancing of banks and the public sector,[25] uncertainty about the impact of the then unclear agreement to restructure Greek sovereign debt, and a sizeable deterioration in the availability of funding sources for European banks in US and European markets. Credit market financing became generally more expensive and these markets remained closed to some banks. Market liquidity worsened in the unsecured euro market while remaining unchanged in the secured market. Volumes remained low compared to the pre-crisis period, with short operations with maturities of up to one month prevailing.[26] This indicates a high level of caution in the financial sector and a persisting lack of counterparty confidence.

…in the Czech interbank market, either

The Czech money market continues to be affected by the transmission of tension from abroad. A lack of counterparty confidence and low market liquidity also persist here (see Chart II.3). The buy-sell spread remains wide at all maturities. The differences between market rates and the CNB's monetary policy rate are not shrinking and are very volatile at longer maturities (see Chart III.4).

25 According to Bloomberg, large EU banks should refinance around EUR 600 billion of longer-term debt in 2012 and 2013. In 2012, Italy also has to refinance more than EUR 287 billion and Spain around EUR 140 billion (as of 13 April 2012).
26 ECB (2011): Euro Money Market Survey, ECB.

Activity in the money market remains lower than before the crisis. The unsecured market is dominated by transactions with overnight maturities and maturities of up to one week, while the secured market is dominated by transactions with maturities of up to three months.[27] However, the money market is a supplementary source of financing in the Czech financial system, which is characterised by excess liquidity and conservative financing preferences. This is evidenced among other things by the low take-up of the extraordinary liquidity-providing facility introduced to support the functioning of the interbank market[28] (see Chart III.5). Moreover, a new regulation for the banking sector classifies short-term interbank market funding sources as less stable (the second liquidity standard in the Basel III proposal – the net stable funding ratio). This may motivate the banking sector to gradually use the unsecured interbank market less. However, this market has no substitute as a quick source of funds, and a return to normal operation is highly desirable.

Persisting concern about the transmission of risks between the banking and fiscal sectors…

Recurring tensions in the balance sheets of the European banking sector and euro area governments linked with the constant refinancing needs put the money market and the government bond market under pressure in some periods (e.g. April 2011 and February 2012). These two markets affect each other because of the interconnectedness of the two sectors' balance sheets, which gives rise to negative feedback.[29] The existence of a relationship between government and bank balance sheets, accompanied by frequent bad news about the possibility of stabilising the public finances of some euro area countries, together with uncertainty regarding the "voluntary" exchange of the Greek debt and the effectiveness of CDS contract hedging, resulted in a surge in government bond yields in November 2011 (see Chart III.6). At the same time, some sovereign ratings were downgraded (see Chart III.7), giving rise to the risk of withdrawal of assets of sovereigns with low ratings from market portfolios. Swap and government yield curves thus diverged at the end of 2011, with the spread falling to highly negative values for most countries (BE, IT and ES; see Chart III.8).

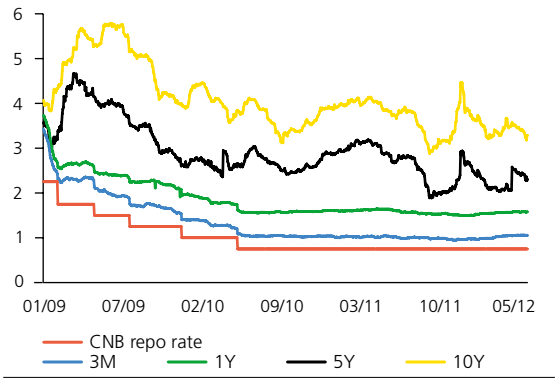
…is being offset by measures introduced by central authorities

The ECB implemented a series of measures in an effort to ease the difficult liquidity situation and sharply rising volatility of euro area markets (see Chart III.9). It provided extraordinary monetary liquidity to the financial system in two three-year refinancing operations (LTROs) with full allotment at a rate equal to the average monetary policy rate

27 http://www.cnb.cz/en/financial_markets/money_market/mm_turnover/A_MM_obraty_11.html.
28 http://www.cnb.cz/en/financial_markets/money_market/param_liquidity-providing_repo.html.
29 Janáček, K., Hlaváček, M., Komárek, L., Komárková, Z. (2012): *Impacts of the Sovereign Default Crisis in the Czech Financial Sector,* FSR 2011/2012.

CHART III.4

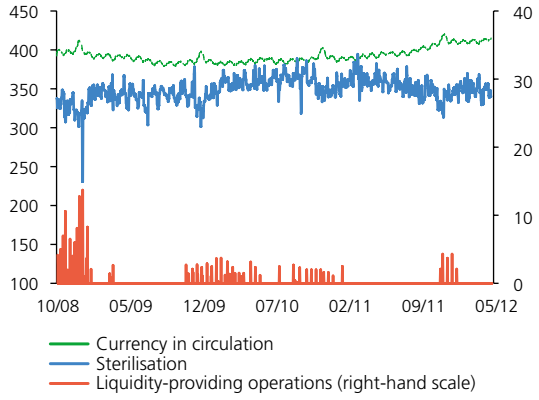
Monetary policy rate and market rates in the Czech Republic
(%)



Source: Thomson Reuters
Note: 3M and 1Y = 3-month and 1-year PRIBOR; 5Y and 10Y = 5-year and 10-year generic government bond yield.

CHART III.5

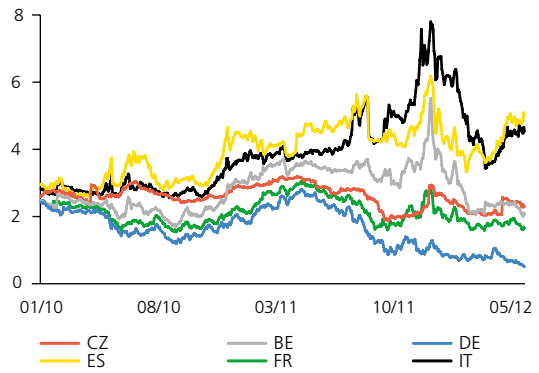
Open market operations and currency in circulation
(CZK billions)



Source: CNB

CHART III.6

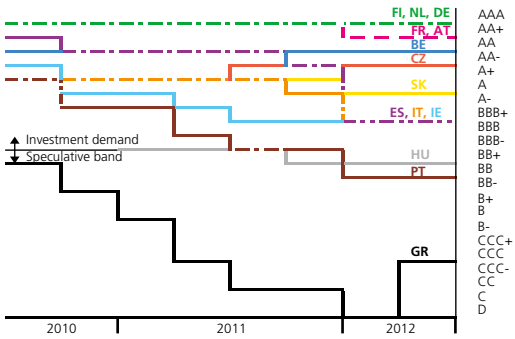
Five-year government bond yields of selected countries
(%)



Source: Thomson Reuters
Note: 5Y generic government bond.

CHART III.7

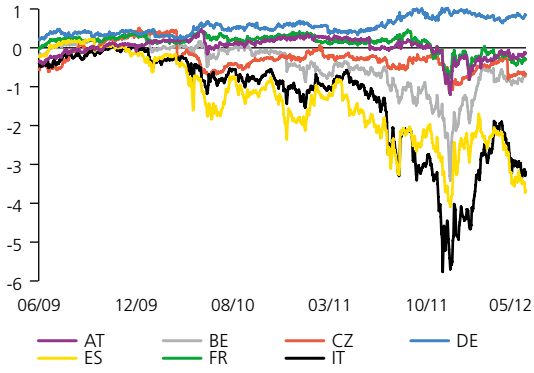
Sovereign ratings of selected countries
(long-term foreign currency rating)



Source: Standard & Poor's
Note: Data as of 10 May 2012.

CHART III.8

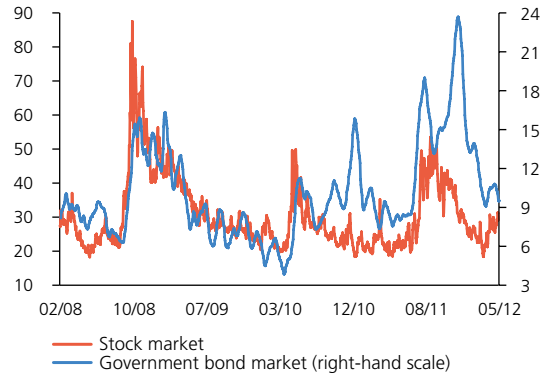
Difference between the five-year interest rate swap yield and the government bond yield of the relevant country
(%)



Source: Bloomberg LP, CNB calculation
Note: In normal market conditions the difference between the swap yield curve and the government bond yield curve (the asset-swap spread, ASW) is positive and expresses the credit quality of government debt.

CHART III.9

Volatility on European financial markets
(price index; 1M moving average)



Source: Bloomberg LP, CNB calculation
Note: The VSTOXX volatility index was used for the stock market. The 10-day volatility of the price indices of 10-or-more-year AT, BE, DE, ES, FR, IE, IT, NL and PT government bonds was used for the government bond market.

over the duration of the contract[30] (see Box 3). At the same time, the ECB further expanded the range of eligible collateral, lowered the key monetary policy rate, reduced the minimum reserve requirement and, together with some other central banks, agreed with the Federal Reserve System to lower the pricing on temporary US dollar liquidity swap arrangements, which made short-term dollar sources of financing cheaper for euro area banks.

In an effort to reduce the high risk premiums, authorities are also focusing on the credit part in addition to the liquidity part. At the end of March 2012, euro area representatives agreed on the European Stability Mechanism (ESM), the successor to temporary solutions in the form of the EFSF and the EFSM,[31] and on a change to its originally envisaged parameters. The ESM's[32] lending capacity remains at EUR 500 billion in addition to the EUR 192 billion committed under the EFSF to programmes in Greece, Ireland, and Portugal. The ESM fund has been ensured the top rating by a capital structure consisting of EUR 80 billion of paid-up capital and EUR 620 billion of disposable capital. The contributions of individual countries will be distributed according to the ECB's existing key (see Table III.1). If a country is unable to contribute, it forfeits its voting right in decisions on the provision of assistance and on changes in parameters. Countries may obtain assistance from this rescue mechanism not only in the form of a credit line or loan,[33] but also in the form of purchases of government bonds in the primary and secondary markets or assistance in recapitalisation of financial institutions.[34] However, such assistance is conditional on extensive fiscal consolidation, with compliance assessed on an ongoing basis between tranches.

BOX 3:
EXTRAORDINARY LIQUIDITY-PROVIDING REPO OPERATIONS

In an effort to mitigate the impacts of the financial market tensions on the financial sector, some central banks (CBs) have introduced extraordinary liquidity-providing measures during the current crisis. The CBs' decisions have been led mainly by concerns about contagion within the domestic financial sector, from the external to the local financial sector, or from the financial sector to public finance and on to the real economy. An extraordinary liquidity-providing repo operation is preferred if the CB is aiming to affect market rates or market risk premiums. The transmission

30 According to ECB (2012): Monthly Bulletin (Box 3), the first three-year LTRO of 21 December 2011 provided EUR 489.2 billion to 523 credit institutions and the second one of 29 February 2012 provided EUR 529.5 billion to 800 credit institutions. In addition, EUR 6.5 billion was allotted in a three-month LTRO and EUR 29.5 billion in the main refinancing operation. A total of EUR 565.5 billion was provided in February.
31 FSR 2010/2011 contains a basic description of the EFSF and EFSM rescue mechanisms.
32 The ESM, which – unlike its predecessor the EFSF – will take the form of an international institution, will start up on 1 June 2012.
33 Candidates for assistance from this programme should be signatories to the Treaty on Stability, Coordination and Governance.
34 The cost of assistance, or the debt service costs, should in future cover only the costs associated with the provision of this financial assistance, as in the case of the EFSF.

channel of a stabilising liquidity-providing repo operation takes the form of direct provision of liquidity to financial institutions' balance sheets in order to improve their balance-sheet liquidity. This, in turn, indirectly affects market liquidity, especially in the market for assets eligible as collateral and in the interbank market. These measures are also intended to break the adverse "liquidity spiral" between market and balance-sheet liquidity that is typically present in liquidity crises, and thereby relatively quickly mitigate the consequences of market failure. However, the instrument does not help identify and remove the causes of systemic risk and crisis. Its effectiveness depends largely on there being a functioning interbank market. This is a necessary condition for redistribution of the additional liquidity from banks – which can make use of extraordinary repo operations – to other financial market institutions. Moreover, extraordinary operations with non-standard settings (e.g. a too wide range of eligible collateral or a full allotment regime at a very low rate) can in the long term tempt the financial system to engage in undesirable activities in the form of riskier investment or less diversified portfolios. The overall impact of an extraordinary instrument on the system as a whole may not be unambiguously positive, so such instruments tend to be used only in the short term.

The introduction of an extraordinary operation is closely linked with the rate on the extraordinary liquidity and with the eligible collateral policy. The application of a penalty rate, i.e. an interest rate above the marginal lending facility rate, should discourage insolvent financial institutions from using CB assistance to stay in business and postpone their bankruptcy and thereby increase the costs to society. On the other hand, a too high penalty rate may imply high costs for illiquid but solvent financial institutions and thereby exacerbate the crisis in the system. Since the central bank is aiming to rescue the illiquid bank, the penalty rate should not be so high that it leads to a negative interest rate spread between banking assets and liabilities. That would only speed up the insolvency of the financial institution concerned. This means that the only condition that should apply when setting the penalty rate is that the CB should be in the position of the last, but not preferred, creditor. The eligible collateral policy, i.e. the decision on the classification of an asset as eligible collateral, and the setting of haircuts affect the amount and value of eligible assets held in financial institutions' balance sheets. By including an asset in the eligible collateral category the central bank sends out a signal about the rating of the asset. When creating rules for the collateral accepted in extraordinary operations, the CB must consider the wider impact of the collateral policy on the financial system. The CB thus cannot focus solely on protecting itself against counterparty credit risk or the market risk associated with the collateral as it does when pursuing monetary policy. On the other hand, the range of eligible collateral is limited by the asset quality threshold, which is constant over time. The CB can

Table III.1

Shares of individual euro area countries in the capital of the ESM
(%)

Country	Share	Country	Share
Germany	27.15	Finland	1.80
France	20.39	Ireland	1.59
Italy	17.91	Slovak Republic	0.82
Spain	11.90	Slovenia	0.43
Netherlands	5.72	Luxembourg	0.25
Belgium	3.48	Republic of Cyprus	0.20
Greece	2.82	Estonia	0.19
Austria	2.78	Malta	0.07
Portugal	2.51		

Source: ECB

thus flexibly respond to market needs, where highly liquid assets can suddenly turn illiquid despite remaining of good quality.

Making extraordinary liquidity too cheap in exchange for a list of eligible collateral that is too benevolent can give rise to a risk of moral hazard or adverse selection. The risk of moral hazard can arise if the provision of liquidity against non-standard eligible collateral gives financial institutions a false expectation that they are hedged against virtually all types of risk. Such expectations can motivate financial institutions to make riskier investments or to reduce their liquidity buffers. Since the financial system tends to behave in a pro-cyclical manner, such false perceptions about holdings of sufficiently large and high-quality liquidity buffers can result in a systemic problem. The risk of adverse selection can arise if the CB provides emergency liquidity at the penalty rate without distinguishing in advance between illiquid and insolvent counterparties to the refinancing transaction and exposes itself to the risk of insolvent financial institutions primarily requesting the facility. At times of crisis, illiquid financial institutions can be pushed out of private credit markets for either precautionary motives (liquidity hoarding) or speculative motives (predation). Such financial institutions then have two options: either to ask the CB for liquidity, or to sell their assets at a discount. If the costs of raising liquidity from the sale of assets are higher than the penalty rate on credit from the CB, the illiquid financial institution will opt for the extraordinary facility. A risk to financial stability can arise when the financial institution is not only illiquid, but also insolvent, since the provision of an extraordinary facility to an insolvent financial institution sends out a signal to the market about the CB's willingness to rescue problem banks as well. Such willingness on the part of the CB encourages the financial system to engage in the moral hazard described above.

The CNB had concerns about cross-border contagion in 2008 after activity in the government bond market fell sharply, spreads widened and parent banks took measures to manage risk in the interbank market. In October 2008, in response to this situation, the CNB started to provide liquidity to Czech banks in regular liquidity-providing two-week (or three-month) refinancing operations against the standard collateral accepted in open market operations (including government bonds). The above risks and potential negative consequences of operations of this type are low for the Czech Republic. The CNB's rules for such operations are stricter than those in some other countries, and banks make very limited use of this facility. In addition, the CNB supervises the financial system. When actively assessing the use of the instrument, it is able to recognise which financial institutions are illiquid and which are already insolvent. Financial institutions that are illiquid and insolvent in the long term are subject to a different policy than the standard facility policy (a liquidity-providing repo tender or Lombard repo).

The situation improved temporarily after the measures…

The two types of measures introduced in the euro area were welcomed by the markets. The extraordinary three-year LTROs led to a decline in risk premiums in all markets. The provision of cheap monetary liquidity into the financial system and the acceptance of a wider range of collateral (e.g. government-guaranteed bonds issued by Italian banks) improved the overall market sentiment. Market tensions eased after the reopening of funding liquidity (see Charts III.2, III.6 and III.9), especially in the interbank market. In addition, extraordinary monetary operations encouraged the euro area banking sector to purchase short-term securities, especially those of their governments, e.g. Italian and Spanish ones. A particularly strong impact was recorded at the short end of the yield curve, but the curve shifted downwards along its entire length (see Chart III.10). The change in some yield curves was fairly significant and sudden. It is difficult to judge at this stage whether these developments, or the "extraordinary" maturity measure used, will have a lasting impact on the stability of the creditors of the above countries' debt.

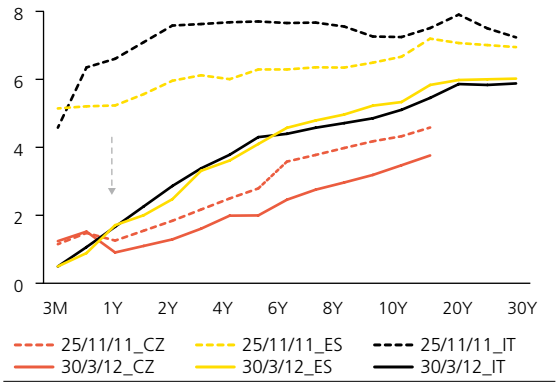
…but their long-term effectiveness is uncertain, since liquidity and credit risk in the system remain elevated

The market situation has improved, but developments in recent months suggest that the improvement was only temporary and sudden deviations in prices can still be expected. The Spanish bond market came under pressure again in April 2012 because of bad news about the economy and the soundness of the banking sector.[35] At the same time, the markets are closely watching other countries – slight growth in yields is being recorded by France and also by the Netherlands, which faced difficulties in drafting the budget for next year and in complying with the EU's 3% limit. The markets seem to have been calmed only partially by the measures adopted, and risk aversion remains elevated. This is mainly because of a persistently high level of liquidity and credit risk in the financial system. From the short-term perspective, the effectiveness of some measures, in particular the ESM rescue mechanism, which is aimed at reducing sovereign risk, is limited. This measure can be expected to have a positive impact on the financial system only in the longer term, since a permanent reduction in the relatively high sovereign risk is a matter of years rather than months (see Chart II.16). Moreover, governments' fiscal consolidation efforts are largely conditional on developments in the real economy. Similarly, the positive market impact of the ECB'S two three-year facilities cannot be considered permanent. First, the provision of liquidity will not reduce the existing credit risk in the system (see Box 3) and second, the maturity of funds in the financial system is not lengthening much. It is this short-term maturity – associated with a need for frequent refinancing of the high debt of individual sectors – which is one of the main factors indicating permanently higher systemic liquidity risk.

35 A sharp contraction of the Spanish economy is expected. This is also reflected in the evolution and condition of public finances – the budget deficit last year amounted to 8.5%, well above the limit set by the EU; public debt is expected to increase to 79.8% of GDP and the banking sector is showing a rise in the proportion of problem loans – to 8.2% in February (giving rise to concerns about the need for state assistance).

CHART III.10

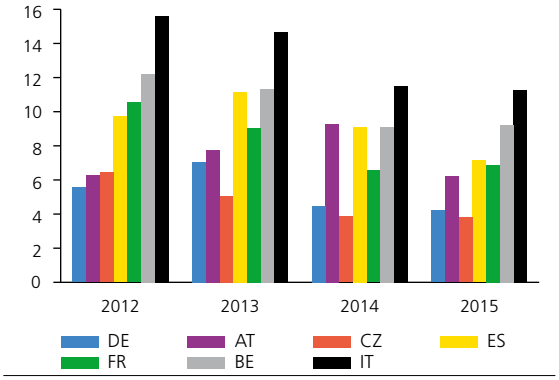
Fall in government yield curves of selected countries
(%)



Source: Bloomberg LP

CHART III.11

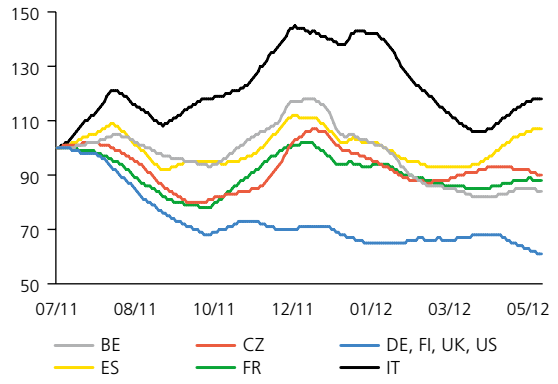
Maturity profile of government debt of selected countries
(% of estimated GDP for 2012)



Source: Bloomberg LP, Eurostat, CNB calculation
Note: Data as of 10 May 2012.

CHART III.12

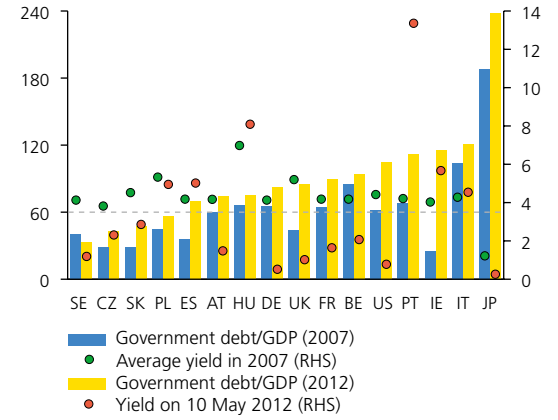
Decoupling of long-term yields for selected countries
(1M moving average; 1 July 2011 = 100)



Source: Thomson Reuters, CNB calculation
Note: 10Y government bond yields. The group consists of countries whose time series correlated at a level greater than 0.9; their mean is presented.

CHART III.13

Comparison of government debts and their yields for selected advanced economies
(%)



Source: IMF, Thomson Reuters, CNB calculation
Note: Average yield for 2007 for SK since 12 April 2007. The average yield is calculated from the 5Y generic benchmark government bond of the relevant country. RHS – right-hand scale.

Fundamental factors (debt levels, primary deficits, economic outlooks, funding maturity and balance-sheet recession in the banking sector) will continue to prevail, reducing the effectiveness of the measures introduced. Increased market volatility and repeated changes in the slope of, or even shifts in, government yield curves can still be expected, especially for countries with negative economic outlooks. The biggest concerns are currently being generated by the situation in Spain and Italy, where there is a need to refinance at least 15% and 13% respectively of their current debt this year (around 12% and 17% of GDP respectively; see Chart III.11) amid a growing yield (see Chart III.6). Moreover, home bias – where the debt of domestic governments is purchased mainly by domestic financial institutions – has been observed recently. Given the amount of government debt, this introduces uncertainty regarding the absorption capacity of domestic markets. For the above reasons, some central banks may provide further liquidity assistance to prevent extreme volatility and an escalation of the debt crisis.

A combination of low returns on, and high demand for, quality assets…

Besides the effort to keep government debt yields low despite growing sovereign risk and to evoke an extra effect regarding the "relative" credit quality of domestic assets, a flight to quality, liquidity and security has been observed in markets for several years now. These effects are causing decoupling of yields (see Chart III.12) in financial markets. The pressure to hold high-quality risk-free assets rose further in 2011, owing mainly to prudential policy. At the same time, however, their potential supply is recording a relative decline as assets are continually moved out of this category (e.g. GR, HU, IE and PT; potentially ES and IT). An imbalance is starting to emerge between the quality supplied and demanded in the markets. On the one hand, this is causing excessive growth in prices of relatively high-quality assets and a decline in their yields regardless of their fundamental credit risk (e.g. DE, US, UK and JP; see Charts III.12 and III.13). On the other hand, relatively lower-quality assets (e.g. ES and IT) are seeing alternate bulk purchases and sales, giving rise to big swings in their prices (see Charts III.6 and III.8). The flight to quality has a macroeconomic and macroprudential dimension. If more countries with large and liquid government debt markets lose their top ratings and their government bonds lose the status of highly liquid collateral, demand for such collateral will shift to the government debt of the remaining top-rated countries. As a result, interest rates in countries with high-quality debt might drop to levels that are not consistent with maintaining price and financial stability in the long term.

…is putting long-term investors at a disadvantage…

The volatility in prices of relatively high-quality government bonds is creating tensions in the balance sheets of investors with long-term liabilities, such as pension funds and insurance companies, whose investment decisions are guided by an emphasis on maintaining asset value. A long period of excessively low yields or constant volatility of government bond prices may in the future limit these investors' demand for such securities beyond the scope of the regulatory requirements.

In such a market environment, and amid a growing present value of benefits paid, pension funds and insurance companies may be motivated to invest in riskier assets. Their investment strategies might converge towards those of banks, which would mean a change in the distribution of individual types of risk in their balance sheets. Governments and other institutions would also have less opportunity to issue long-term maturity debt (see section 4).

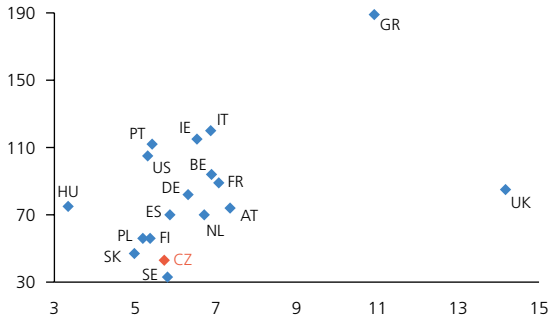
…and adversely affecting small countries with conventional policy

Keeping some countries' long-term yields low through often "artificial" demand for their assets regardless of sovereign risk can have adverse side effects on small countries with largely conventional policy. Spillover of tensions from abroad is evident in the Czech government bond market (see Charts III.1, III.6 and III.8). Yields are still slightly higher than those assigned by the market to countries with similar or worse public finance positions and outlooks (see Chart III.13). The Czech government bond market is small and relatively illiquid due to the Czech Republic's lower debt and its main creditors' preference for holding government debt to maturity.[36] Most Czech debt is held by domestic financial institutions, usually to maturity (see section 4). Foreign investors hold less than 30%, usually as available for sale. This to some extent contributes to the sensitivity of the Czech bond market to the transmission of market shocks from abroad and to higher volatility in the absence of purely fundamental causes. The Czech government bond market is clearly vulnerable to aggregate market risks and contagion risks (see Box 4), even though the Czech Republic was one of only two EU countries to have their ratings upgraded last year amid mass downgrades (see Chart III.7). Demand for primary issues of Czech government bonds has long exceeded supply and the average maturity – currently almost six years – is gradually increasing (see Chart III.14).

At a time of protracted uncertainty in financial markets, and given large refinancing needs, large advanced countries with accommodative monetary policies and advanced liquid markets can crowd out smaller countries and create an illusion of unwillingness among investors to invest in long-term bonds of smaller yet fiscally stable countries. For this reason, it is not necessarily appropriate for small stable countries to increase their limits on short-term government debt. Instead, it is better for them not to reduce the share of the long-term component and to time their issues appropriately with regard to large or highly indebted countries. Spreading the total nominal government debt over the longest possible period (see the UK in Chart III.14) reduces the planned gross borrowing requirement in individual years, allows more stable repayments, and to some extent protects the debt against the market tension and random volatility typical of times of crisis.

CHART III.14

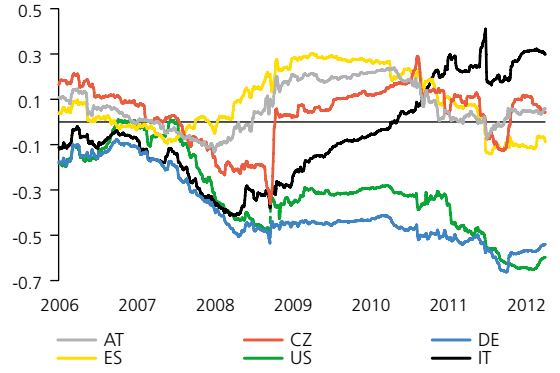
Average government bond maturity versus government debt
(x-axis: average maturity in years as of 10 May 2012; y-axis: estimated ratio of government debt to GDP for 2012 in %)



Source: Bloomberg LP, IMF

CHART III.15

Correlations between weekly yields on government bonds and stock indices

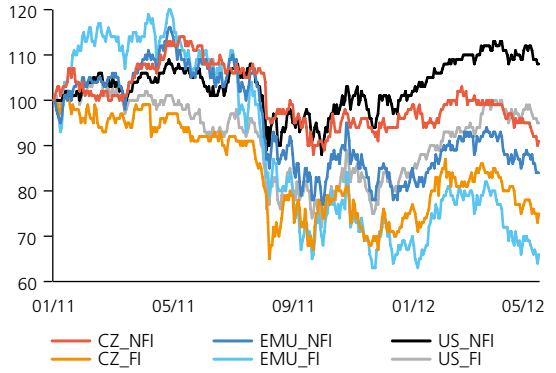


Source: Thomson Reuters, CNB calculation
Note: Rolling correlation with a window of 500 observations. Correlation between yields on stock indices and price indices of 10Y generic government bonds of the relevant countries. Last observation 10 May 2012.

36 In July 2011, the Czech Ministry of Finance launched the MTS Czech Republic electronic platform, which should further promote trading in the secondary Czech government bond market. The government bond market should see an increase in transparency and efficiency, since MTS enables foreign domestic market makers to be added to the group of primary dealers. This should lead to an increase in liquidity in the Czech government bond market.

Chart III.16

Financial and non-financial sector stock indices
(3 January 2011 = 100)



Source: Thomson Reuters, CNB calculation
Note: NFI is non-financial sector (non-financial corporations), FI is financial sector.

Chart III.17

Gold and silver prices
(USD/Troy Ounce)

Source: Thomson Reuters, CNB calculation
Note: Gold Bullion LBM U$/Troy Ounce and Silver Fix LBM Cash Cents/Troy Ounce. Last observation 10 May 2012.

Longer bond maturities depend largely on the absorption capacity of institutional investors (see section 4, Box 5) and households. The Czech Ministry of Finance has implemented a pilot issue of government saving bonds, the results of which confirmed the expected interest of Czech nationals in saving through Czech government debt, although so far only for short-term maturities.[37] A major benefit of government debt holdings in the balance sheets of investors with long-term liabilities is that they are not subject to frequent and sudden changes, unlike short-term debt held in the balance sheets of banks and investment funds. Increased volatility of government bond yields and repeated attacks on government balance sheets, amid a high volume of government debt held by the banking sector, is clearly documented by the current euro area debt crisis.

The volatility in banks' balance-sheet liquidity and sovereign risk is affecting other markets…

The tensions in fixed income asset markets in some euro area countries (IT and ES in particular) are also documented by the strength of the correlations between weekly returns on long-term government bonds and shares (see Chart III.15). For instance, the correlation of Italian shares and bonds has clearly separated from the correlations observed in Germany and the USA, as the correlation coefficient turned positive in 2010. This change is due mainly to falling prices of Italian bonds. By contrast, the negative correlation of German shares and bonds, as well as US ones, showed that investors are interested in assets perceived as safe and liquid. Turning to the Czech Republic, the correlation was temporarily negative in 2011 H2. Investors started to distinguish in more detail between the credit risks of individual countries and showed greater interest in Czech government debt, while stock market returns declined.

All stock markets recorded falls in 2011 H2 (see Chart III.16). The decline was more pronounced on European markets, reflecting not only negative expectations regarding future economic growth, but also considerable uncertainty regarding the euro area debt crisis. A decline in expected earnings due to exchanges of Greek bonds and to the assumed necessary recapitalisation of some banks meant that the largest decreases were recorded by European financial institutions, including Czech ones. Most stock markets returned to growth in late 2011. The return of investor interest was also reflected in lower index volatility (see Chart III.9), although large differences can be observed across markets. The best performers are US non-financial stocks, whose upward trend can be attributed to positive expectations of future economic growth (for more details see section 2.1 and Chart II.1), low yields on US government bonds or overly optimistic perceptions of developments in some non-financial sectors. On the other hand, financial corporations in euro area countries are being strongly affected by the ECB and the measures it has introduced.

37 http://www.sporicidluhopisycr.cz/cs/grafy-a-statistiky.html.

…but gold remains a popular safe asset

The general global uncertainty is reinforcing perceptions that precious metals are a store of value and a safe asset, often without much regard to their market risk. The high demand for gold (see Chart III.17) is being driven by low or negative real yields, for example, in the USA and some euro area countries, as well as in China, India and Turkey. The high demand is also due to central banks of emerging economies, which, in diversifying their growing foreign exchange reserves, have changed from being net sellers of gold to net buyers since the start of the crisis. The gold market is relatively small but accounts for 11% of the safe asset market.[38] In light of the continuing crisis and the existence of negative real rates on some financial products, demand for gold can be expected to remain higher over the next few years.

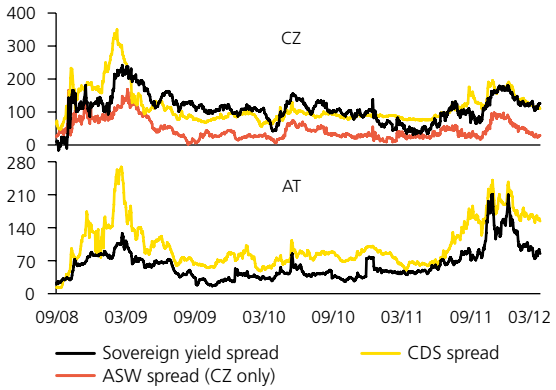
BOX 4: ANALYSIS OF SOVEREIGN CDS AND THEIR RELATIONSHIP TO THE CZECH GOVERNMENT BOND MARKET

The interest of debt securities holders in marketable insurance against debtor default in the form of credit default swaps (CDS) increased with the onset of the global financial crisis. As a market indicator of credit risk, the CDS spread started to represent an alternative to the previously predominant definition of the risk premium as the difference between the yields on a debt security and a risk-free benchmark (the "sovereign yield spread"; e.g. the yield on Czech government debt versus that on German government debt). Theoretically, the two premiums should be equal as a result of arbitrage, but developments on the two markets usually reflect more factors (aggregate risks, contagion risks, etc.) than just sovereign risk. This causes them to temporarily decouple sometimes. However, the question remains which of the two premiums/markets is the leader, and under what conditions. Empirical studies[39] analysing the relationship between the two premiums – primarily on euro area government bond markets – have found that the government bond market usually plays the leading role for low-yield bonds (fiscally stable countries), while the CDS market plays a leading role for high-yield and fiscally troubled countries. The main reasons given are (i) high and different sensitivity of prices of the both markets to joint market factors (e.g. a change in market conditions), and (ii) significant market barriers and structural changes, which limit arbitrage and slow the movement of capital and thus the fast equalisation of sovereign premiums on the two types of markets.

CHART III.1 BOX

Credit premiums on the government bond and CDS markets of the Czech Republic and Austria

(bp)



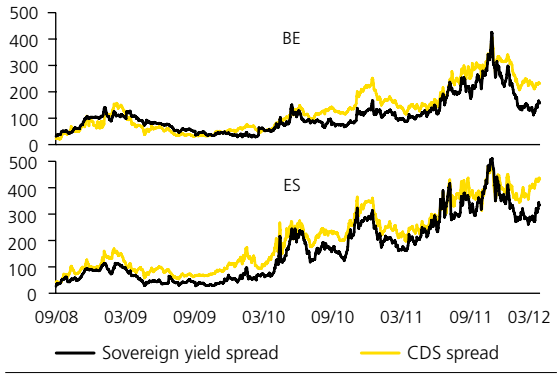
Source: Bloomberg LP, CNB calculation

Note: The credit premium on the government bond markets of the countries under review is calculated as the sovereign yield spread, i.e. the difference between the 5Y government bond yield of the relevant country and the German equivalent. In the case of the Czech Republic it is supplemented by the difference between the 5Y Czech government bond yield and the 5Y IRS in CZK (the ASW spread). Owing to the non-existence of a 5Y benchmark bond for the Czech Republic its yield was approximated between August 2009 and the start of 2010.

CHART III.2 BOX

Credit premiums on the government bond and CDS markets of Belgium and Spain

(bp)



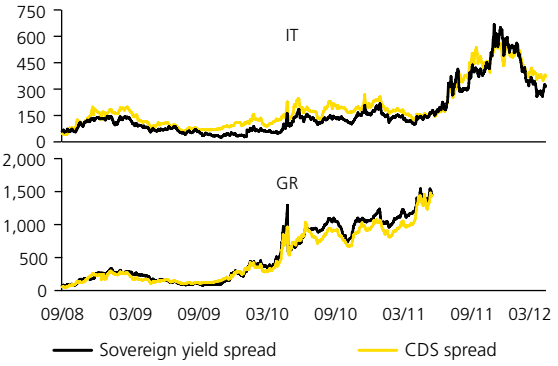
Source: Bloomberg LP, CNB calculation

38 IMF (2012): *Global Financial Stability Report,* April 2012

39 See, for example, Coudert, V., Gex, M. (2011): *The Interactions between the Credit Default Swap and the Bond Markets in Financial Turmoil*, CEPII, No. 2011–02; Delatte, A.-L., Gex, M., López–Villavicencio, A. (2010): *Has the CDS Market Amplified the European Sovereign Crisis? A Non-linear Approach*; Fontana, A., Scheicher, M. (2010): *An Analysis of Euro Area Sovereign CDS and Their Relation with Government Bonds*, ECB WP No. 1271; Zhu, H. (2004): *An Empirical Comparison of Credit Spreads between the Bond Market and the Credit Default Swap Market*, BIS, WP No. 160.

Chart III.3 box

Credit premiums on the government bond and CDS markets of Italy and Greece
(bp)



Source: Bloomberg LP, CNB calculation
Note: For GR, the entire period under review ends in May 2011.

Table III.1 box

Results of leading relationship analysis

	Entire period under review	Financial crisis period	
	VECM model	VECM model	Granger causality test
	(15/09/08–31/03/12)	(15/09/08–15/09/09)	
CZ	CDS market	CDS market	
AT	Equal	CDS market	
BE	CDS market		Bond => CDS
ES	CDS market		
GR	CDS market		Bond => CDS
IT	Bond market	Bond market	

Source: CNB calculation
Note: The Granger causality test was conducted if no cointegration relationship was found between the variables for the given period. "Bond => CDS" means that we reject the hypothesis that changes on the bond market do not cause changes on the CDS market at the 5% significance level. For GR, the entire period under review ends in May 2011. For CZ, the financial crisis period is shortened to July 2009 for data reasons.

The aim of this box is to analyse the relationship between these premiums using the example of the Czech Republic and to try to identify whether the leading sovereign premium in the Czech Republic is determined by the Czech government bond (cash) market or by the Czech sovereign CDS market. The leading ability of these markets was tested on five-year generic government bonds and five-year sovereign CDS spreads in 2008–2012 for the Czech Republic (and for comparison also for AT, BE, IT, ES and GR). The German bund is considered the risk-free benchmark for the analyses of euro area countries and the swap yield curve for the Czech Republic.[40] Since, in theory, there should be a close long-term relationship between the two markets, a cointegration method applying a VECM[41] was used, as in the foreign studies mentioned above.[42] Based on this method, or equations (Fontana and Scheicher, 2010), two key coefficients were obtained for the long-term cointegration relationship between sovereign premiums from the sovereign CDS and cash markets. The direction of the dependence and the significance and magnitude of the coefficients determined the speed of return to the long-term relationship between these premiums and thereby the leading position of one of them. To determine the relative significance of the two coefficients obtained using this method, the Gonzalo-Granger ratio – taking values in the range of 0 to 1 – was then used. In simplified terms, this ratio takes values higher (lower) than 0.5, the sovereign CDS market (bond market) is the leading market.

The plots of the two premiums over the entire period under review reveal a close long-term relationship (see Charts III.1 Box–III.3 Box) but quite frequent divergences in their levels, indicating limited arbitrage between the two markets. The largest difference occurred after the failure of Lehman Brothers, when market and funding liquidity fell sharply. This period was characterised by a flight to liquidity, with fast sales of some assets (including selected government bonds), and by an increase in aggregate risk aversion. As a result, the number of arbitrageurs fell significantly (Fontana and Scheicher, 2010). A flight to security rather than a flight to liquidity started to emerge in spring 2010. Investors, especially foreign ones, started to diversify more

40 As the Czech Republic is not a euro area country, the swap yield curve, which is also routinely used in literature as the risk-free benchmark, was used as an alternative to the bund. The swap yield curve can be used because it lies below the government yield curve. The difference between the yield on a representative government bond and the yield on the German bund of the same maturity is called the sovereign yield spread, and the difference between the yield on a representative government bond and the IRS yield of the same maturity is called the asset swap spread (ASW spread).
41 Vector error correction model.
42 Cointegrated series of two variables (the premium determined by the CDS market and the premium determined by the government bond market) return quickly to their long-term relationship if one of them deviates. If one of the variables deviates from the other, either the latter must move very quickly in the same direction or the former must move back very quickly.

between Central European countries and ranked the Czech Republic among the countries with a more stable fiscal outlook. The difference between the premiums under review therefore shrank in the Czech Republic.

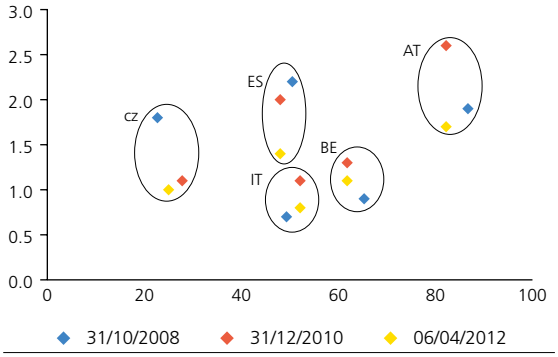
The results for the Czech Republic for the entire period under review put the Gonzalo-Granger ratio at 0.76, indicating that the sovereign CDS market is the leading market (see Table III.1 Box). By contrast, the Gonzalo-Granger ratio of 0.5 for AT indicates that the two markets were equal in strength. For more indebted countries (BE, ES and GR), the results showed the sovereign CDS market to be the leading market. The exception is IT, with a leading cash market. The model was estimated separately for the financial crisis period, which in Central and Eastern Europe was characterised by growth in foreign investor risk aversion towards this region as a whole due to an insufficient ability to distinguish between individual countries. For the Czech Republic and AT a cointegration relationship was found between the sovereign CDS market and the cash market and market events were clearly led by the sovereign CDS market. This relationship was not confirmed for the other countries analysed, except for IT with its leading cash market. This does not mean, however, that in BE and GR the two markets were completely independent of each other. The Granger causality test indicated that a change in the risk premium in the cash market of these two countries caused a change in the premiums on their sovereign CDS market in the financial crisis period. These results are in line with the fact that foreign investor aversion during the financial crisis was particularly visible in Central and Eastern Europe. This was reflected in the dominance of the CDS market in this period.

The leading position of the sovereign CDS market in the Czech Republic can be explained by means of several factors. The first factor, which can be more or less generalised for any country, falls into the category of aggregate risks. The bond price is affected by interest rate, default and liquidity risk, while the sovereign CDS spread is mostly affected by the default risk of the bond issuer and the credit risk of the counterparty to the contract. And it is market liquidity, or the flight-to-liquidity or flight-to-quality effects, that can foster increased interest in government bonds and a decline in their yields and the risk premium, even though the sovereign default risk remains unchanged according to fundamentals. The opposite applies for a decline in market liquidity. Market liquidity is not aided by the fact that a large part of government debt is held to maturity and hardly enters the secondary market at all.

Another possible factor, which is more a country-specific risk, is market size and market participant type. As a country's government debt grows, its sovereign risk premium rises and

Chart III.4 box

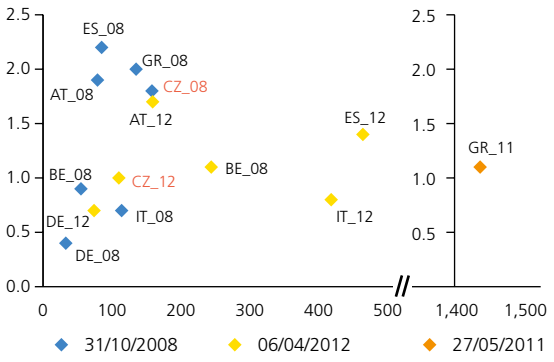
Sovereign CDS net notional amounts outstanding versus government bonds held by foreign investors
(%; x-axis: share of government bonds of given country held by foreign investors; y-axis: share of net notional amounts in total government debt)



Source: DTCC, Eurostat, EIU
Note: Owing to the unavailability of current data on debt held by foreign investors, the figure for 2010 is used for both 31/12/2010 and 06/04/2012, with the exception of CZ (2011 Q4). The figures for Greece and Germany are not available.

Chart III.5 box

Credit premiums on the sovereign CDS markets of the countries analysed
(x-axis: sovereign CDS spread in bp; y-axis: share of CDS net notional amounts outstanding in total government debt in %)



Source: Bloomberg LP, DTCC, EIU, CNB calculation

the motivation of debt holders to hedge against this risk should increase. On the other hand, if the debt is held mostly by domestic entities (the "home bias effect"), which are less motivated to hedge, it can be assumed that sovereign CDS premiums are created mostly by foreign entities. AT has a relatively high share of government bonds held by foreign investors, and interest in hedging Austrian debt differs from that in the Czech Republic (see Chart III.4 Box). The Czech Republic recorded a relatively significant decline in net CDS hedging as a percentage of total government debt compared to the start of the global crisis, while the value for AT initially increased with the onset of the debt crisis. Increased interest in hedging with the onset of the debt crisis is also visible for IT and BE. No data on the share of debt held by foreign entities were available for DE, but it can be seen (see Chart III.5 Box) that it was the only one to record increased interest in hedging with rising sovereign CDS spreads. This may indicate an increasing share of German debt held by foreign entities.

Market participant type is also associated with another factor affecting the difference in the premiums, namely contagion risk. The crisis has shown that the Czech sovereign CDS market responds to bad market news abroad more quickly and strongly than the government bond market. This is due partly to its relatively small size (see Charts III.4 Box and III.5 Box) and partly to foreign entities' higher sensitivity to uncertainty about global developments and their unwillingness to distinguish between individual countries in detail. A negative market shock can thus transmit between countries relatively quickly and without fundamental causes.

3.2 THE PROPERTY MARKET

Apartment prices on the residential property market continued to decline in 2011, although at a slower pace than in the past. The decline in prices was combined with a drop in the number of property transactions and a further deterioration in sales of new apartments in residential development projects. This was reflected in a rise in the NPL ratio in the property development sector. At the same time, however, growth in mortgage loans picked up pace, perhaps indicating the onset of a recovery on the market. An assessment of the property market situation using simple price sustainability indicators suggests slightly undervalued prices. However, this is largely due to the backward-looking nature of these indicators. Flat or slightly falling apartment prices can thus still be expected in the future given the expected evolution of the real economy. The downside risks stem mainly from the possibility of apartment foreclosures and a deterioration in the income situation of households. The commercial property segment saw a substantial rebound in investment demand, a decrease in vacancy rates and a recovery in new supply. It remains to be seen whether this rebound will lead to an overheating of the market.

Property prices fell for the third consecutive year in 2011

Following a marked decline in property prices in 2009–2010, 2011 was the third consecutive year in which the transaction prices of most types of property fell (see Chart III.18). Transaction prices of apartments fell most (by 1.2% at the end of the year) and are now about 20% down from the peak recorded in late 2008. Building plot prices also decreased (by 0.5% year on year; 1.3% below their peak). However, the decline in prices was smaller than in previous years, and family house prices actually rose (by 2% year on year at the end of 2011 H1; 2.3% below their peak). The downside risk assumed in FSR 2010/2011 was therefore confirmed.

Apartments, which have the most dynamic prices as well as probably the most representative index[43] and the most alternative sources of price data available, saw a slowing year-on-year decline in transaction prices[44] in 2011 (see Chart III.19). By contrast, the declines in asking prices deepened for most of the year, so the difference between the two types of prices narrowed. As regards regional developments, the property price decline in 2011 was stronger in Prague than in the rest of the Czech Republic. Given Prague's role as apartment price leader, this may signal lower prices in the other regions in the near future.[45]

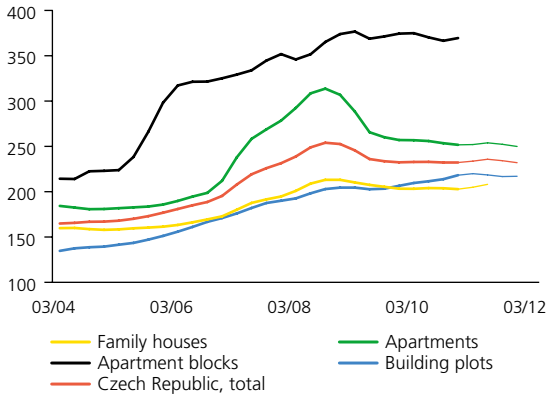
43 Apartments are more homogeneous than other types of property, so it is easier to construct an index for them (than, say, for family houses). The building plot price index is affected by the fact that around 85% of building plot transactions form part of complex property sales, which can involve tax optimisation and price distortion. The index of apartment block prices is affected by the relatively small number of transactions in that segment (about 18 times lower than for other property types).

44 Since last year the CZSO has been publishing two types of data on property transaction prices: traditional transaction prices based on data from the cadastre and, newly, data from a CZSO survey of estate agencies. See the Glossary for details.

45 However, the larger decline may be partly due to base effects, as apartment prices outside Prague fell more markedly than those in Prague in 2009.

CHART III.18

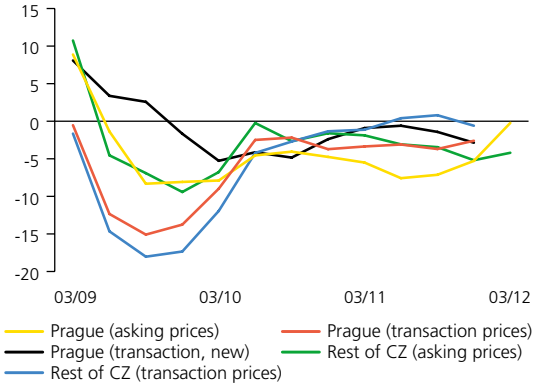
Property prices – transaction prices
(absolute index; 1999 Q1 = 100)



Source: CZSO, CNB calculation
Note: 2011/2012 data preliminary or calculated from asking prices.

CHART III.19

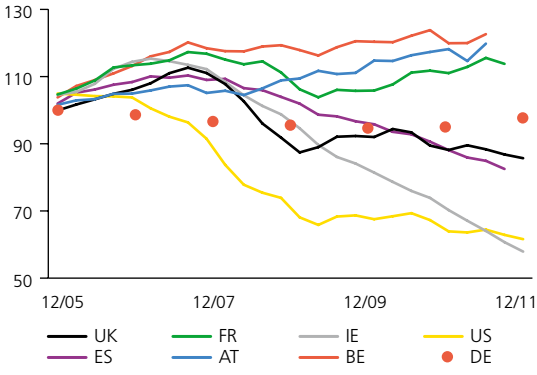
Property prices – transaction prices and asking prices
(y-o-y indices)



Source: CZSO

CHART III.20

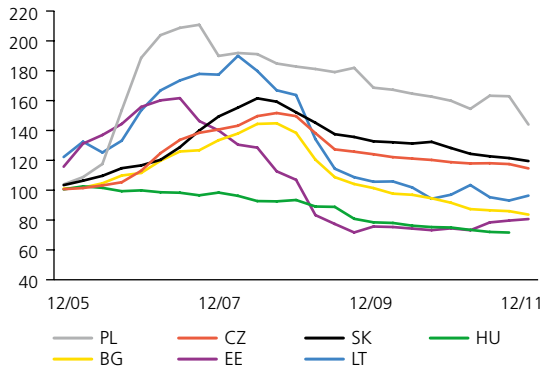
Property prices – international comparison, advanced countries
(prices in real terms; absolute index; 2005 average = 100)



Source: BIS, S&P (US), Nationwide (UK), national statistical offices

CHART III.21

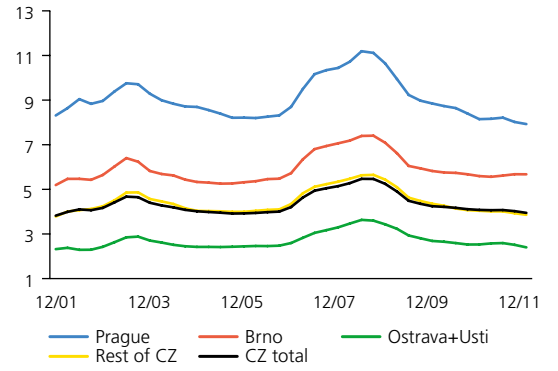
Property prices – international comparison, selected EU countries
(prices in real terms; absolute index; 2005 average = 100)



Source: BIS, national statistical offices and central banks

CHART III.22

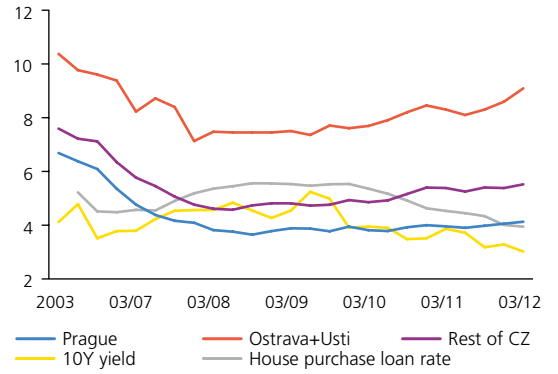
Price-to-income ratios
(ratio of price of 68 m² apartment to moving sum of wage for last four quarters)



Source: CZSO, CNB calculation
Note: 2011 data preliminary or calculated from asking prices.

CHART III.23

Rental returns
(averages for period in %; 2003–2006 yearly data, then quarterly)



Source: IRI, CNB
Note: Comparison with 10Y government bond yields and house purchase loan rates.

On the other hand, asking prices in Prague recorded a surprising 3.8% quarter-on-quarter rise in early 2012. This was probably linked with the increase in VAT on property on 1 January 2012 (from 10% to 14%) and will therefore probably be one-off in nature. However, it could also be a sign of stabilisation on the apartment market.

Property prices abroad are mixed

Property prices in the Czech Republic moved in line with prices abroad, as in many countries the real property market declines continued mostly at a slower pace than at the time the financial crisis escalated (see Charts III.20 and III.21). Price declines deepened in countries where the financial crisis was aggravated by debt crisis (real decreases of 17.8% in Ireland, 9% in Spain and 6.3% in Greece in 2011). Property prices started to rise in some countries that had recorded subdued price growth in the previous decade (by 3% in Austria, 2.8% in Germany and 6.3% in Switzerland). Property price movements were more or less predictable immediately after the onset of the financial crisis, with larger falls occurring in countries that had recorded the fastest price growth in previous years, whereas the developments over the last two years have been rather mixed. Therefore, it is difficult to predict in which countries problems due to property price overvaluation might arise.[46] Such problems could happen in countries where the property price declines have not fully reversed the rapid pre-crisis growth (e.g. France or Sweden), but also in countries where the growth was relatively moderate in individual years but prices rose to relatively high levels (Austria, Belgium and Italy). From the point of view of the Czech banking sector and potential cross-border contagion, it is alarming that there is talk of overvalued prices in the countries of the parent banks of the biggest Czech financial institutions (Austria, Belgium and France).

Most countries in the group of developing EU states saw similar property price developments as the Czech Republic, although their real price declines were slightly more pronounced (10% year on year in Poland, 8.7% in Bulgaria, 6.8% in Slovakia and 4.9% in Hungary, compared to 3.5% in the Czech Republic). In the Baltic states, which had recorded the sharpest price decreases during the financial crisis (to one-half of their previous peaks), prices stabilised, and in Estonia they actually rose (by 8.4%).

Property price sustainability indicators improved

Property price sustainability indicators improved further, primarily on the back of the aforementioned price decline. Overall, these indicators point to slightly undervalued property prices. The price-to-income ratio for the entire Czech Republic fell by 3.3% on average over the course of the year and was 27.9% down from its mid-2008 peak (see Chart III.22). In most regions, this indicator is below or very close to the level observed in 2005 H2, i.e. before the last major price increase.

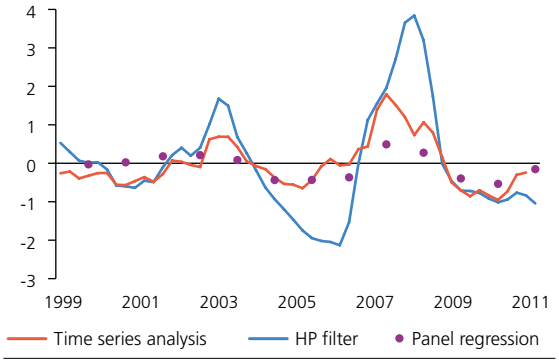
46 For a discussion of this issue, see also *Global Economic Outlook*, April 2012, CNB.

The apartment rental return (see Chart III.23) rose in year-on-year terms in all the monitored regions (by 0.2 pp on average). Given a concurrent drop in yields on alternative assets (yields on ten-year government bonds were down by 0.8 pp) and a decline in interest on house purchase loans, apartment rental returns exceeded these interest rates in all regions. On the one hand, this implies low pressure for a further decline in apartment prices, but on the other hand it opens up the possibility of speculative property purchases financed by mortgages, which are recording record-low interest rates. In the context of relatively rapid growth in new house purchase loans (see section 5.1), it cannot be ruled out that such purchases have already been going on to some extent during 2012. Although the negative effects of mass speculative property purchases are generally smaller at a time of falling prices than in a period of buoyant price growth, there is a risk of a property bubble emerging from below (i.e. prices stay constant while the fundamental value of property is driven down by adverse economic developments). In future, both the rental return and the price may be affected ongoing rent deregulation[47] coupled with the possibility of growth in the supply of apartments as a result of that deregulation and the none-too-good financial situation of many households (see section 2.3).

As in previous years, property prices were affected above all by the labour market situation in 2012. Although the registered unemployment rate fell by about 0.7 pp and the number of vacancies rose by 17%, the overall income situation of households was unfavourable, with real wages rising at a record-low pace and real disposable income falling (see section 2.3). Turning to the demographic determinants of property prices, natural population growth fell further (by 82.3% year on year) and is nearing zero. Population growth due to migration rose slightly (by 7.9%) but remains very low (the second lowest increase since 2002). Moreover, it is driven by a decrease in emigration, while immigration continued to fall and reached the lowest level since 2001. Despite the above explanation of the property price decline in 2009–2011 having stemmed from a deterioration in the price determinants, part of the decline remains unexplained, probably because of the negative outlooks for households, which are difficult to capture in the data. This fact was reflected in the "statistical" undervaluation of property prices according to most of the methods considered (in addition to the gaps shown in Chart III.24, this includes the property price sustainability indicators discussed above). However, the extent of the undervaluation was relatively modest and decreased towards the end of the year. Given the expected macroeconomic developments

CHART III.24

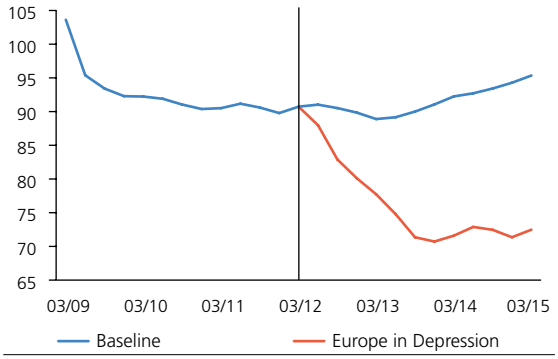
Apartment price gaps in the Czech Republic – devations of actual prices from estimates
(CZK thousands per m²; positive values overvaluation, negative values undervaluation)



Source: CZSO, CNB calculation (WP 12/2009)

CHART III.25

Property price index according to different scenarios
(2007 Q4 = 100)

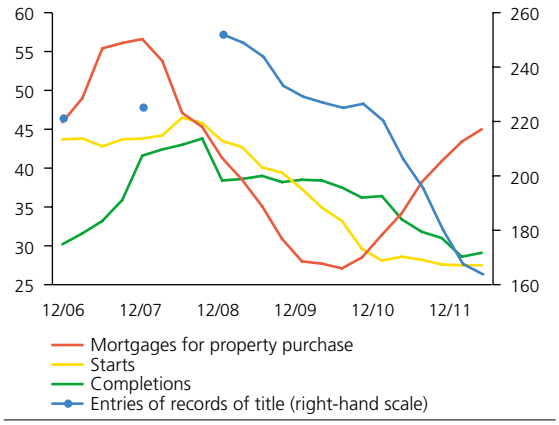


Source: CNB

47 The existing regulation was abolished for around 400,000 apartments on 1 January 2011, and rents in these apartments should now be determined on a contractual basis. In the remaining roughly 300,000 apartments (in regional capitals excluding Ústí nad Labem and Ostrava and in large municipalities in Central Bohemia), the existing regulation will remain in place until 1 January 2013. However, as regulated rents are already close to market rents (the ratio of market to regulated rents is 1.04 in Prague), most of the deregulation was already reflected in rents in 2012.

Chart III.26

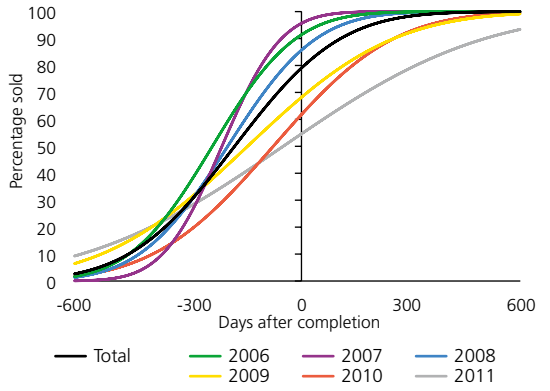
Numbers of transactions in the property market
(thousands of transactions; moving sums for the past year)



Source: CZSO, COSMC, FINCENTRUM HYPOINDEX
Note: Entries of records of title to buildings and apartments only.

Chart III.27

Progress with the sale of residential developments



Source: CTU, CNB calculation
Note: Estimated S-curves (cumulative normal distributions) with minimum deviations from individual projects (see Hlaváček, Prostějovská and Komárek, 2011)

and the deterioration in the financial situation of households, the *Baseline Scenario* continues to assume flat or slightly falling apartment prices, although they could begin to rise in 2013 H2 (see Chart III.25). However, this scenario is subject to considerable risks. In addition to the impacts of rent deregulation and adverse macroeconomic developments, foreclosures affecting overindebted households or developers with loan repayment problems remain a downside risk to prices. The *Europe in Depression* stress scenario, which reflects the risk of a substantially negative macroeconomic outlook, estimates a drop in property prices of up to 22%. On the other hand, the higher profitability of speculative property purchases and partly also the increase in VAT on newly completed apartments may be sowing the seeds of a short-term speculative bubble.

The number of property market transactions is falling

The property price decline was also associated with a decrease in the number of property market transactions due to lower demand among households and smaller supply of new apartments (see Chart III.26). The number of entries of records of title to houses and apartments in the cadastre[48] and the number of newly completed apartments (which reacted with a lag to an earlier drop in apartment starts) declined quite quickly. On the other hand, the mortgage market recovered, as the number of mortgages increased (see Chart III.26) and the average mortgage amount also went up slightly. This recovery was due largely to substitution between mortgages and building society loans,[49] a rise in the share of refinancing in new mortgages (see section 2.3) and a one-off recovery in demand for new apartments linked with the VAT increase. Given that past changes in the number of mortgages have preceded changes in the number of transactions, this can be regarded as a sign of stabilisation on the apartment market.

Significant risks associated with residential developments persist

The decline in property market activity in 2011 also had an adverse effect on progress with the sale of residential developments, where there was a further increase in the time it takes to sell new apartments (see Chart III.27). Before the onset of the financial crisis, almost 95% of all the apartments in a typical development were sold prior to completion, whereas in 2011 the figure fell to 54%.[50] This is increasing the financing needs of developments, as well as reducing their profitability and their ability to repay loans. The increase in the time it takes to sell new apartments in residential developments may reflect, among other things, the low transparency of developers, with households postponing purchases in response to the increased credit

48 However, the total number of entries of records of title increased in late 2011/early 2012, from 402,600 to 411,200.
49 Given the significant decrease in interest rates on new mortgage loans and the relatively rigid interest rates on building society loans, mortgage loans are currently cheaper.
50 The methodology for estimating progress with the sale of a typical development is described in the thematic article *An Analysis of Progress with the Sale of Residential Developments* in FSR 2010/2011.

risk they would otherwise have to bear. At the same time, however, marked differences in the success of individual developments are apparent, as customers differentiate more between developments according to their quality and price. The worse progress with sales is also in line with the rise of around 4.3% in the number of unsold completed apartments in 2011 (Trigema data). However, 2011 H2 saw a recovery in demand for residential developments, with the number of apartments sold in Prague rising by 30% year on year (Ekospol data for developments of more than 50 apartments). This was associated with the one-off VAT increase from 10% to 14% in early 2012 and also with a decline in apartment prices in developments, which occurred with a lag compared to older apartments (see the time series of transaction prices of new apartments in Chart III.19).

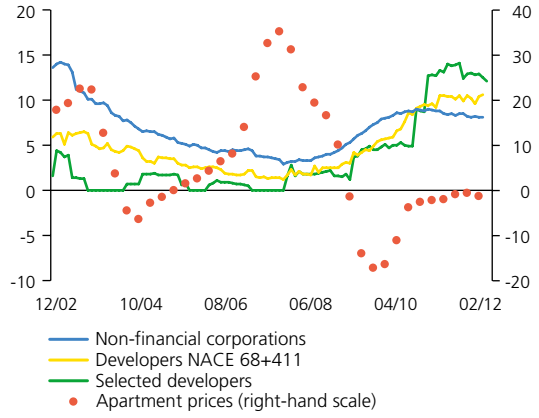
The longer apartment sale periods for developments and the decline in apartment prices were reflected in relatively rapid growth in the ratio of non-performing loans to developers. This ratio increased by 1.4 pp during 2011 and 2012 Q1 despite a 0.7 pp decrease in NPLs in the non-financial corporations sector as a whole (data for corporations in the property sector and developers in NACE 68 and 411; see Chart III.28).[51] The NPL ratio is thus about 2.5 pp higher than in the non-financial corporations sector. The NPL ratio for selected developers is even higher, still exceeding 12% despite a decrease in the second half of the year.

The commercial property sector recovered

Following previous declines, the commercial property sector saw a substantial recovery in investment activity in 2011 (see Chart III.29). Total investment in commercial property reached around EUR 2.07 billion in 2011, i.e. roughly 2.6 times the figure recorded in 2010. Retail was the most active segment (accounting for about 50% of investment). Commercial property take-up (the volume of renting) also recovered. For example, gross take-up of office property rose by 52% year on year. The share of renegotiations in gross take-up fell from 42% in 2010 to 29.7%,[52] so net take-up increased even faster. The vacancy rate for office property declined by 1.2 pp to 12% in 2011 (see Chart III.30). Similarly, the vacancy rate for industrial property decreased to 6.7% (down by 12 pp from the record high recorded in 2009 Q2) and that for retail fell to 5.0% (from 6.4% in 2009). The recovery in new supply continued above all for office buildings, where total floor area increased by 3.8% year on year, and for industrial property (a rise in floor area of 8.6%). The recovery in take-up was also reflected in higher prices and a related annual drop in yields on commercial property

CHART III.28

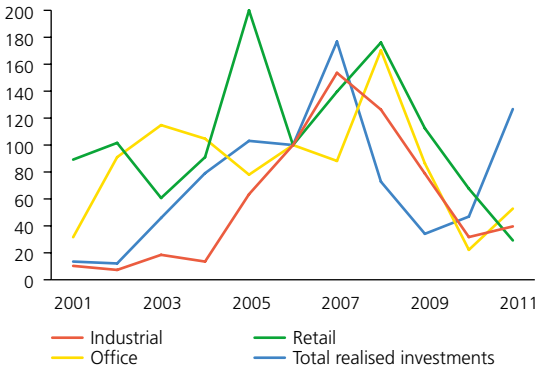
NPL ratios in the property development sector
(%; year-on-year growth for apartment prices)



Source: CZSO, CNB

CHART III.29

Planned supply and realised demand on the commercial property market
(2006 = 100)



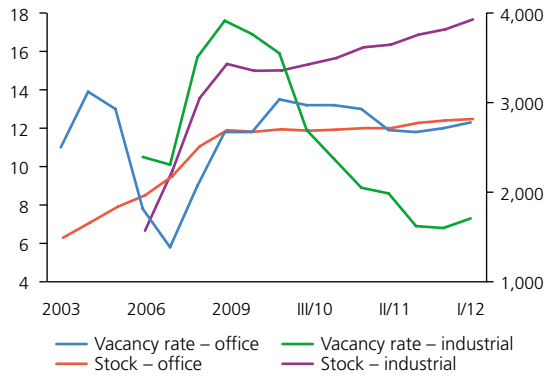
Source: Jones Lang LaSalle
Note: Supply of industrial, retail and office property calculated from new supply in m^2; realised investments from data in EUR.

51 The NPL ratio for developers in Chart III.28 is calculated in two ways; both use the CNB's Central Credit Register as the source of data. The first method is based on selected (the largest) developers and related companies (about 1,000 entities). The second series shows loans granted to all corporations in the categories "Real estate activities" (NACE 68) and "Development of building projects" (NACE 411). Owners' associations and housing cooperatives were excluded.

52 Jones Lang LaSalle data.

Chart III.30

Total stock and vacancy rates
(vacancy rate in %; stock in thousands of m² on right-hand scale; 2003–2009 yearly data, then quarterly)



Source: Jones Lang LaSalle, Prague Research Forum

(of around 0.25 pp for most types of commercial property). However, the decline in the return on speculative assets was even sharper, which again opens up the possibility of speculative property purchases. There is a question as to whether the recovery in investment activity – driven mainly by foreign entities – and the related rise in new supply reflect a search for yield without being linked to the domestic economic situation. This could lead to an overheating of the market and an increase in the vacancy rate, something that already partially occurred in 2012 Q1 (see Chart III.30).

4 THE FINANCIAL SECTOR

2011 was a relatively good year for the Czech financial sector. The banking sector as a whole maintains a good starting position in terms of credit risk, capital adequacy and profitability, but the situation remains quite heterogeneous across the sector. Insurance companies have solid capitalisation this year, but their profitability decreased. The pension fund segment remains stable but will be affected by a reform of the pension system. The market shares of collective investment funds and, as in the previous year, of non-bank financial corporations engaged in lending decreased slightly.

The risks to the financial sector consist mainly in possible worse-than-expected performance of the Czech economy, which could substantially increase the credit losses of Czech banks despite their caution in providing loans. If concerns regarding the ability of governments to stabilise fiscal imbalances spread and financial market turbulence re-emerges, substantial bond revaluation could take place, affecting financial institutions' balance sheets. Another significant risk is potential contagion from the foreign banking system through the links between Czech banks and their parent companies, for example if the above-mentioned two risks were to materialise.

The depth of financial intermediation in the Czech Republic increased in 2011

The relatively favourable economic developments in 2011 and persisting confidence in the Czech financial sector were reflected in a rise in the balance-sheet total of the financial sector. The ratio of financial institutions' assets to GDP increased from 143% in 2010 to 150% in 2011.[53] Banks, and partly also credit unions and pension funds, strengthened their shares in the financial sector. By contrast, the shares of insurance companies, collective investment funds and non-bank financial corporations engaged in lending decreased slightly (see line FS.2 of the Table of Indicators). On aggregate, the largest growth in assets was recorded in the banking sector, owing chiefly to purchases of government bonds and the provision of new loans.

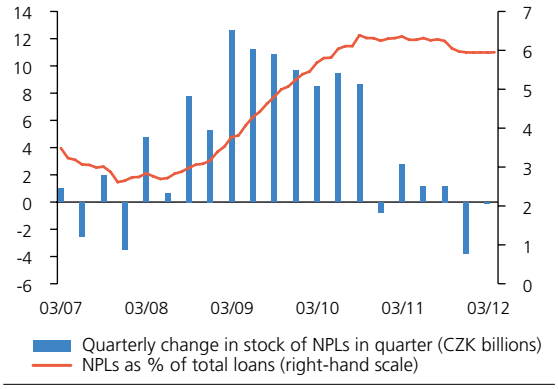
Credit risk in the banking sector improved slightly in 2011

In contrast to 2009–2010, there was no further strong growth in NPLs, and their ratio to total loans declined slightly to 6% at the end of 2011 (compared to 6.3% at the end of 2010). The ratio remained at a similar level in March 2012. This was due not only to a smaller absolute change in NPLs, which in 2011 H2 returned close to its pre-crisis levels of 2007–2008 (see Chart IV.1), but also to moderate growth (of around 6%) in the total volume of loans provided. An international comparison between selected EU countries shows that the NPL ratio in the Czech Republic is similar to that in Slovakia (5.6%), higher than in Austria (2.7%) and Belgium (2.8%), and lower than in Poland (8.2%), Slovenia (11.8%) and

53 Because of a substantial data revision, this figure is not in line with the one published in FSR 2010/2011 (see the Table of Indicators).

CHART IV.1

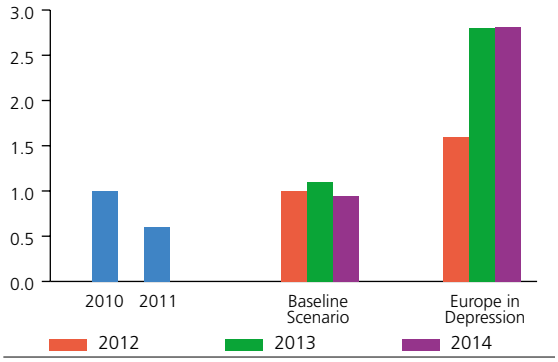
NPLs in the Czech banking sector
(client loans; %, CZK billions)



Source: CNB

CHART IV.2

Risk costs of the banking sector
(%)



Source: CNB, CNB calculation

TABLE IV.1

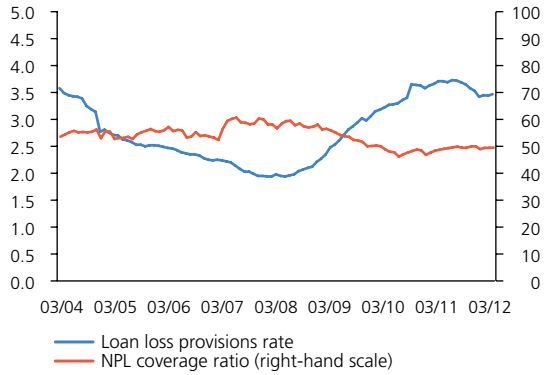
Shares of loans in segments restructured in the given year
(%)

	Non-financial corporations	Households (house purchase loans)	Households (consumer credit)
2008	0.4	0.2	0.1
2009	1.0	0.5	0.9
2010	1.9	0.6	1.6
2011	1.9	0.5	1.4

Source: CNB
Note: Credit excluding overdrafts and card credit.

Chart IV.3

Provisions and coverage of NPLs by provisions
(%)



Source: CNB

Table IV.2

Structure of NPLs
(%)

	Sufficiently collateralised loans to households and corporations	Fully non-collateralised loans to households and corporations	Other loans	NPLs, total
2008	26.4	38.6	35.0	100.0
2009	31.0	32.5	36.5	100.0
2010	35.1	31.5	33.4	100.0
2011	36.8	30.6	32.6	100.0
	Non-standard	**Doubtful**	**Loss**	**NPLs, total**
2008	31.3	15.0	53.6	100.0
2009	37.8	21.0	41.2	100.0
2010	39.2	13.4	47.4	100.0
2011	32.8	14.1	53.1	100.0
	Not past due	**Up to 3M past due**	**More than 3M past due**	**NPLs, total**
2008	45.2	9.2	45.6	100.0
2009	52.9	8.7	38.4	100.0
2010	51.8	9.6	38.6	100.0
2011	46.0	9.3	44.8	100.0

Source: CNB, CNB calculation
Note: Sufficiently collateralised loans = loans for house purchase + loans to corporations backed by property and at least two other types of collateral (pledged receivables, movables, securities, sureties, guarantees, etc.).

Hungary (13.3%).[54] A moderate decline in credit risk is also indicated by the evolution of risk costs, defined as net provisioning relative to total loans (see Chart IV.2), and by the evolution of loan restructuring in both the household segment and the non-financial corporations segment (see Table IV.1). The risk of banks using loan restructuring to avoid admitting default by debtors and using the current low interest rate environment to reduce the burden on debtors is significantly limited by law, compliance with which is actively supervised. The legislation deems a change in the terms and conditions of a loan agreement that is motivated by the debtor's inability to repay under the original terms and conditions to be forced restructuring, and the bank is required to categorise the restructured loan as non-performing and create provisions where relevant.

The outlook for the near future represented by the *Baseline Scenario* assumes moderate growth in NPLs and risk costs owing to stagnation of the Czech economy in 2012. However, if the adverse *Europe in Depression* scenario were to materialise, risk costs would more than double (see Chart IV.2).

At the aggregate level, credit risk can be regarded as sufficiently covered by provisions, but risks remain…

NPL coverage was just below 50% throughout 2011 and stood at 49.5% in March 2012 (see Chart IV.3). This confirms that banks created sufficient provisions in the previous period to cover the stagnating volume of NPLs. However, the question remains whether coverage of around 50% will be sufficient in a stagnating economy in the period immediately ahead. On the one hand, the proportion of well secured NPLs increased further in 2011 (see Table IV.2), but on the other hand valuation of property and other types of collateral may be problematic in a situation of weak economic performance.

Other signals from the evolution of the NPL structure may indicate some risks. In 2011, the share of NPLs categorised as loss loans increased significantly.[55] The share of loss loans in total NPLs reached the level observed in 2008, when, however, the volume of NPLs was much smaller. Given the current economic situation, moreover, it is reasonable to expect continuing migration of NPLs towards loss loans and a need for additional provisions or write-offs, with an adverse knock-on effect on bank profitability.

The available data still indicate relatively cautious categorisation of NPLs, as a large proportion of these loans (46%) are not actually overdue. By comparison with 2010, however, the share of loans that are not past due is decreasing and the share of all loans that are more than three months past due is rising (see Table IV.2). This phenomenon, too, reflects the migration of NPLs conservatively categorised in past years into worse NPL categories and may represent a risk of additional provisioning.

54 Figures based on IMF data (Financial Soundness Indicators) as at the end of 2011.
55 This share increased from 52.7% to 59% in the household sector (house purchase loans from 41.2% to 45.2% and consumer credit from 58.8% to 54.8%) and from 29.6% to 33.1% in the non-financial corporations sector.

There are quite large differences in NPL coverage across domestic banks

For most banks, the coverage of NPLs by provisions is close to the sector average. However, there are banks in which this indicator is much lower. Moreover, the NPL ratios of these banks exceed 10%, which is well above the sector average and is roughly equivalent to the third quartile of the distribution of banks according to this indicator (see quadrant IV of Chart IV.4). Although the lower volume of provisions may also reflect better collateralisation of NPLs in some banks (e.g. by guarantees and pledges) or a higher repayment probability, the combination of a high NPL ratio and low coverage by provisions may represent an increased risk at least to some banks in the "problematic" quadrant IV. Similarly, an analysis of the NPL structure by default period shows that in some banks with high NPL ratios loans are categorised only after they become overdue (see quadrant II of Chart IV.5). Although these banks may categorise loans in accordance with the applicable regulation, they face a higher risk of additional provisioning, as they lack the safety buffer of "cautiously" created (and thus partly forward-looking) provisions for categorised loans that are not past due.

To assess the coverage of NPLs with provisions, an analysis of sufficiency of provisioning was performed, based on a comparison of the actual and "required" coverage levels using loss given default (LGD) values.[56] In comparison with 2010 there is a higher number of banks whose actual degree of coverage exceeds the "required" level (see Chart IV.6). Even in 2011, however, more than one-half of the monitored banks would not reach the "required" coverage in the event of an additional stress adding 10 pp to the initial LGD values.

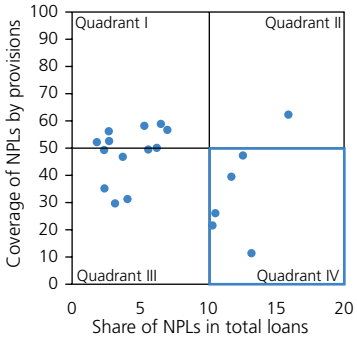
The risks connected with government bond holdings in banks' balance sheets are rising as their share in the banking sector balance sheet increases

A preference for low-risk assets among domestic and foreign banks has been apparent since the onset of the financial crisis. Domestic banks increased their holdings of domestic government bonds from 11% of their balance-sheet total at the end of 2008 to 15.1% at the end of 2011. Although a flight to quality is also visible in the euro area, the share of domestic government bond holdings in the balance sheet of euro area monetary financial institutions excluding central banks has long been much lower than in the Czech Republic (see Chart IV.7), due mainly to a lower excess of client bank deposits over loans. There are several incentives for domestic banks to increase their holdings of

56 The "required" coverage should cover NPL losses and was therefore calculated as the product of the LGD values and the volume of NPLs according to the main segments (loans to corporations, loans for house purchase, consumer credit and other loans). The baseline LGD values for the individual portfolio categories were identical to the values reported by banks in the joint stress test project. For other banks (excluding foreign bank branches) which did not participate in the project, averages for the participating banks were used. The LGD values applied in 2011 were 42% for loans to non-financial corporations, 20% for house purchase loans, 46% for consumer credit and 42% for other loans. The calculated average required coverage for the baseline LGD values was 37.9% for 2010 and 35.2% for 2011. The figures for LGD under additional stress were 47.9% for 2010 and 45.2% for 2011.

CHART IV.4

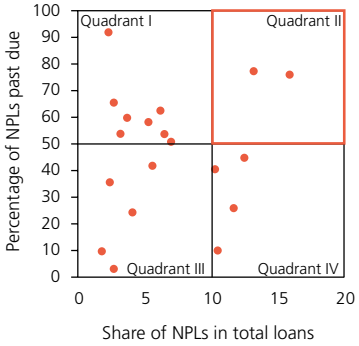
NPL coverage
(%; client loans; as of 31 December 2011; NPLs = non-performing loans)



Source: CNB
Note: Banks excluding branches of foreign banks.

CHART IV.5

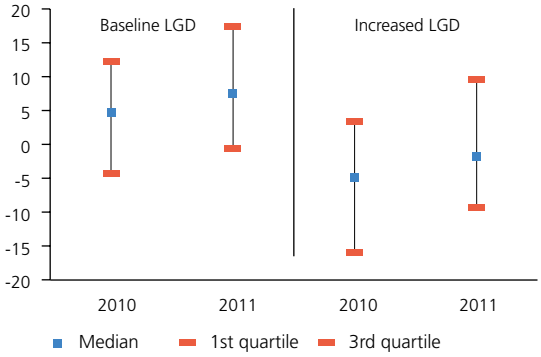
Credit risk in banks' balance sheets
(%; client loans; as of 31 December 2011)



Source: CNB
Note: Banks excluding branches of foreign banks.

CHART IV.6

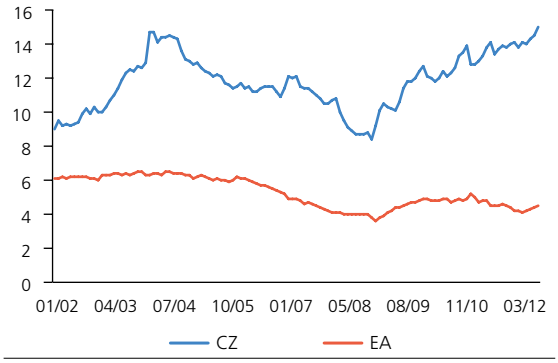
Differences between actual and required level of NPL coverage by provisions according to the LGD method
(pp; for the additional stress 10 pp was added to the LGD)



Source: CNB

Chart IV.7

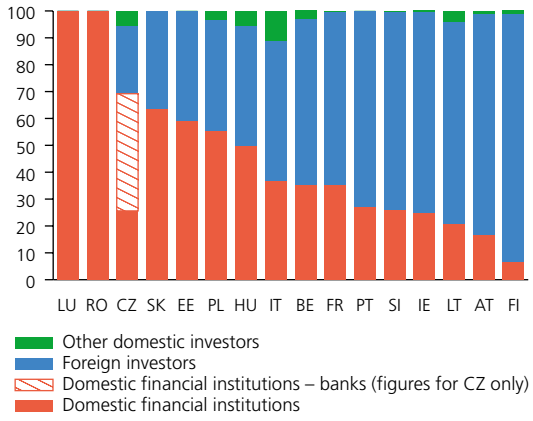
Share of bonds issued by domestic governments in the balance sheet of MFIs excluding central banks
(%, MFIs excluding central banks comprise credit institutions and money market funds)



Source: ECB

Chart IV.8

Government bonds holdings by type of investor
(%; 2010; figure for CZ for 2011 Q4)



Source: Eurostat, CNB

domestic government bonds. The current applicable regulation assigns a zero risk weight to domestic government bonds in the calculation of capital adequacy. This gives banks a relatively certain yield amid a minimum cost of capital.[57] Czech government bonds are regarded as very liquid assets, also because banks can use them as collateral in the CNB's liquidity-providing repo operations, which were introduced in 2008 to support the bond market and still remain among the CNB's instruments (see Box 3 in section 3.1). Although the use of these operations is not significant given the good liquidity position of the banking sector, they provide banks with a liquidity safeguard at this time of increased uncertainty. In the medium term, however, they may foster a rise in concentration risk in the sense of asset concentration vis-à-vis a single debtor (the government).

However, the zero regulatory risk weight motivating banks to hold domestic government bonds may also lead to a higher tolerance of banks to Czech government debt and therefore to less cautious assessments of sovereign risk. This may, in turn, support further expansion of government debt. As the Czech banking sector currently holds about 44% of the total volume of government bonds (see Chart IV.8), a significant rise in credit risk and a loss of confidence in the government's ability to maintain fiscal stability might lead to significant sales of bonds from banks' balance sheets, either at the decision of the banks themselves or at the behest of their foreign owners. This would lead to a sharp decrease in the Czech Republic's ability to refinance its debt in the market and to a slump in the market value of these securities, which would also have a secondary effect on other holders, e.g. pension funds and insurance companies.[58] This scenario represents a medium-term risk in the event of continuing expansion of Czech government debt.

The off-balance-sheet activities of banks remain significant, despite decreasing since the start of the crisis

Banks' off-balance-sheet activities are closely correlated with the business cycle, with economic growth supporting growth in the off-balance-sheet total until 2008. By contrast, the crisis period saw a decline in irrevocable loan commitments given (of almost 20% between 2008 and 2011), owing to subdued credit growth, and in derivative contracts (of 41% between 2008 and 2011). On the other hand, a rising trend was recorded by guarantees given for clients (up by 6% between 2008 and 2011) and pledges received by banks (up by 24% between 2008 and 2011) owing to the higher economic uncertainty and the related need for both clients and banks to hedge against risks (see Table IV.3). At the end of 2011, total off-balance-sheet assets were CZK 6.7 trillion (i.e. around 150% of the banking sector's balance-sheet total) and off-balance-sheet liabilities were CZK 10.1 trillion (225% of the banking

57 Some banks applying the IRB approach to the calculation of capital adequacy use slightly positive risk weights for government bonds.

58 While banks may hold any amount of Czech government bonds as held-to-maturity receivables, which are not revalued to fair value, in the case of pension funds and insurance companies the volume of government bonds not revalued to fair value is limited by regulation. Moreover, the new Solvency II regulatory framework should completely rule out this possibility.

sector's balance-sheet total). However, the overwhelming majority of the off-balance sheet (almost 90% of all off-balance-sheet assets and almost 60% of off-balance-sheet liabilities) consists of derivatives transactions, which are recognised in off-balance-sheet assets and liabilities at the value of the underlying instrument. The fair value entering the balance sheet is much lower than that of the underlying instrument.[59]

However, the considerable decrease in banks' off-balance-sheet activities due to the crisis does not necessarily correspond to a decline in the risks arising from the off-balance sheet, which for some items, conversely, can increase in bad times. First, higher drawings on irrevocable credit facilities and payments under guarantees provided may represent a liquidity risk for banks (see the liquidity stress tests in section 5). Second, the fact that these items are potential receivables also gives rise to credit risk, which may not be negligible in a period of weak economic performance. The ratio of irrevocable facilities and guarantees to banks' balance-sheet total is a sizeable 16.3%, exceeding the figure for the EU in 2008 by approximately 5 pp.[60]

Banks regularly assess credit risk from contingent receivables in the form of commitments and guarantees given and create reserves for these potentially risky exposures. Commitments and guarantees are also subject to capital regulations and enter the calculation of the capital requirements for credit risk.

The decline in economic activity increases the probability of payments under guarantees and associated risks

The provision of guarantees to legal entities and natural persons who are entrepreneurs fell moderately between the start of the crisis and late 2010. The volume of "risky" guarantees, defined as guarantees given by a bank for clients who are in default, rose in line with the NPL ratio between 2008 and 2010 (see Chart IV.9). Besides the probability of having to honour a guarantee to a third party, the bank's expected loss from the resulting balance-sheet claim on the client also increases in the case of such guarantees.[61] The volume of "risky" guarantees varied over time depending on the economic situation, reaching almost CZK 9 billion in 2010 but falling considerably to CZK 4 billion in 2011 in connection with the moderate post-crisis recovery. If this risk were to materialise in full, the NPL ratio in the non-financial corporations sector would rise by around 0.5 pp.

TABLE IV.3

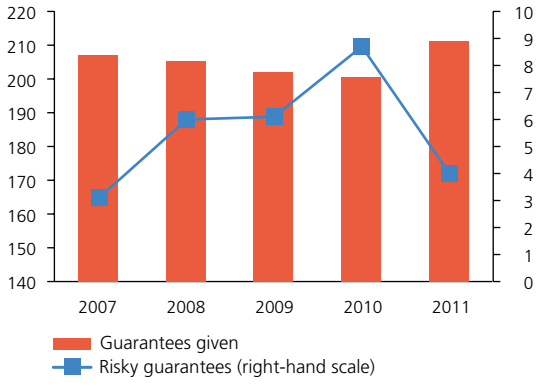
Off-balance-sheet items
(CZK billions)

	31 Dec. 2008		31 Dec. 2011	
Receivables (liabilities) from derivatives	9,832	(9,826)	5,829	(5,834)
Commitments given (received)	609	(108)	491	(26)
Guarantees given (received)	225	(385)	238	(410)
Pledges given (received)	2	(1,475)	13	(1,822)
Receivables (liabilities) from spot transactions	44	(44)	48	(52)
Write-off receivables	29	(" ")	39	(" ")
Values given (received) to custody and asset management	50	(1,398)	35	(1907)
Off-balance-sheet assets (liabilities), total	10,791	(13,236)	6,694	(10,051)
Share of value of off-balance-sheet assets and liabilities in banking sector balance sheet (%)	267	(327)	150	(225)

Source: CNB
Note: In terms of notional value derivatives are made up mainly of interest rate derivatives (68% at the end of 2011) and currency derivatives (31% at the end of 2011). The share of interest rate swaps (IRS) in total interest rate derivatives is 90%.

CHART IV.9

Risky guarantees
(CZK billions; legal entities and individual entrepreneurs)



Source: CNB
Note: Risky guarantees = Volume of guarantees given to clients who have a non-performing loan with the given bank or another bank.

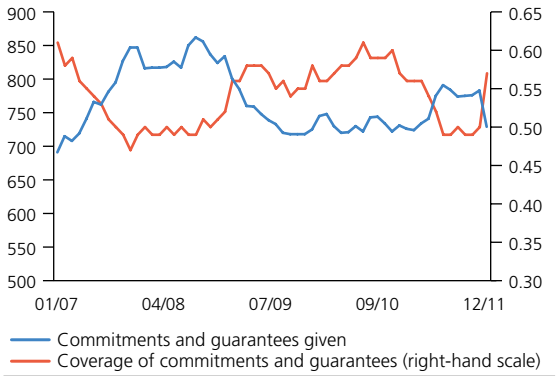
59 At the end of 2011, for example, the positive fair value of derivatives totalled CZK 162 billion, i.e. only 2.8% of the value of the underlying instruments recorded in off-balance-sheet assets.

60 The ratio of loan commitments and guarantees given to assets in the EU was 11% in 2008 (ECB, EU Banking Sector Stability 2009) as compared to 16.3% and 20.6% in 2011 and 2008 respectively for the Czech Republic.

61 The bank will first make good on the guarantee, i.e. pay the agreed amount for the client to a third party, but it will then record a claim on the client equal to the amount paid under the guarantee. If the payment under the guarantee was due to the client's bankruptcy, it can directly classify the claim as an NPL with a usually high loss given default.

CHART IV.10

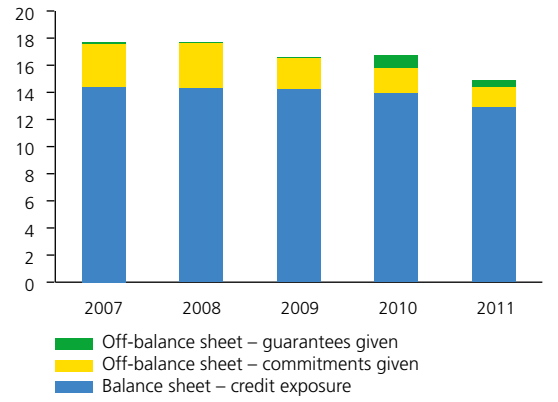
Coverage of commitments and guarantees by reserves
(CZK billions; %)



Source: CNB

CHART IV.11

Concentration of corporate portfolios, including the effect of the off-balance sheet
(%; share of three largest client credit exposures in corporate portfolio, including off-balance-sheet items)



Source: CNB
Note: The corporate portfolio represents credit exposures to all legal entities. Concentration is calculated as a weighted average of the concentrations of the portfolios of individual banks, where the weights used were the market shares of the banks in the total portfolio of loans to legal entities.

Reserves for off-balance-sheet items may be too low

As in the case of loans provided, from the point of view of the banking sector the risks arising from guarantees provided must be discussed in the context of the sufficiency of their coverage (see Chart IV.10). The reserves created for off-balance-sheet items, i.e. for irrevocable loan commitments and guarantees, are virtually constant over time (between the start of the crisis and the end of 2011 the reserves averaged CZK 4.2 billion), in contrast to the more volatile amount of commitments and guarantees given. Together with the long-standing relatively low coverage of off-balance-sheet items (below 1% of the volume of off-balance-sheet items), this raises the question of sufficient and flexible creation of reserves to cover expected losses from the off-balance-sheet activities of banks.

Loan portfolio concentration is falling steadily…

The average (weighted) concentration of client loan exposures, as measured by the share of the three largest exposures in the portfolio of loans to legal entities, is around 13%, but has been recording a moderate downward trend in recent years (see Chart IV.11).[62] If the definition of the three largest exposures were to include loan commitments and guarantees, the average concentration rate would be higher (15% in 2011), but it would also be falling slightly over time. Some concentration in bank portfolios is unavoidable given the size of some corporations operating in the Czech Republic and their financing needs. However, the observed greater involvement of banks in syndicated loans and other measures taken by individual banks to increase their portfolio "granularity" (diversification) may foster a gradual decrease in concentration.

…but the collateralisation of the largest loans is declining

The available evidence continues to suggest low collateralisation of large exposures. At the end of 2011, the share of completely uncollateralised claims in the volume of loans to the three largest clients of each bank was 47% (42% for loans to the five largest clients). This represents a rise of almost 7 pp (or 4 pp for the five largest debtors) since 2008. If any large debtors were to get into trouble owing to worse-than-expected economic developments, the credit losses could be quite high given the low collateral. Concentration stress tests are described in section 5.

The profitability of the banking sector remains above average by international comparison…

On an unconsolidated basis, return on equity was 19.4% at the end of 2011, a slight decrease from 21.9% in 2010. The slight annual decline in the net profit of the banking sector of CZK 2.14 billion to CZK 53.5 billion in 2011 was due mainly to recognition of the impairment of Greek bonds in some banks. By contrast, profit from fees and commissions, and especially interest profit, increased year on year. However, the breakdown of the key components of profit from financial activities was broadly unchanged from 2010 (see Chart IV.12).

62 A similar trend is visible for the share of the five largest debtors, which stood at 17% at the end of 2011.

…but from the short-term perspective it may be jeopardised by financial market developments…

Gains and losses from financial market operations are one of the areas that can affect banks' operating profit. Although banks in the Czech Republic tend to focus on the conservative banking model of accepting deposits, providing client loans and investing in domestic government bonds, they are relatively active in the area of currency and interest rate derivatives held for trading. Insofar as banks use derivative transactions to hedge market risks and recognise them as hedging derivatives in their books, the volatility of their profits decreases. However, hedging derivatives account for only 14% of the notional value of all derivatives, while the rest is recognised as derivatives held for trading, which are revalued to fair value against profit and loss.

However, derivatives held for trading may in fact also be used for hedging, especially with regard to currency risk and interest rate risk. In the case of currency derivatives with domestic exporters, which are used to eliminate risks stemming from the currency mismatch between the claims and liabilities of exporting corporations, a bank usually opens the opposite position with its parent bank or another foreign bank, so its sensitivity to exchange rate movements is kept to a minimum. Interest rate derivatives are generally used to manage the interest rate risk of the assets and liabilities of the entire balance sheet, including deposits and loans, and to convert fixed interest rates into floating ones or vice versa. While this approach might ensure matched cash flows, it may cause one-off losses due to the revaluation of interest rate derivatives to fair value if interest rates change sharply, thereby adversely affecting the profit and loss account depending on the derivative position of a bank.

…and from the long-term perspective it may be reduced by structural changes

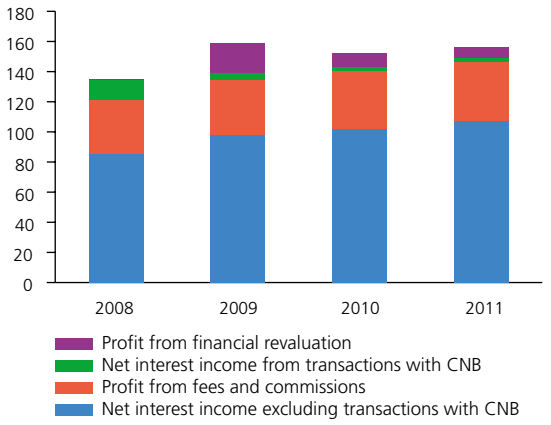
Analyses of the profitability of the Czech banking sector confirm that the ability to generate stable operating profit (especially interest rate profit), even in a period of less favourable economic conditions is to a large extent a structural characteristic of the Czech banking sector. Downward pressures on profits can therefore be caused primarily by structural changes, which are already partly visible, for example stronger competition in both the deposit and loan segments due to the entry of new players into the Czech banking market, mortgage refinancing at lower rates (with a subsequent drop in interest rate margins – see section 2.3) and reorientation of depositors to non-bank investment products, for example in connection with the pension reform (see Box 5).

The banking sector has sufficient capital adequacy and high-quality capital

As in the previous period, the Czech banking sector maintains relatively high overall capital adequacy and Tier 1 capital adequacy ratios (15.3% and 14.2% respectively at the end of 2011). Regulatory capital was strengthened above all by retained earnings. The Tier 1 capital adequacy ratio, which for the Czech banking sector equals the common equity Tier 1 ratio proposed in Basel III, is well above 9% for the banking sector

CHART IV.12

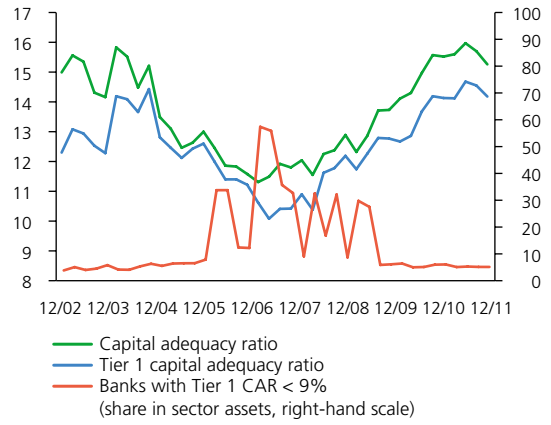
Key components of profit from financial activities
(CZK billions)



Source: CNB

CHART IV.13

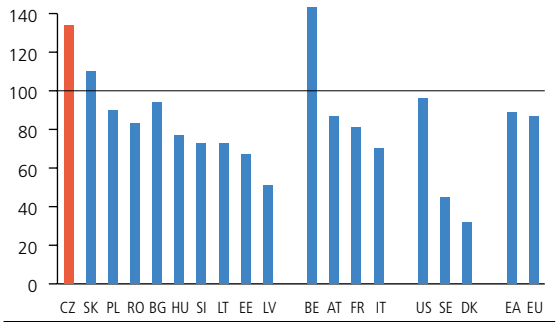
Capital adequacy
(%)



Source: CNB
Note: Assets of sector = assets of banks excluding branches of foreign banks.

Chart IV.14

Ratio of deposits to loans granted in selected EU countries
(%; end of 2011; deposits/loans to residents)



Source: ECB
Note: EA = euro area; EU = average for all EU countries.

Table IV.4

Situation of the parent groups of Czech banks
(data as of 31 December 2011; consolidated figures)

	Erste Group	KBC Group	Société Générale	UniCredit Group
Total assets (EUR bn)				
2011	210	285	1,181	927
2010	206	321	1,132	929
Net profit (% of assets)				
2011	-0.3	0.0	0.2	-1.0
2010	0.5	0.6	0.3	0.1
Impairment losses (% of assets)				
2011	1.1	0.5	0.4	0.6
2010	1.0	0.5	0.4	0.7
NPLs (%)				
2011	8.5	4.9	5.7	7.1
2010	7.6	5.2	5.4	6.6
NPL coverage ratio (%)				
2011	61.0	69.0	76.0	57.1
2010	60.0	79.0	72.0	58.8
Risk costs				
2011	168 bp	82 bp	67 bp	108 bp
2010	155 bp	91 bp	77 bp	123 bp
Capital adequacy (Core Tier 1 ratio, %)				
2011	9.4	10.6	9.0	8.4
2010	9.2	10.9	8.5	8.6
Exposures to indebted economies* (EUR billions)				
2011	0.6	4.8	4.5	40.9
2010	2.1	10.0	9.3	50.1

Source: Bank websites and results of EBA stress tests
Note: Risk costs are generally defined as the ratio of provisions to total loans provided. However, non-uniform calculation methodology prevents a closer comparison between banks. * Portugal, Ireland, Italy, Greece and Spain.

as a whole; only a small proportion of individual banks, representing 5.1% of the sector's total assets, do not exceed this level. Even higher dividends paid this year would not pose a significant threat to the aggregate level of regulatory capital (see Chart IV.13).

The Czech banking sector remains independent of external sources of funding

Although the Czech banking sector is almost exclusively owned by foreign investors,[63] it has long maintained a positive net external position. This reduces its dependence on foreign entities and supports its stability. The net external position (foreign assets minus foreign liabilities) stabilised at around 5% of GDP during 2011 despite a slight decrease (see line BS.47 of the Table of Indicators). The positive position is due to a long-standing high ratio of client deposits to loans, which reached 134% at the end of 2011 and is falling only very slowly over time (for example, in 2005 it was 160%). An international comparison reveals that the ratio of deposits accepted to loans provided in the Czech banking sector is well above average (see Chart IV.14).

Exposures to parent groups are stable over time and are being closely monitored by the CNB

Thanks to the good liquidity position of the banking sector, concerns arose at the start of the crisis about whether the domestic resources of banks would be used to fund their parent groups. These concerns intensified during 2011 in connection with the unclear situation of many large European banks and the need of parent groups to increase their capital by June 2012 as a result of an EBA measure.[64] In year-on-year comparison, the profitability of the parent groups of the four largest domestic banks is declining, with Erste Bank and UniCredit Group even recording a net loss associated with a rise in the NPL ratio (see Table IV.4).

In view of the uncertainty about the future of the economy and the continuing debt problems of some euro area countries to which parent groups have exposures, the situation of parent groups and their relations with domestic subsidiaries must continue to be monitored. The total gross exposure of the investment and trading portfolios of the five largest domestic banks to their parent groups has been fluctuating around CZK 120 billion over the last three years, representing about 60% of their regulatory capital (see Chart IV.15). In 2011, 71% of this exposure consisted of exposure to the parent bank itself, while 13% was exposure to domestic entities in the group and 16% was exposure to foreign entities in the group. Adjusted exposure, i.e. gross exposure net of liabilities in the form of loans and deposits accepted from foreign parent banks,[65] describes the relationship between domestic banks and their parent companies better than gross exposure. At the end of 2011, adjusted exposure was around CZK 74 billion (36.4% of regulatory capital).

63 Almost 97% of the banking sector's balance-sheet assets are controlled (directly or indirectly) by foreign owners.
64 Selected European banks have to increase their core Tier 1 capital to 9% by the end of June 2012.
65 Gross exposure and adjusted exposure are defined in the footnote to Chart IV.15.

The market share of building societies is shrinking

In 2011, the building society segment was partly affected by uncertainty surrounding the future parameters of the building savings product and its state support. Although building societies managed to stop the decline in deposits amid low interest rates and continuing, albeit reduced, state support, on the lending side they were unable to offer competitive pricing compared to the growing segment of mortgage loans, recording a drop in their share in house purchase loans of 2.5 pp. This drop was due not only to lower provision of new loans, but also to clients migrating to competing mortgage banks when refinancing their house purchase loans (see section 2.3).

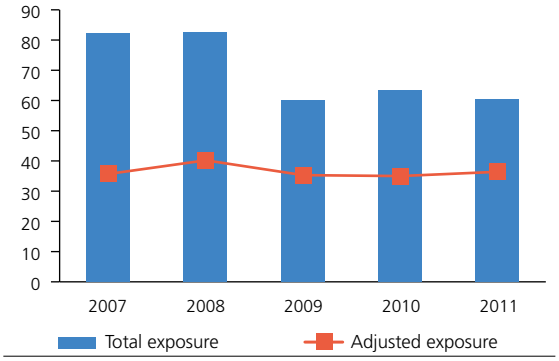
Although the building society segment is comparable to other banks in terms of credit risk, capital adequacy and profitability, a significant difference stemming from the specific business model of building societies is visible in the area of liquidity. The share of quick assets in total assets fell further to roughly 15% in 2011 and remains much lower than in other banks (see Table IV.5). If the loss of attractiveness of building savings schemes were to lead to an outflow of deposits after the binding period (such deposits account for more than two-thirds of total deposits), it could have a significant impact on the liquidity position of this sector, as the maturity mismatch between loans and deposits is larger than in the rest of the banking sector. This is particularly true for long-term claims with maturity of over five years, which significantly exceed long-term liabilities in the building society sector and are thus basically financed by short-term deposits (see Chart IV.16).

The riskiness of the credit union segment decreased from the previous year, but remains elevated

The credit union segment saw mixed trends in 2011. Improvements were recorded in compliance with prudential rules and in risk management, especially in terms of credit risk, owing partly to intensive CNB supervision. Provisioning increased compared to the previous year and the coverage of NPLs edged up from 12.8% in December 2010 to 13.5% in December 2011. However, this figure is still very low by comparison with the banking sector, where the coverage is almost 50% (see Table IV.6). The interest margin increased further, owing mainly to a rise in client interest on loans amid flat interest on deposits, resulting in relatively high profitability in the credit union segment. At the same time, however, the segment's capital adequacy ratio declined. Owing to continuing depositor interest, the share of deposits with credit unions in total deposits with credit institutions increased from 0.7% to 0.9%. The share of credit unions in total loans provided by credit institutions also increased slightly, but remained below 1% (see Table IV.6).

CHART IV.15

Total and adjusted exposure to parent groups
(%; exposure in relation to regulatory capital)



Source: CNB
Note: The chart shows the aggregate exposure of the five largest banks in the Czech Republic, which have foreign parents in the euro area. Gross exposure consists mainly of claims in the form of loans provided to the parent group and claims arising from derivatives transactions and other off-balance-sheet items in the investment and trading portfolios. Adjusted exposure = gross exposure minus liabilities in the form of deposits accepted and loans from foreign parent banks.

TABLE IV.5

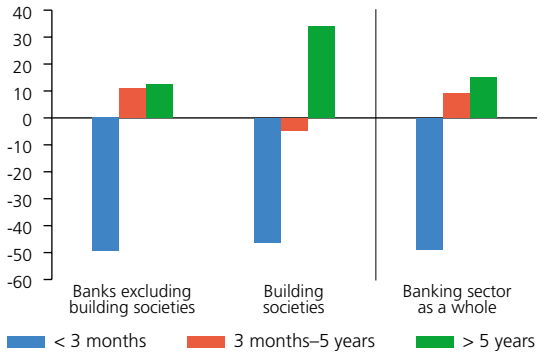
Selected indicators of building societies as compared to banks
(%; end-2010 and 2011 data)

	2010		2011	
	Building societies	Banks excl. building societies	Building societies	Banks excl. building societies
Average interest rate on client loans for house purchase (1)	5.1	5.4	5.1	5.1
Average interest rate on household deposits (2)	2.3	1.0	2.2	0.9
Interest margin (1)–(2)	2.8	4.4	2.8	4.2
Client deposits/loans	146.4	114.2	147.8	111.8
Client NPL ratio	2.5	7.1	2.6	6.7
Quick assets/total assets	16.3	27.3	15.2	28.3
Coverage of NPLs with provisions	41.8	47.1	45.1	49.2
Tier 1 capital adequacy ratio	13.9	14.1	14.1	14.2
RoE	26.1	20.7	23.1	18.6
RoA	1.1	1.4	1.1	1.2
Share of sector in loans for house purchase	37.9	62.1	35.1	64.9
Share of sector in household deposits	28.7	71.3	27.6	72.4

Source: CNB

CHART IV.16

Loan and deposit maturity mismatch: net balance-sheet position of banks and building societies
(as % of balance sheet; March 2012)



Source: CNB
Note: Banks including branches of foreign banks.

TABLE IV.6

Selected indicators of credit unions as compared to banks
(%; end-2010 and 2011 data)

	2010		2011	
	Credit unions	Banks	Credit unions	Banks
Average interest rate on client loans (1)	7.2	5.2	8.1	5.1
Average interest rate on client deposits (2)	3.3	1.1	3.1	1.1
Interest margin (1)–(2)	3.9	4.1	4.9	4.0
Client deposits/loans	138.5	118.7	127.1	116.5
Client NPL ratio	11.5	6.5	15.9	6.2
Quick assets/total assets	17.6	26.1	13.1	26.9
Coverage of NPLs with provisions	12.8	46.8	13.5	48.9
Tier 1 capital adequacy ratio	12.2	14.1	11.3	14.2
RoE	-2.5	21.1	5.5	19.0
RoA	-0.2	1.3	0.5	1.2
Share of sector in client loans	0.6	99.4	0.9	99.2
Share of sector in client deposits	0.7	99.3	0.9	99.1

Source: CNB

The credit union sector cannot be regarded as resilient to increased risks

Despite some positive signs in the credit union segment, the NPL ratio increased substantially from 11.5% in 2010 to almost 16% at the end of 2011. The adverse trend in the sub-sector peaked in March 2012, when the licence of the credit union Unibon was withdrawn. Although some aggregate indicators for the credit union sub-sector are considerably more favourable without Unibon, this fact cannot be assessed as a decline in the overall risk. This is also evidenced by a simple stress test of credit unions performed jointly by the IMF and the CNB as part of the FSAP mission (see section 5 for information on the FSAP mission). This test indicated relatively low resilience of the credit union sub-sector to potential adverse developments. From this point of view, therefore, a fundamental reorganisation of the credit union sub-sector would be desirable.

The current results of domestic insurance companies indicate stagnation

The insurance sector recorded a drop in profitability in 2011, not only in the non-life insurance area, where profitability has been broadly flat in recent years, but above all in the life insurance segment.[66] The long-running growth in gross premiums written in life insurance slowed considerably in 2011, mainly as a result of weaker growth in single premium payments (see Chart IV.17). In addition to the adverse trend in premiums written, the deteriorating economic results are explained by a continuing upward trend in gross claims paid.

In the longer term, the economic performance of life insurance companies may be adversely affected by low interest rates, as some life insurance policies concluded at a time of higher interest rates guarantee a return close to or even above the current return on less risky instruments. Upon maturity of a security held to cover life insurance, the insurer is forced to reinvest the funds at a lower return or to choose a riskier portfolio structure. The importance of this effect rises with the degree of maturity mismatch between life insurance investments and liabilities.

Competition is increasing in the non-life insurance market, leading to a drop in profitability

The falling profitability in the non-life insurance segment is largely due to competitive pressures, as the total number of non-life insurance policies has long been rising while gross premiums written have been broadly flat since 2009 (see Chart IV.17). The volume of premiums written in liability insurance and vehicle insurance is decreasing in particular. Stronger price competition will have the biggest impact on the profitability of smaller insurance companies, which cannot compensate for their results in these areas with other insurance products in the

66 The following text pertains to domestic insurance companies unless stated otherwise. Measured by the share of gross premiums written in 2011, domestic insurance companies represent 97% of the non-life insurance market and 92% of the life insurance market.

long run. The efficiency of this segment can be expressed using the combined ratio, which is the sum of losses and operating costs divided by total premiums written. Net of reinsurers' share, this indicator rose towards 95% in 2008–2011.

The structure of financial placements of insurance companies in the Czech Republic is rather conservative

By international comparison, the financial placement of assets is dominated by bonds and other fixed-income securities. By contrast, loans and deposits with credit institutions account for only a small share (see Chart IV.18). Czech government bonds represent a significant proportion (roughly 50% of assets covering technical provisions excluding investment life insurance). The Czech government bond market is therefore systemically important for most insurance companies, even more so than in the case of Czech banks. If prices were to fall rapidly on this market, the insurance sector would be severely affected.

Investment risk is being partly transferred to policyholders

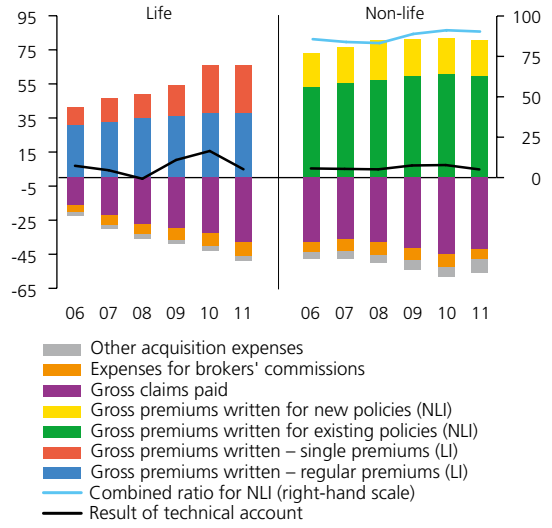
Back in 2004 the value of financial placement of unit-linked insurance had been 1.5% of total financial placement, but by the end of 2011 the figure had reached 14%. This rise was due chiefly to the growing importance of investment life insurance (ILI). The structure of financial placement of assets (investments) used to cover investment life insurance provisions is characterised by a higher share of equity securities, especially those issued by collective investment funds, and therefore higher investment risk compared to assets used to cover capital life insurance provisions and higher volatility of the pricing of such investments (see Chart IV.19).

The pension fund sector is strengthening its position in the allocation of household savings

The pension fund sector saw several changes in 2011. Stronger growth was recorded for contributions received (see Chart IV.20), pushing up the sector's balance-sheet total to CZK 248 billion. Further growth can be expected in the years ahead, due among other things to the pension reform and the changes it introduces in the third pillar (see Box 5).[67] In addition, an upswing can be seen in migrations of planholders between funds, which halted in 2009 owing to the introduction of migration fees. It can be assumed that planholders decided to change funds in response to the approved reform, with different rates of return in past years being one of the possible reasons.[68] A record increase in benefits, due chiefly to the retirement of the large post-war generation, was another change compared to the previous year. In view of demographic trends, this tendency can be expected to continue in the years ahead. Lump-sum settlements still account for the largest share of benefits (74.6%, similar to the previous year's figure of 73.5%).

CHART IV.17

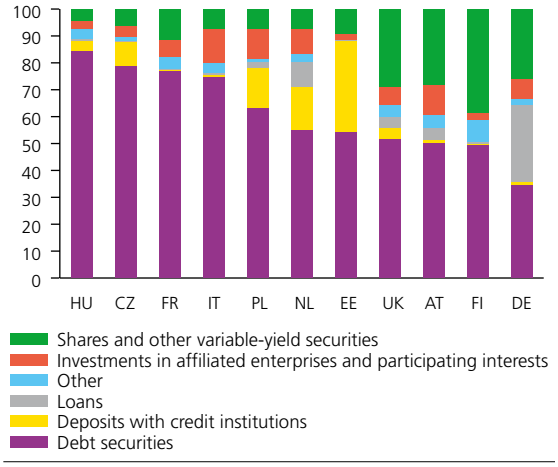
Key financial indicators for the insurance sector
(CZK billions; right-hand scale in %)



Source: CNB

CHART IV.18

Financial placement of assets of insurance companies in selected EU countries
(% of total assets)



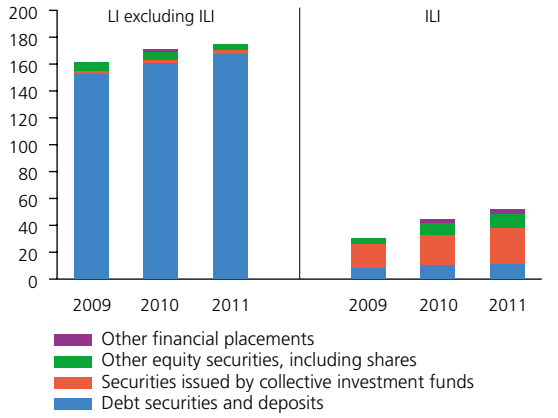
Source: EIOPA
Note: Data as of 31 December 2010; domestic insurance companies and branches of foreign insurance companies are both included.

67 In the reform of the third pension pillar, the minimum monthly planholder contribution for which a state contribution is paid will increase from CZK 100 to CZK 300 on 1 January 2013. Tax deductions will apply only to monthly planholder contributions of between CZK 1,000 and CZK 1,500, as against the current range of CZK 500 to CZK 1,000.

68 Current planholders could change pension funds until 28 February 2012.

CHART IV.19

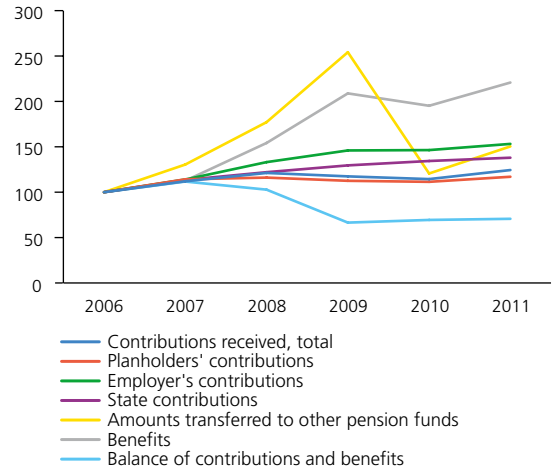
Financial placement of assets from technical reserves
(CZK billions)



Source: CNB

CHART IV.20

Pension fund contributions and benefits
(index; 2006 = 100)



Source: CNB

Assets are invested mostly in debt securities

By law, pension funds must invest at least 50% of the fund's assets in the currency in which the fund's liabilities to planholders are denominated. Therefore, Czech government bonds and other Czech debt securities are clearly the predominant assets. This makes the sector sensitive to movements in domestic government bond prices (see Chart IV.21). The long-standing situation of low interest rates is limiting the ability of pension funds to achieve higher returns on their assets. However, the risk of searching for yield, which could lead to mispricing and excessive purchases of risky assets, is not as significant in the pension fund sector as in other European countries thanks to relatively strict legislative rules for managed portfolios. Moreover, pension funds reduced the share of equity securities in total assets in 2011 – shares fell to 0.4% and fund units to 2.5% compared to the previous year.

BOX 5:
THE PENSION REFORM

The structure of the Czech pension system will change on 1 January 2013.[69] In addition to the existing pay-as-you-go (PAYG) state system (the first pillar), which has been complemented by voluntary pension insurance (the third pillar), a new second pillar allowing fund saving will be introduced. For economically active citizens, participation in this pillar is voluntary but irreversible, and the decision to participate must be taken before 35 years of age.[70] Participation involves transferring 3% of the social security assessment base in the PAYG state system to a personal pension account. Participants must add 2% from their own funds in the form of a deduction from their gross wage. The savings will be managed by pension management companies (PMCs) through four retirement funds with different investment strategies for the managed portfolio and different related risks.

Retirement savings participants choose the saving strategy (i.e. the allocation of savings between the individual funds) themselves and are allowed to make any changes.[71] The PMC is entitled to charge a fee for managing the assets and receive remuneration for gains in asset value. If asset value declines in bad times, remuneration for gains in asset value will be paid to the PMC only after the fund's value reaches the level of the amount initially invested (the "high-water mark"). The role of PMCs is solely to manage retirement savings. At the end of the saving phase, the money saved will be transferred to a life insurance company, which will be responsible for paying out the benefits.

69 The pension reform is a response to adverse demographic trends in the Czech Republic and the related unsustainability of the current pension insurance system – see the *Final Report of the Expert Advisory Forum* (2010), Ministry of Labour and Social Affairs (the "Bezděk Commission").
70 Economically active citizens above 35 years of age must decide whether to participate by the end of June 2013.
71 PMCs are obliged to offer participants a life-long saving strategy, with the distribution of savings between funds changing depending on the participant's age.

A CNB forecast on the level of participation in the fund pillar indicates that as much as CZK 25 billion could be deposited in PMCs during 2013.[72] This amount is composed of two parts. The first part consists of the 3% transferred from the original first pillar. These transferred funds will become a new source of savings for those participating in the new fund pillar, because so far they have been used for PAYG pension payments. The second part is made up of the additional 2% from participants' own funds, which may consist largely of money they previously held in other assets before joining the second pillar.

The introduction of fund pension saving will affect not only the amount and structure of households' assets, but also the financial sector as a whole, as a new type of institutional investor will come into existence. This could lead to a rise in demand for securities. In the case of the more conservative funds, there will be an increase in demand primarily for government bonds. For the government as debtor, this will mean a larger number of potential creditors and a decrease in refinancing risk, the possibility of issuing bonds with longer maturities, and subsequently better stabilisation and smoothing of the government debt maturity profile over time. However, the creation of such a close relationship between PMCs' balance sheets and the state budget requires prudent public finance policy, as PMCs will be heavily exposed to sovereign risk through the purchase of large volumes of government bonds.

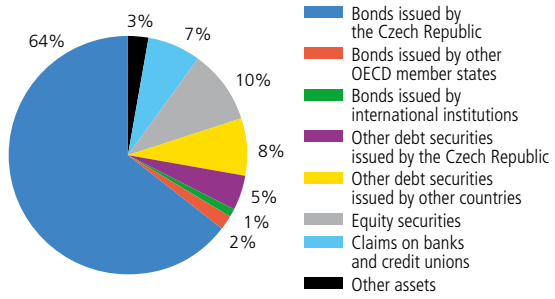
The less conservative fund types may also invest part of their funds in riskier and more volatile securities such as long-term government bonds, corporate bonds and shares. As the current offer of Czech shares is limited, a rise in demand for foreign shares is likely. In the long term, provided that the PMCs are established and operate successfully and are regulated and supervised effectively, this financial market segment can be expected to have a positive impact on the overall development of the capital market.[73] In addition to the effect of PMCs on demand for securities, their effect on security prices must be taken into account. In normal, good times, demand from PMCs reduces yields on securities, as their size – affecting portfolio diversification, purchased volumes and economies of scale in gathering information – is reflected in a lower demanded risk

72 The forecast assumes that those who will achieve higher returns from fund saving and whose pension as a ratio to contributions paid is low will be interested in participating in the second pillar.

73 For example, Davis (2005) finds a positive effect of the PMC sector on the size of the equity market (as measured by market capitalisation). The correlation coefficient between the total assets of PMCs and the equity market is 0.73 in advanced economies and 0.55 in emerging markets. See Davis, E. P. (2005): *The Role of Pension Funds as Institutional Investors in Emerging Markets*, Economics and Finance Discussion Papers 05–18, School of Social Sciences, Brunel University, London.

CHART IV.21

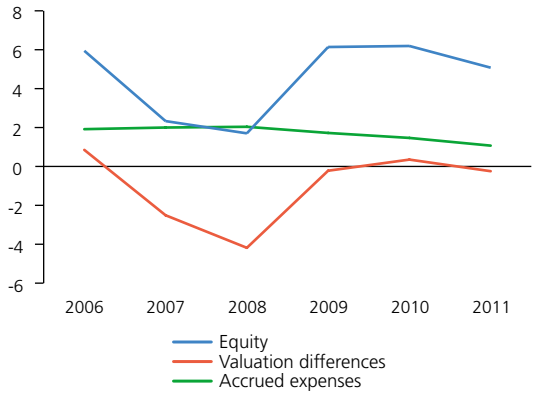
Pension fund asset allocation
(%)



Source: CNB

CHART IV.22

Pension fund capitalisation, valuation differences and accrued expenses
(% of assets)



Source: CNB

premium.[74] At the same time, thanks to lower transaction costs and high-quality information, PMCs have a positive effect on the pricing of assets in line with their fundamental value. At times of uncertainty, however, PMCs – like other institutional investors – have a tendency towards herd behaviour. Given the volumes traded, such behaviour may have a visible impact on asset prices.

The introduction of a second pillar into the pension system may also have implications for the banking sector. PMCs will become new financial intermediaries and will generate a change in the competitive environment in the financial system. This may cause a slowdown in the growth of bank deposits of households and foster a relative drop in the currently high deposit base of banks, especially in the longer run. The possibility of managing one's own savings could lead to greater interest of households in investing in other non-bank investment products and a lower willingness to deposit funds in low-interest deposit accounts. This change in household behaviour could increase the financing costs of the banking sector and reduce its profitability. On the other hand, PMCs may be a source of bank financing as part of a strategy of purchasing debt securities issued by banks (e.g. mortgage bonds) or depositing some of their funds on term accounts.

All this implies that the addition of the fund pillar to the PAYG pension system may bring about a number of significant changes in the functioning of the financial sector. Although the experience of other countries suggests that the changes may be profound, the possibility of voluntary participation in the second pillar may moderate these effects of the fund pension system. However, it will not be possible to determine how much the pension reform will affect the structure of the financial sector until the level of participation in fund saving, for which estimates currently differ, is known.[75]

As regards financial stability, macroeconomic stability is of particular importance for the effective functioning of PMCs, as it is for any other financial system segment. The introduction of fund financing may have a positive effect on the development of the financial sector, provided that regulation and supervision is effective.

74 Experience from the UK shows that demand of PMCs for long-term debt securities smoothed the yield curve, resulting in a more favourable interest rate environment for the business sector. See Catalan, M., Impavido, G., Musalem, A. (2000): *Contractual Savings or Stock Market Development: Which Leads?* Journal of Applied Social Science Studies 120(3).
75 See *Inflation Report IV/2011*, Box 1.

The capitalisation of pension funds was stable in 2011, but the sector must continue to prepare for the pension reform

The capitalisation of pension funds remained around 5% of assets in 2011 (see Chart IV.22). Consequently, no pension fund was forced to activate the prudential mechanism introduced jointly by the CNB and the Association of Pension Funds, or to increase its equity capital. The valuation changes item, where sizeable losses were recorded in 2007–2009, has been falling slightly in connection with the recent financial market developments. The sector's stability is still aided by the option allowing pension funds to value selected securities at amortised cost. In 2011, however, only a modest decline was recorded in accrued expenses, which stood at CZK 2.7 billion at the end of 2011. This item is mostly related to expenses on new planholders, specifically the gradual amortisation of commissions paid, which funds are gradually writing off. As funds are trying to amortise these expenses by the end of 2012, this may have a significant effect on the revenues generated by some funds this year.[76]

Collective investment funds generally stagnated in 2011…

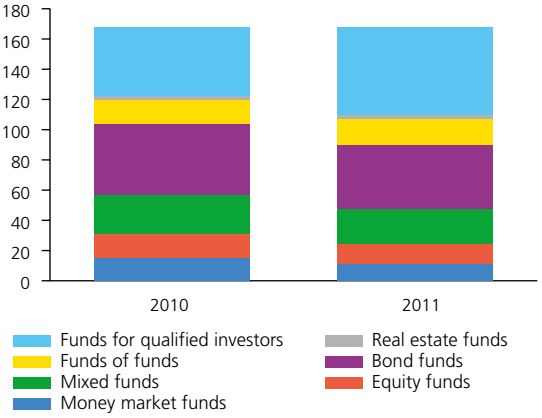
The total value of assets held by households and institutional investors in collective investment funds (CIFs) was little changed from the previous year, reaching almost CZK 170 billion (see Chart IV.23). In 2011, a slight decline in asset value was recorded by most funds except real estate funds, which saw no change, and funds of funds and funds for qualified investors, which recorded an inflow of investment. As in previous years, funds for qualified investors saw buoyant growth in 2011. The value of the assets they manage increased by almost CZK 13 billion, taking their share in total CIF assets up to 35% (a rise of 8 pp). This rise demonstrates the expected attractiveness of funds for qualified investors compared to other CIFs. This is due mainly to favourable tax conditions, but is also linked with the absence of investment policy constraints.[77] Owing to the pension reform, funds invested in CIFs might increase in the years ahead, with the specific amount depending on financial market developments, which are the key factor in the CIF segment.

…and their equity fell as a result of higher unit redemptions

Given the low asset prices around the world in 2011, most CIFs intended for the public recorded higher unit redemptions than unit sales. This was reflected in a decline their equity (see Chart IV.24). Only funds of funds and equity funds recorded an inflow of investment. In the case of equity funds, this might have been linked with renewed investor interest in investment in these funds at the end of 2011 on expectations of growth in shares following the sharp falls seen in 2011 H2 (see section 3).

CHART IV.23

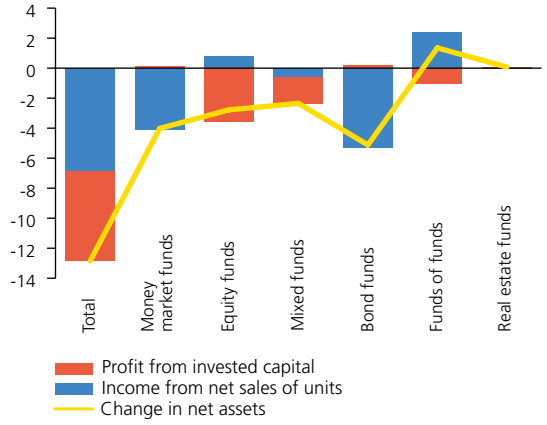
Collective investment fund structure
(CZK billions; assets at the end of 2010 and 2011)



Source: CNB
Note: As a result of a change to the European regulation, some funds were moved from the money market funds category to the bond funds category in 2011.

CHART IV.24

Decomposition of changes in the net assets of open-ended mutual funds intended for the public
(CZK billions; for 2011 as a whole)



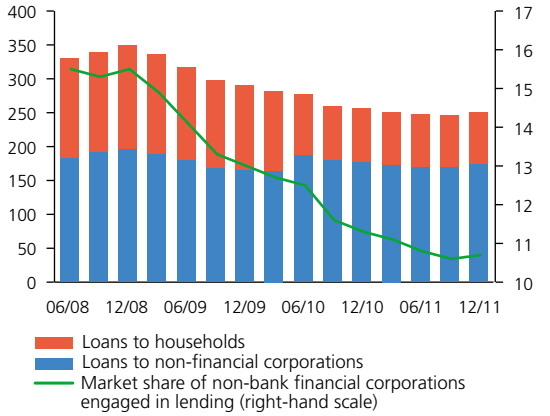
Source: CNB

76 In the third pillar, the pension reform assumes separation of managed planholder assets from shareholders' assets. Planholder assets will be transferred to transformed third-pillar funds and the pension fund's remaining assets will be transferred to the new PMCs.

77 Funds for qualified investors, which are classified as closed-end mutual funds, started to be established on the basis of an amendment to the Collective Investment Act adopted in 2006. The favourable tax conditions result from a corporate income tax rate of 5%.

CHART IV.25

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



Source: CNB
Note: Market share in total loans provided to residents by banks and non-bank financial corporations engaged in lending.

The situation of non-bank financial corporations engaged in lending stabilised

The decline in loans provided by non-bank financial corporations engaged in lending halted during 2011. These loans totalled CZK 258 billion at the end of 2011. By contrast, a slight increase was recorded in 2011 Q4 despite the negative impact of a year-on-year fall in demand for financing of photovoltaic equipment. In 2009–2010 the decline in lending had been due chiefly to a decline in the household sector, but in 2011 the overall dynamics were affected by households and non-financial corporations in equal measure (see Chart IV.25).

The total market share of non-bank financial corporations engaged in lending stabilised just below 11% during 2011. However, this share does not include all of the activity of the corporations monitored. According to data from the Czech Leasing and Finance Association, the long-running shift in the method of leasing financing, used mainly by non-financial corporations, from financial to operational leasing[78] continued. Its share rose to 33% in 2011, from 26% in 2010.

78 Operational leasing allows a movable or immovable item to be used, but unlike in the case of financial leasing there is no transfer of the substantial risks and benefits associated with ownership of the asset. Operational leasing is therefore de facto renting and is not included in the CNB's financial intermediation statistics.

5 RISKS TO FINANCIAL STABILITY AND MACROPRUDENTIAL POLICY

The aim of this section, which is appearing in the Financial Stability Report for the first time, is to assess the current position of the Czech economy in the financial cycle, the degree to which it is cyclically aligned with the advanced countries and the euro area, what is and what is not a risk to financial stability, the resilience of the Czech financial sector to such risks, and the tasks and recommendations arising for macroprudential policy, microprudential supervision or other economic policy tools. The first part contains an assessment of financial stability indicators. The second part presents the results of stress tests conducted for banks, insurance companies and pension funds. The third part provides recommendations and warnings aimed at reducing potential risks to financial stability and describes CNB measures taken or planned in the macroprudential policy area.

5.1 ASSESSMENT OF RISKS TO FINANCIAL STABILITY

The systemic crisis in the euro area was followed by fragile stability…

Following a temporary improvement in spring 2011, the tensions in the global financial system started to rise sharply in June. In late summer, the euro area debt crisis became the dominant factor in international finance. Failed attempts to "resolve" the debt crisis led to the crisis spreading from periphery countries to sound economies. In November, doubts arose about the solvency of highly indebted countries and their ability to stay in the monetary union. An open systemic crisis erupted as a result of a collapse of confidence, and the events in the monetary union became a severe threat to the whole world economy. The crisis led to serious disruptions in market structures. The primary long-term financing market started to close to both governments and banks and the liquidity crisis threatened to turn into a solvency crisis. The financial market tensions were reduced only by a combination of resolute central bank measures, progress with restructuring Greek sovereign debt, an agreement to tighten the fiscal rules in the EU, and national measures to stabilise public finance and strengthen banking sectors. The renewed stability is still very fragile, however, and contagion may re-emerge at any time through a triangle made up of risks in banks' balance sheets, problems in the real economy and sovereign risk.

…which persisted in the first few months of 2012

The situation in spring 2012 is similar to a year ago. Although financial markets have stabilised somewhat, there is still great uncertainty about the future. The structure of the risks is also similar to a year ago, although perceptions of the intensity of individual risks have changed. The perception of the seriousness of sovereign risk has decreased, although maybe unjustifiably, after measures taken in late 2011 and early 2012. Centre stage has been taken by risks relating to weak economic growth in an environment of excessive indebtedness of individual sectors or whole economies. From the short-term perspective, emphasis has started to be put on the negative impacts of

fiscal consolidation. From the long-term perspective, there are doubts about some EU countries' ability to implement economic reforms and increase their competitiveness.

Emphasis is being put on the risks associated with the deleveraging process

The hidden problems in banks' balance sheets are currently the major risk factor in the euro area financial sector. Lack of confidence in the reported quality of assets, doubts about the sufficiency of provisioning against NPLs and concerns about forbearance (see the Glossary), combined with regulatory uncertainty and market volatility, may create an adverse trend with side effects on numerous other areas. There are also concerns that deleveraging in banking sectors (see Box 6) will make it more difficult for private entities to access bank credit, thereby hampering an economic recovery and feeding back into a further deterioration in loan portfolio quality.

BOX 6:
DELEVERAGING OF EUROPEAN BANKS AND FINANCIAL REPRESSION

Against the background of the currently subdued financial crisis, the banking sector in Europe, and particularly in the euro area, is facing numerous pressures. Some large international banks have not yet managed to secure long-term asset funding sources and are dependent on funding from central banks. If the current version of the new Basel III liquidity requirements is approved and implemented, the problems with long-term funding in many European banks may deepen further, as banks – and especially large international institutions – will have to increase and improve their regulatory capital in connection with the implementation of the new standards. It cannot be ruled out that compliance with the new capital and liquidity requirements will meet with insufficient investor interest in newly issued bank shares or long-term bank debt. International, and sometimes also national, authorities are increasing the already very high degree of uncertainty among investors and creditors by discussing a whole range of new regulations with impacts that are difficult to quantify and by considering new specific taxes for financial institutions.

In late 2011, some national authorities reacted to signs of a lack of confidence in the stability of their banking sectors by introducing their own, internationally uncoordinated requirements, including an increase in core capital adequacy, the creation of "conservation" buffers or reserves against potential losses and last but not least also the strengthening of balance-sheet liquidity by switching to a more stable funding structure (stronger links between the scale of new lending and domestic deposits and funds obtained by issuing long-term bonds). Some national supervisors have also declared that they

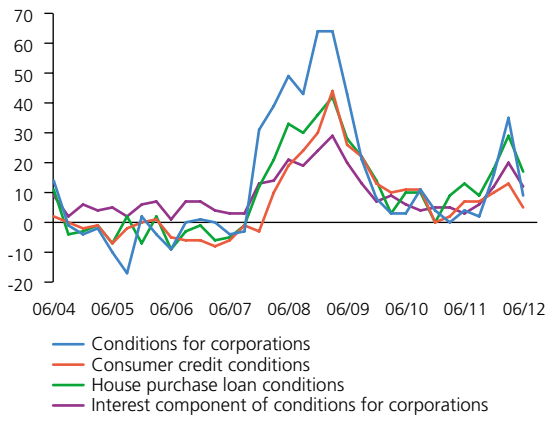
will introduce additional capital requirements in the next few years for institutions that they regard as systemically important (see the thematic article *How to Identify Systemically Important Financial Institutions* in this Report). In December 2011, in reaction to the euro area crisis, the European Banking Authority (EBA) adopted a recommendation for large European banks to increase their capital adequacy ratios to at least 9% of core capital by mid-2012.

As a result of the above developments, disorderly deleveraging of European banks became one of the most emphasised and analysed risks at the end of the year. This risk can be described as a scenario where banks try to reduce their risk-weighted assets by selling assets or curtailing lending, leading to worse availability of external resources for financing production and to weaker economic growth.[79] Concerns about deleveraging increased after the publication of the results of the regular Bank Lending Survey in the euro area in January 2012 (see Chart V.1 Box). These indicated that the lending conditions had tightened significantly in 2011 Q4, with conditions for loans to non-financial corporations recording the biggest deterioration. The interest component of the lending conditions had also tightened significantly, probably due to problems in obtaining balance-sheet liquidity, which banks are trying to resolve by boosting deposits through offering higher deposit rates. The results of the subsequent round of the survey, published in April 2012, show that the tightening continued into 2012 Q1, albeit much more slowly.

It is not easy to assess the scale of the deleveraging-related risks. Deleveraging – especially in the euro area – is a necessary and natural reaction of the system to the previous expansion of balance sheets (see Chart V.2 Box and Chart V.3 Box). For illustration, the bank balance sheet total in spring 2012 was EUR 33 trillion (350% of euro area GDP) in the euro area but only CZK 4.7 trillion (125% of GDP) in the Czech Republic. Bank loans to the domestic private sector total 124% of GDP in the euro area and 57% of GDP in the Czech Republic.

Chart V.1 Box

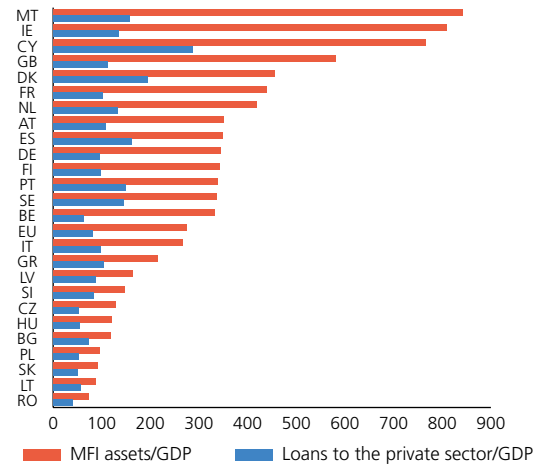
Lending conditions in the euro area according to the Bank Lending Survey
(%)



Source: ECB, Thomson Datastream
Note: Conditions – net percentage change (gross tightening – gross easing) in lending conditions in given category. Positive values mean an overall tightening of the conditions.

Chart V.2 Box

International comparison of bank assets and loans to the private sector as a percentage of GDP
(%)

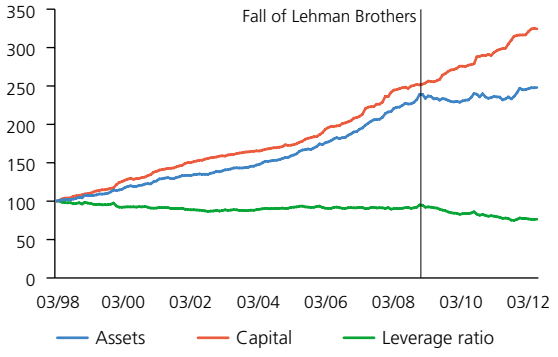


Source: ECB, Eurostat
Note: Data as of 29 February 2012.

79 The EBA recommendation to national supervisors was accompanied by instructions urging them to ensure that banks are not achieving higher capital adequacy by taking actions leading to worse availability of loans for the private sector. The plans to achieve the recommended capital ratio which individual banks are sending to the EBA suggest that the overwhelming majority of the actions will be taken on the capital side and only a small proportion will be on the asset side. Nonetheless, the IMF estimates in its April Global Financial Stability Report that large euro area banks will reduce their assets in the *Baseline Scenario* by 7%, or around EUR 2 trillion, by the end of 2013. The IMF also predicts that in the process the volume of loans in the euro area will decrease by 2%, and expresses concerns that deleveraging in the euro area may have very negative consequences in other parts of the world through declining asset prices and adverse impacts on market and balance-sheet liquidity.

Chart V.3 Box

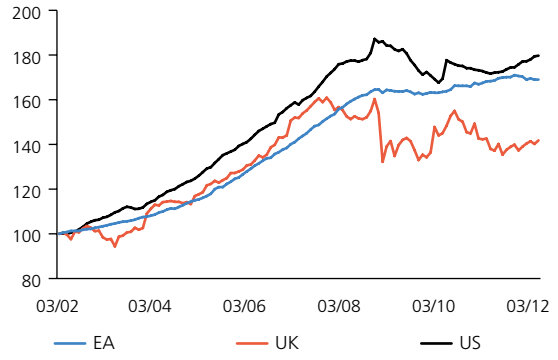
Total assets, capital and leverage of euro area banks
(%; basic index; March 1998 = 100)



Source: ECB
Note: The leverage ratio is the ratio of total assets to capital.

Chart V.4 Box

Loans to the private sector in the euro area, the USA and the UK
(%; basic index; March 2002 = 100)



Source: Thomson Datastream

Deleveraging can take place in either an "orderly" or "disorderly" manner. Examples of orderly deleveraging include a scaling back of highly speculative transactions in derivatives and complex structured products or cross-border transactions where banks are unable to assess the risks sufficiently. Processes that make it more difficult for the private sector to access credit can be described as disorderly deleveraging. The ratio of orderly to disorderly deleveraging will be affected by many factors, but most of all by the final form of the planned regulations and by public finance developments in advanced countries (see the discussion of financial repression below).

In an environment of low nominal interest rates and suppressed collateral value, deleveraging can be counteracted by forbearance[80] on the part of banks. Deleveraging and forbearance can both have desirable and undesirable effects. Given the significant differences between national banking sectors in the euro area, the inappropriate combination of unfavourable deleveraging in crisis-hit countries and damaging forbearance[81] in more or less stable countries is a potentially big problem. Such a combination would result in renewed or deepening recession in the first group and a long period of slow economic growth in the second.

Regardless of what sort of deleveraging prevails in Europe, it is reasonable to assume that in many countries deleveraging is just at the beginning and that its continuation will be associated with an overall contraction of bank debt. This applies primarily to the euro area, where, unlike in the UK or the USA, total loans to the private sector did not decrease during the crisis (see Chart V.4 Box) and where the total leverage ratio fell only thanks to an increase in capital (see Chart V.3 Box). It can be assumed that the deleveraging will take place via both reduced credit supply and subdued credit demand, as the less favourable trend in disposable income (see section 2.1, Chart II.6) is being reflected in growth in the saving rate in many countries. It is also highly likely that the deleveraging will dampen nominal income growth (GDP growth at current prices) in the long term via both components – economic growth and inflation.

If the deleveraging also leads to higher loan rates, credit risk will go up as well, as the ability of many clients to repay existing loans may critically depend on interest rate levels (see section 2.1).

80 Forbearance is the practice where banks, instead of recognising a deterioration in asset quality and posting a loss, "restructure" the loan, for example by spreading the repayments over a longer time horizon, allowing the debtor temporarily to pay interest only, or otherwise changing the lending conditions so that the debtor does not have to acknowledge open default.

81 Damaging forbearance is the situation where constant restructuring of bad loans leads to inefficient allocation of savings in the economy. Credit sources get tied up in unproductive firms and projects and do not reach new and potentially more efficient investors.

The effect of the deleveraging on client loan rates in the euro area will partly depend on the evolution of the unorthodox component of monetary policy, which is difficult to estimate (e.g. the future size of government bond purchases by the Eurosystem), but in principle will depend mainly on government demand for credit. If governments fail to continue reducing structural public finance deficits or if they decide to react to the weak economic activity by renewing fiscal expansion, the traditional crowding-out effect of public budget deficits could start to emerge.

Concerns about the above developments are being reinforced by the potential side effects of the new regulations on financial institutions, which are creating incentives for increased investment in government debt. Government bonds traditionally enjoy preferential treatment as regards capital requirements. The regulatory liquidity indicators contained in the Basel III proposal (liquidity coverage and net stable funding) may extend such treatment to the liquidity management area. The new Solvency II rules for insurance companies will also probably result in a shift to safer, more liquid and lower-yielding assets, which traditionally include government bonds. Government bonds are also attractive to financial institutions because they are accepted as collateral in central banks' liquidity-providing operations (see section 3.1) and in centralised clearing of derivatives trades. The new regulatory framework for financial institutions thus contains numerous elements of "financial repression"[82] (see also FSR 2010/2011, Box 1, pp. 23–24).

The risk that private creditors in advanced countries will face significantly higher loan rates in the coming years remains relatively low, however. This fact is based on the likely evolution of the supply of savings compared to demand for savings. Even before the crisis interest rates were being pushed down by savings surpluses in Asian economies, which were being transferred to Western economies partly through deliberately weak currency policy.[83] In the post-crisis years, the global savings surplus increased further owing to low investment demand among non-financial corporations accompanied by rising household saving rates in many countries. In some countries, savings surpluses are being reflected in balance-sheet recessions (see Box 1).

82 The term "financial repression" covers policies that allow the government to fund its debt cheaply at the expense of domestic creditors by borrowing from them via banks, insurance companies and pension funds at artificially low interest rates or by imposing an inflation tax on them. Low nominal interest rates reduce the real debt servicing costs, and low real interest rates *de facto* reduce the principal (the debt-to-GDP ratio).

83 See the article *What is the Real Rate of Interest Telling Us?* on Martin Wolf's blog (Financial Times, 19 March 2012) or Frait, J., Komárková, Z., Komárek, L. (2012): *Monetary Policy in a Small Economy after Tsunami: A New Consensus on the Horizon?* Czech Journal of Economics and Finance, No. 1, pp. 5–33.

In the debate about the interest rate impact of financing rising government debts, Jacob Kirkegaard and Carmen Reinhart[84] argue that in the current conditions financial repression may, rather paradoxically, be keeping loan rates in advanced countries at low levels for both governments and the private sector. This is because two specific interests have coincided. On the one hand there is need to finance high government and private debts in advanced countries, and on the other hand emerging countries want to prevent their currencies from appreciating as a result of existing or potential inflows of capital seeking higher returns. These two seemingly unrelated interests are creating a single common interest of ensuring that savings created in Western economies stay "at home". This interest is being promoted by Western politicians under the colours of better financial market regulation and by Asian politicians under the banner of macroprudential policy. In practice, Western economies are maintaining loose monetary policies and introducing regulations forcing financial institutions to hold more government bonds, while Asian economies are introducing capital controls to prevent credit expansion, which could lead to overheating of the economy, inflationary pressures and ultimately a loss of competitiveness.

To sum up, there is therefore also a somewhat optimistic scenario that over the next ten years governments in advanced countries will strive to reduce and manage their debts and maintain low debt servicing costs. Given slow credit growth and labour market tensions, inflationary pressures will be contained and central banks should be able to hit their inflation targets while keeping interest rates low. Thanks to the global savings surplus being channelled to Western economies, interest rates on loans to the private sector may stay low for some time, even after the introduction of new regulations supporting financial institutions' demand for government debt. This situation could be changed only by a substantial global shift in saving and investment rates, an escalation in government demand for savings or – in some economies – a loss of confidence in public debt sustainability.

84 See Kirkegaard, J., Reinhart, C. (2012): *Financial Repression: Then and Now*, VoxEU Debates, 26 March 2012 or Reinhart, C. (2012): *The Return of Financial Repression*, Banque de France Financial Stability Review – Public Debt, Monetary Policy and Financial Stability, April 2012, pp. 37–48.

In advanced countries, risks that originated in the pre-crisis period are dominant…

Euro area and other advanced countries are still in a phase of the business cycle that is subject to risks associated with decisions made during the pre-crisis boom and with the authorities' subsequent reactions to the crisis. A phase of necessary deleveraging is now starting in the euro area, and this will be a medium to long-term phenomenon. The speed and success of this process in the euro area will depend on whether the authorities avoid the mistakes they made in previous years, when they underestimated the extent of the problem and allowed the debt crisis to escalate in 2011 into an acute systemic phase. Another deciding factor going forward will be the strength of financial repression through which governments are generally resolving their overindebtedness (see Box 6).

…as they are in the Czech Republic, which, however, is in a different phase of the financial cycle

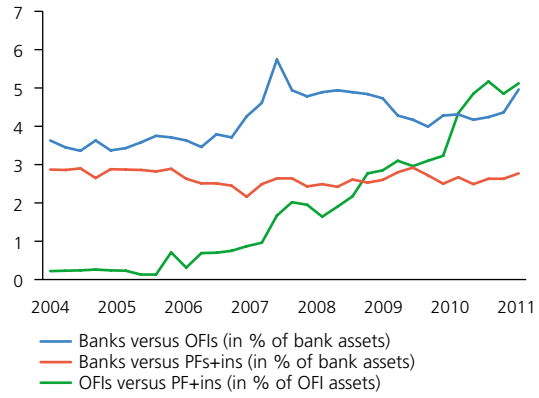
The domestic financial sector is also currently in a phase of the financial cycle[85] that is still subject to risks that originated in the pre-crisis years. Unlike in the euro area, however, these risks are materialising largely because of the situation in the Czech Republic's external environment. At the same time, the Czech financial cycle is not very synchronised with the euro area cycle. Debt in the Czech Republic is not at a level that requires deleveraging at the level of the economy as a whole, and banks' balance sheets are in a condition that allows them to maintain relatively easy lending conditions.

The sources of the structural component of systemic risk remain contained

Analyses of the connections between institutions and sectors, which focus on network links and therefore on the structural or cross-sectional dimension of systemic risk (the risk of contagion between institutions and sectors), indicate no clear trend. On the one hand, there are gradually increasing links not only between financial and non-financial sectors as financial intermediation continues to deepen,[86] but also between individual financial segments (see Chart V.1). Exposure to the government sector is increasing in parallel, especially in the case of banks. On the other hand, the degree of use of the interbank market and thus also the degree of interconnectedness of domestic banks is still low[87] and has been actually falling over time.[88] At the same time, the concentration of bank loan portfolios is gradually declining and exposures to parent groups are decreasing (see section 4).

CHART V.1

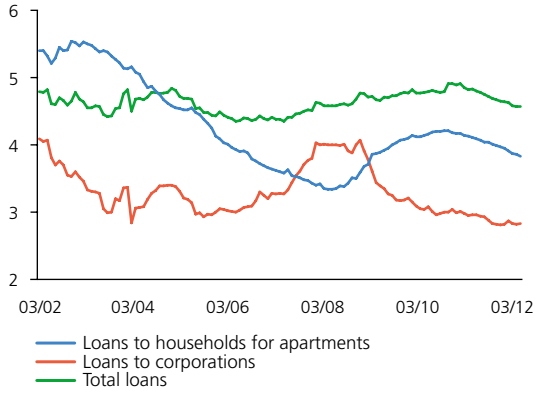
Links between individual segments of the financial sector
(sum of all mutual exposures, including asset and credit exposures, in assets and liabilities between sector pairs)



Source: CNB (financial accounts)
Note: OFIs comprise other financial corporations engaged in lending and mutual funds other than money market funds; PF+ins comprises pension funds and insurance companies.

CHART V.2

Margins on the stock of bank loans
(% p.a.)

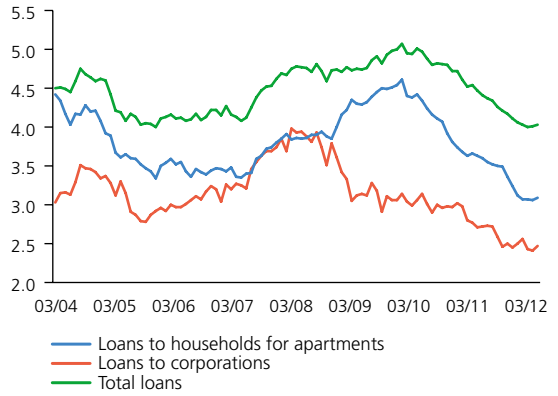


Source: ARAD, CNB calculation
Note: Margins are calculated as the lending rates for the given sectors minus the average deposit rate.

85 A description of the phases of the financial cycle can be found in the thematic article *Financial Stability, Systemic Risk and Macroprudential Policy* in FSR 2010/2011 (Chart 1, p. 99).
86 See the thematic article *Contingent Claims Analysis of the Inter-sector Transmission of Credit Risk* in this Report.
87 The issue of the interconnectedness of banks is analysed in thematic article *How to Identify Systemically Important Financial Institutions* in this Report.
88 The degree of interconnectedness was measured by the degree of connectivity, which is defined as the ratio of existing links between institutions to all potentially possible links between institutions in a given network of interbank relationships. This degree was 13% in the Czech Republic in the pre-crisis year 2007 and around 11% in 2008–2009, then fell back to 10% in 2010 and was only 9% in 2011.

CHART V.3

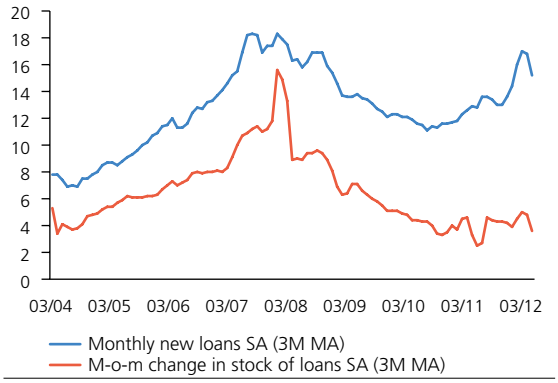
Margins on new bank loans
(% p.a.)



Source: ARAD, CNB calculation
Note: Margins are calculated as the lending rates for the given sectors minus the average deposit rate.

CHART V.4

New loans versus change in stock of loans to households for house purchase
(CZK billions; monthly data; 3M moving average; SA = seasonally adjusted)



Source: CNB

The observed evolution of the two components of the lending conditions can be assessed as positive

The lending conditions in the Czech Republic stabilised in 2011. The concerns heard sometimes from the corporate sector that access to bank loans would deteriorate or even that lending activity would stop did not materialise. The evolution of bank lending conditions (see sections 2.2 and 2.3) indicates that the interest rate component eased in late 2011 and in the first few months of 2012 for loans to corporations and loans to households for house purchase. At the same time the available data indicate that the non-interest component tightened slightly. The assessment of bank lending standards and (non-interest) lending conditions is based on data for 2012 Q1 from the pilot round of the CNB survey of bank lending conditions.[89] The net percentage share of banks, calculated as difference between the market shares of banks that tightened standards and conditions and those that eased them, was positive (i.e. meaning a tightening) for all the credit market segments surveyed, standing at almost 20% for loans to corporations, 2% for households for house purchase, 7% for consumer credit and 17% for loans to sole traders. In the near future, banks expect a further tightening in the segments of loans to non-financial corporations and loans to households for house purchase. At the same time, they expect a rise in demand for loans. This can be interpreted as relatively prudent behaviour amid a continuing modest recovery in lending.

Margins on new loans fell significantly

An easing of interest rate conditions is also indicated by interest rate margins, measured as the difference between the relevant lending and deposit rates. The margins on the stock of loans (see Chart V.2) have declined to historical lows in the last few quarters for both corporate loans and loans for house purchase. Nonetheless, total margins – which also reflect the conditions for bank overdrafts and consumer credit – have long been stable. A sizeable decrease was recorded for margins on new loans, which fell to all-time lows in all categories (see Chart V.3). In time this will also be partly reflected in margins on the stock of loans and banks will probably record lower interest income on their credit portfolios. For this reason, it is legitimate to ask whether this level is consistent with appropriate risk assessment of new loans given the existing uncertainties. This is particularly true in a situation where no improvement in clients' creditworthiness is apparent.

Indicators of the cyclical component of systemic risk suggest that the Czech financial system is entering a phase of modest post-crisis recovery in lending

Credit growth is still below its high pre-crisis level, but remains in positive territory. In all probability, 2012 will see stability or a modest decline in credit growth, but a stronger recovery is possible in 2013. In

89 The CNB started this survey, also known as Bank Lending Survey, in 2012. It will be conducted on a quarterly basis in line with other similar surveys in the euro area and other EU countries, and 18 selected banks will take part. A pilot round took place in March and April 2012. The first regular round will be conducted in June and July 2012 and its results will then be published on the CNB website.

connection with rapid growth in new house purchase loans observed in the monetary and financial statistics, media commentators began to speak of a mortgage boom and a renewal of the property market bubble in 2011 H2. If one compares the growth in the total stock of loans for house purchase and new loans for house purchase, it is clear, however, that this is not the case (see Chart V.4). The month-on-month increases in the stock of loans for house purchase are far below the mortgage boom level of 2006–2008. The explanation of the difference between the two time series is that some new loans are existing loans that have been refinanced with other banks at the end of the interest rate fixation period (see section 2.3).

An increase in the cyclical component of systemic risk is being prevented by pessimistic expectations

A fundamental factor reducing the possibility of a new wave of ill-considered borrowing is the high level of pessimism among financial institutions and their clients. Economic agents are now aware of the risk of renewed recession, the potential continuation of the property price decline, and the generally increased probability of default.

The ratio of loans to GDP is at an appropriate level in the Czech Republic

Under Basel III, the evolution of loans to the real sector as a percentage of GDP compared to the "trend" estimated by Hodrick-Prescott filter will be the first tentative indicator of a lending boom and in future should also be used to determine the rate of the countercyclical capital buffer. Although the simple filtering technique proposed by the Basel Committee on Banking Supervision does not necessarily suit converging countries such as the Czech Republic,[90] this indicator will routinely be calculated under the proposed European implementation of Basel III. National regulators will also be allowed to use other major credit cycle indicators (see Box 7). The evolution of credit as a percentage of GDP in the Czech Republic and its estimate for the near future show that the Czech Republic is currently roughly at the trend level under the Basel III methodology (see Chart V.5). However, an estimate of the equilibrium level based on economic fundamentals indicates that the real sector's debt is still below the average for similarly advanced countries. We do not see any significant risks in this area in the near future given the expected stabilisation of the credit-to-GDP ratio due to subdued growth in lending.

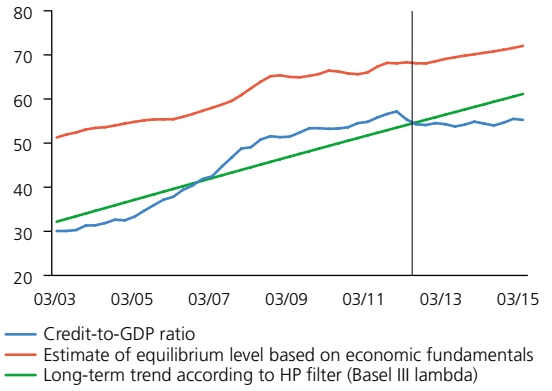
Deleveraging in the euro area will have only an indirect effect on the Czech economy

The risk of deleveraging and its direct adverse impacts on the Czech economy is currently low and should not strongly affect the lending conditions in the Czech Republic. The total debt of domestic economic sectors is not high by international standards either. This is evidenced by an international comparison of gross debt levels in the form of loans

90 See the discussion in Geršl, A., Seidler, J. (2011): *Excessive Credit Growth as an Indicator of Financial (In)Stability and its Use in Macroprudential Policy* in FSR 2010/2011.

CHART V.5

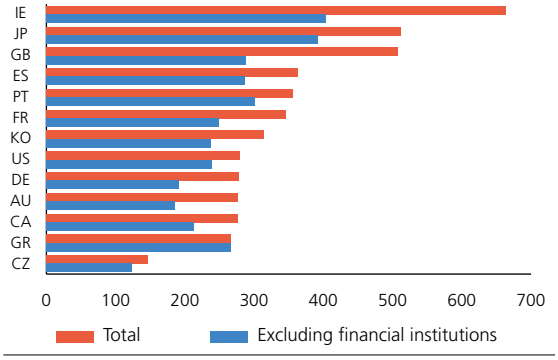
Assessment of real sector debt in the Czech Republic
(%; bank loans only)



Source: CNB, CNB calculation
Note: Estimate of equilibrium level based on method described in Geršl, A., Seidler, J.: *Credit Growth and Capital Buffers: Empirical Evidence from Central and Eastern European Countries*,CNB Research and Policy Note 3/2011.

CHART V.6

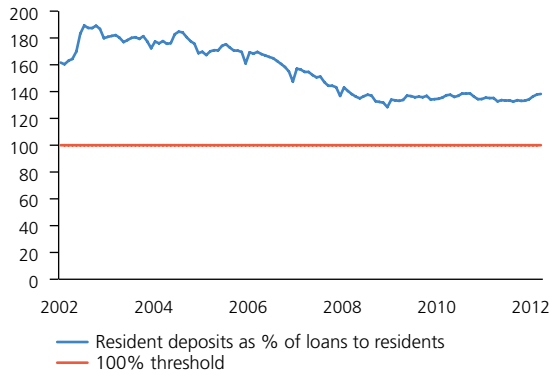
Total gross debt of selected economies
(% of GDP)



Source: McKinsey, CNB
Note: Total gross debt is the sum of the debt of households, corporations, government and financial institutions. Data as of 30 June 2011; for Ireland, Portugal and Italy as of 31 March 2011; for the Czech Republic as of 31 December 2011.

CHART V.7

Liquidity of the Czech banking sector
(%)



Source: CNB

received and bonds issued by individual sectors (see Chart V.6).[91] Given its high degree of openness, however, the output of the domestic economy may be indirectly adversely affected by the problems of highly indebted euro area economies.

Banking sector liquidity indicators are indicating stabilisation at safe levels

The Czech banking sector has above-average liquidity by international comparison and a significant excess of deposits over loans (see section 4). In addition, such coverage has been kept at safe levels (well above 100%) since the crisis began. The trend of a gradual reduction in this buffer stopped back in 2008 (see Chart V.7).

91 The data are taken from the study *Debt and Deleveraging: Uneven Progress on the Path to Growth* (McKinsey Global Institute, January 2012), which is an update of a more detailed report: *Debt and Deleveraging: The Global Credit Bubble and its Economic Consequences,* McKinsey Global Institute, January 2010. The gross debt level indicator overstates the debt burdens of individual economies to a varying extent, as particular sectors have many assets vis-à-vis other sectors and in some cases also vis-à-vis other countries and their net debts may thus be much lower. Despite this, gross debt is a useful measure for assessing the potential stress of debtors if the economy takes a turn for the worse.

5.2 STRESS TESTS OF BANKS, INSURANCE COMPANIES AND PENSION FUNDS

The stress test results confirm that banks and insurance companies are highly resilient to adverse shocks, while the pension fund sector remains sensitive to strong market shocks

In order to assess the resilience of banks, insurance companies and pension funds, macro-stress tests were performed using one *Baseline Scenario* and one *Europe in Depression* stress scenario, which was gradually extended to include several selected risks. Liquidity stress tests were also conducted for the banking sector, assuming the extension of the adverse *Europe in Depression* scenario to include liquidity shocks. The test results confirmed that this sector is highly resilient to a combination of adverse macroeconomic, market, liquidity and selected ad-hoc shocks. The insurance company sector is able to cope well with the risks stemming from adverse market developments thanks to its relatively large capital buffer, but the pension fund sector remains highly sensitive to greater volatility in securities prices.

The strong position of the Czech financial system was also confirmed by the results of the IMF's FSAP mission

The IMF's FSAP (Financial Sector Assessment Program) mission took place in the Czech Republic in the second half of 2011. The mission focused on assessing stability in the Czech financial system and the compliance of banking supervisory practices with international standards. As part of the mission, stress tests were also performed jointly by CNB and IMF experts. These tests confirmed the high resilience of the Czech banking sector to strongly adverse shocks. The FSAP mission also produced numerous recommendations, mainly regarding the financial stability mandate and on organisational aspects of macroprudential policy, as well as in the areas of supervision and regulation, credit unions and crisis management.[92]

The stress test methodology has been refined

The shock impact horizon in the banking sector solvency stress tests has been extended from two to three years. This change allows for better testing of the impact of scenarios with protracted weak growth, including lagged transmission of the adverse situation in the economy to the quality of banks' loan portfolios. According to the available analyses, a fall in GDP passes through quickly to the quality of corporate loan portfolios, but takes one to two years to affect the quality of loans to households. At the same time, satellite models linking loan growth, default rates, loss given default and property prices to macroeconomic developments were re-estimated. Another innovation is the assumption of haircuts on government bonds of all EU countries with government debt exceeding the "Maastricht" limit of 60% of GDP (for the scenarios or their sensitivity variants where such a shock to sovereign risk is expected), and not only for the most indebted EU countries. The haircut

92 See the FSSA (Financial Sector Stability Assessment) and other Technical Notes that will be published on the CNB website during the year 2012.

Table V.1

Haircuts on government bonds of EU countries with debt exceeding 60% of GDP used in the stress tests
(%)

Country	S&P 10 May 2012	Haircut in %
Belgium	Haircut	7
France	AA+	4
Ireland	BBB+	25
Italy	BBB+	25
Cyprus	BB+	35
Hungary	BB+	35
Malta	A-	21
Germany	AAA	0
Netherlands	AAA	0
Portugal	BB	39
Austria	AA+	4
Greece	CCC	60
Spain	BBB+	25
United Kingdom	AAA	0

Source: S&P, CNB calculation

Table V.2

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

	Actual value	*Baseline Scenario*			*Europe in Depression*		
	2011	2012	2013	2014	2012	2013	2014
Macroeconomic variables							
GDP (y-o-y %)	1.7	0.0	1.9	3.1	-2.0	-3.2	-2.7
CZK/EUR exchange rate	24.6	24.7	24.3	24.2	25.3	26.5	25.9
Inflation (%)	1.9	3.6	1.5	1.7	3.6	1.3	1.4
Unemployment (%)	8.9	8.8	8.9	8.4	9.3	11.0	11.7
Nominal wage growth (%)	2.9	3.1	4.2	5.0	-0.3	0.4	1.5
Effective GDP growth in euro area (%)	2.8	0.5	1.6	2.1	-0.4	-2.4	-2.8
Credit growth (%)							
Total	6.0	3.2	4.1	6.1	0.2	-3.3	-4.5
Corporations	6.1	4.8	6.1	9.3	-0.3	-5.9	-7.7
Households	5.0	3.6	4.4	6.3	0.6	-2.9	-4.4
Default rate (PD, %)							
Corporations	3.1	3.2	2.9	2.5	5.9	6.7	6.0
Loans for house purchase	4.7	4.4	4.5	4.1	6.2	8.2	7.4
Consumer credit	4.7	4.3	4.0	3.6	6.1	7.9	7.8
Loss given default (LGD, %)							
Corporations	45.0	45.0	45.0	45.0	49.1	55.1	56.6
Loans for house purchase	22.0	22.5	23.4	22.0	28.0	42.5	44.5
Consumer credit	55.0	55.6	56.0	53.8	57.4	64.1	67.1
Asset markets (%)							
3M PRIBOR	1.2	1.0	1.0	2.1	2.1	1.4	0.6
1Y PRIBOR	1.8	1.5	1.5	2.6	2.3	1.5	0.8
5Y yield	2.7	2.3	2.3	2.9	3.1	3.2	2.9
3M EURIBOR	1.4	0.8	0.8	1.1	2.4	1.3	0.2
1Y EURIBOR	2.0	1.0	0.9	1.2	2.3	0.7	0.4
5Y EUR yield	2.0	0.7	0.7	0.8	1.2	1.2	1.2
Change in res. property prices	-1.8	0.1	1.4	3.5	-10.8	-11.7	0.9
Change in share prices	-10.0	-5.0			-30.0		
Banking sector earnings							
Adjusted operating profit (y-o-y %)	2.4	-12.1	0.2	8.4	-27.0	-22.3	11.6

Source: CNB, CNB calculation

Table V.3

Impact of the alternative scenarios on the banking sector

	Baseline Scenario			*Europe in Depression*		
	2012	**2013**	**2014**	**2012**	**2013**	**2014**
Expected credit losses (minus sign for losses)						
CZK billions	-22.5	-26.7	-23.5	-36.5	-65.8	-63.5
% of assets	-0.5	-0.6	-0.5	-0.8	-1.5	-1.4
Profit/loss from market risks						
CZK billions	5.2	-0.9	-5.9	-2.1	2.9	2.5
% of assets	0.1	0.0	-0.1	0.0	0.1	0.1
Earnings for covering losses (adjusted operating profit)						
CZK billions	72.8	73.1	80.1	60.2	45.7	51.3
% of assets	1.6	1.5	1.6	1.3	1.0	1.2
Pre-tax profit/loss						
CZK billions	55.5	45.5	50.7	21.6	-17.3	-9.7
% of assets	1.2	1.0	1.0	0.5	-0.4	-0.2
Capital adequacy ratio						
total in %	**14.5**	**14.6**	**13.8**	**13.3**	**11.5**	**10.1**
Tier 1 in %	**13.8**	**14.0**	**13.2**	**12.6**	**11.0**	**9.6**
Capital injections						
CZK billions		0.0			14.6	
% of GDP		0.0			0.4	
No. of banks below 8% CAR		0			12	

Source: CNB, CNB calculation

rate is linked to the rating of each country (see Table V.1).[93] This type of sovereign risk testing work has also been introduced for the tests of pension funds and insurance companies. A three-month horizon has been added to the already applied one-month horizon for the banking sector liquidity stress tests.

The *Baseline Scenario* indicates no significant fall in risks

Given the importance of the banking sector from the perspective of the financial sector (see line FS.1 in the Table of Indicators), stress tests of the banking sector are traditionally one of the most important tools for assessing potential risks to the stability of the financial sector as a whole. The tests therefore focus mainly on credit risk, which is the largest risk for the Czech banking sector and is particularly closely linked with the household and corporations sectors. The uncertain economic outlook in these sectors for the years ahead (see sections 2.2 and 2.3) is therefore reflected in persisting credit risk for the main credit segments of banking portfolios. This risk is characterised mainly by the expected default rate, which stays at similar levels as in 2011 given the assumptions of the *Baseline Scenario* (see Table V.2). Owing to increased competitive pressures pushing down interest profit, the *Baseline Scenario* assumes a relatively sizeable decrease in adjusted operating profit. Despite this, the banking sector is still profitable over the entire test horizon and has high capital reserves.

The *Europe in Depression* stress scenario would imply a sizeable rise in credit risk and lower profitability of the sector

The adverse *Europe in Depression* scenario describes a significant and protracted decline in economic activity over the entire three-year test horizon. This scenario differs to some extent from the stress scenarios used during 2011, which tended to show a sharp contraction in GDP followed by a gradual return to positive territory. The macroeconomic developments assumed in the *Europe in Depression* scenario result in a noticeable rise in credit losses and a decline of around 30% in the adjusted operating profit of the banking sector at the forecast horizon. The adverse developments will therefore give rise to an accounting loss of the banking sector in 2013 and 2014 (see Table V.3). Despite the conservative calibration of the stress test system, which overestimates the potential risks, the aggregate CAR of the banking sector is maintained above 13% in the *Baseline Scenario* and sufficiently above the regulatory minimum of 8% even in the adverse scenario (see Chart V.8). Tier 1 capital adequacy is about half a percentage point below total capital adequacy, which also illustrates the good capitalisation of the sector.

93 The haircuts of highly indebted countries were set pro rata based on their Standard & Poor's ratings as of 10 May 2012. For example, the haircut on exposures to Greece (rated CCC in May 2012) was set at 60% for all bank exposures to this country. The haircut is applied to the lowered residual value of the exposures, which is around 30% of the original nominal value in the case of Greek government bonds. This assumption thus implies an additional write-down of Greek claims of 18 pp of the original nominal value and a decrease in the residual value of the exposure from 30% to 12%. The haircuts for Portugal (BB), Hungary (BB+) and Ireland (BBB+) were set at 39%, 35% and 25% respectively. A zero haircut was set for countries with the highest AAA rating reporting government debt of more than 60% of GDP.

Although the aggregate CAR is maintained above the regulatory minimum in the scenarios considered, the CARs of 12 banks fall below 8% in the *Europe in Depression* scenario and those banks would have to strengthen their capital. The necessary capital injections total almost CZK 15 billion, which is around 0.4% of GDP; given the size of the banking sector, this is not a significant amount and does not threaten its stability (see Table V.3).

Sensitivity variants of the adverse scenario extend the range of risks tested

As part of its stress tests, the CNB traditionally extends the adverse scenario to include sensitivity analyses which intensify the impacts of the negative developments and illustrate the sensitivity of the sector to some relevant risks. One of the variants extending the *Europe in Depression* scenario is an assumption of an escalation of the debt crisis and significant growth in yields on EU countries' government bonds. This would manifest itself in a loss of investor confidence and growth in risk aversion not only to indebted EU countries, but also to the Czech Republic. The *Europe in Depression and Loss of Confidence* scenario assumes some impairment (around 3%) of all exposures to indebted EU countries, including exposures to AAA-rated countries. To this basic impairment we add additional haircuts on exposures to indebted EU countries using the values listed in Table V.1, which would imply additional losses of up to CZK 20 billion. The value of Czech government bonds held by banks would also decline, given the significant assumed increase in yields on domestic government bonds during 2012 (see Table V.4).

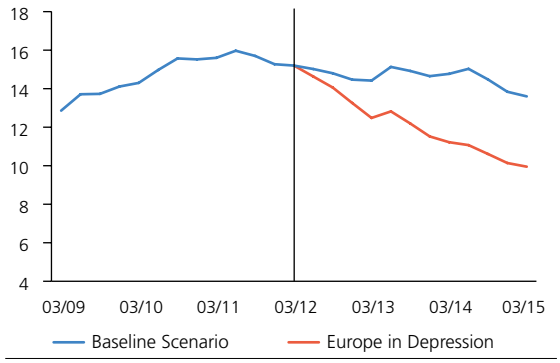
The aggregate CAR will remain above 8% even for an extreme shock combining the adverse scenario, a loss of confidence and partial write-downs of exposures to parent groups

The loss of confidence stress scenario also includes another stress in the form of an assumed impairment of 50% of all exposures of the five largest domestic banks to their parent groups.[94] Unlike the stress tests published in March 2012, where exposures to parent banks were also tested, so-called adjusted exposures are used here. They are obtained by deducting the bank's liabilities in the form of loans and deposits received from the parent bank from the total gross exposure (see section 4). This extreme assumption will cause the banking sector to incur additional losses of almost CZK 37 billion and a decline in capital adequacy to 8% (see Chart V.9). This additional shock should be understood as a means of quantifying the transmission of extreme shocks from parent groups to the Czech banking sector rather than as an assumption that the five parent banks considered will go bankrupt. The necessary capital injections for this shock amount to CZK 32.5 billion (0.8% GDP).

94 Similar tests have been performed for the Czech banking sector in the past – for the first time in 2011 jointly with the IMF during the FSAP mission, and for the second time in February 2012 as part of the CNB's regular stress testing.

CHART V.8

Capital adequacy ratios in each scenario
(%)



Source: CNB, CNB calculation

TABLE V.4

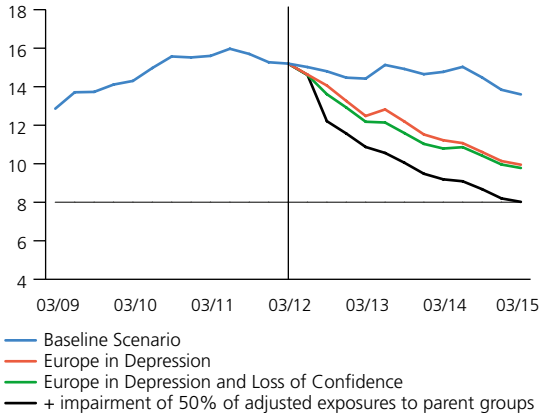
Results of sensitivity analyses
(in *Europe in Depression* scenario)

	Loss of confidence			Parent groups		
	2012	**2013**	**2014**	**2012**	**2013**	**2014**
Expected credit losses (minus sign for losses)						
CZK billions	-36.3	-63.1	-63.7	-36.3	-63.1	-63.7
% of assets	-0.8	-1.4	-1.4	-0.8	-1.4	-1.4
Profit/loss from market risks						
CZK billions	-13.1	4.4	3.1	-13.1	4.4	3.1
% of assets	-0.3	0.1	0.1	-0.3	0.1	0.1
Country risk						
CZK billions	-20.0	0.0	0.0	-20.0	0.0	0.0
% of assets	-0.4	0.0	0.0	-0.4	0.0	0.0
Interbank contagion						
CZK billions	0.0	-1.0	0.0	-0.2	-1.2	-0.3
% of assets	0.0	0.0	0.0	0.0	0.0	0.0
Loss from parent exposures						
CZK billions	0.0	0.0	0.0	-36.9	0.0	0.0
% of assets	0.0	0.0	0.0	-0.8	0.0	0.0
Earnings for covering losses (adjusted operating profit)						
CZK billions	64.2	54.7	60.1	62.2	46.0	46.1
% of assets	1.4	1.2	1.4	1.4	1.0	1.0
Pre-tax profit/loss						
CZK billions	-5	-5	0	-44	-14	-15
% of assets	-0.1	-0.1	0.0	-1.0	-0.3	-0.3
Capital adequacy ratio						
total in %	**12.9**	**11.0**	**10.0**	**11.6**	**9.5**	**8.2**
Tier 1 in %	**12.3**	**10.5**	**9.5**	**10.9**	**8.9**	**7.7**
Capital injections						
CZK billions		17.6			32.5	
% of GDP		0.4			0.8	
No. of banks below 8% CAR		12			15	

Source: CNB, CNB calculation

CHART V.9

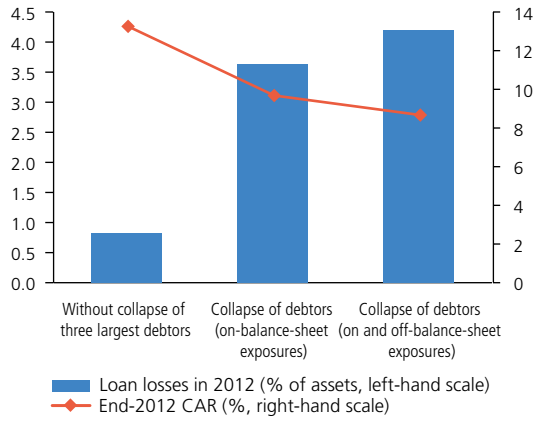
Capital adequacy ratios
(%)



Source: CNB, CNB calculation

CHART V.10

Results of the concentration stress test
(in *Europe in Depression* scenario)



Source: CNB

TABLE V.5

Scenario type and shock size

Scenario type	Values
Bank run (average for banks, %)	10
Drawdown of credit facilities (credit lines, % of volume)	10
Share of short-term claims on banks that will become unavailable (%)	30
Share of short-term claims on other clients that will become unavailable (%)	30
Reduction in value of government bonds eligible as collateral in CNB liquidity-providing operations (%)	30
Reduction in value of other securities (%)	40
Reduction in value of assets sold before maturity (average for banks, %)	50

Source: CNB, CNB calculation

The portfolio concentration test confirms significant impacts of potential bankruptcy of the largest debtors

Concentration risk – consisting in high exposures of banks to a small group of entities – is traditionally tested by partially impairing the largest exposures of each bank. The concentration test is performed for the three largest debtors of each bank and takes into account the current balance-sheet exposure of the largest debtors to the bank as well as the potential increase arising from commitments and guarantees (see section 4). The test assumes a substantial 80% impairment of total exposures to the largest debtors and causes a significant loss to the sector (see Chart V.10). In terms of the stress, however, this is an extremely implausible variant which exceeds the stress scenarios normally used owing to its strength and substantially smaller probability. Despite this, the banking sector as a whole will remain above the 8% capital adequacy level at the end of 2012. Given the size of the stress, even the sizeable fall in capital adequacy to the regulatory minimum for this sensitivity test can be assessed positively.

In addition to the concentration test, the CNB regularly tests the risks associated with exposures to selected sectors or groups of debtors. For the purposes of this FSR, an additional sensitivity test was performed, assuming a write-down of 50% of all exposures to selected developers (see section 3). The write-off of these losses represents a loss of CZK 17.5 billion for the banking sector, and its impact on the aggregate CAR in the adverse *Europe in Depression* scenario is similar to that in the loss of confidence extension.

Liquidity tests confirm the good liquidity position of banks in the Czech Republic

The assessment of the resilience of the banking sector also included a liquidity stress test using a stress scenario that can be interpreted as an extension of the *Europe in Depression* stress scenario to include liquidity shocks (see Table V.5). The two-round macro-stress-testing model presented in FSR 2010/2011 was used to test banks' liquidity risk. The first round of the impact involves the emergence of a potential gap in banks' balance sheets associated with increased demand for asset financing amid lower resources (see the first two items of Table V.1) and a concurrent decline in the value of some assets (the other items) with no difference in their accounting (the revaluation also affects assets held to maturity). The outflow of deposits and the decline in the value of assets sold before maturity are expressed as average values of various parameters applied to a specific bank. These were derived from the results for individual banks obtained in the solvency stress tests presented above.[95] The second round of shocks emerges as a result of a rise in reputational and systemic risk brought about by banks' efforts to close the liquidity gap and is expressed through additional losses arising from the revaluation of securities held in the balance sheet. Overall, this is a scenario with a very high degree of stress.

95 Banks that incurred accounting losses in the credit risk stress scenarios face a greater outflow of liquidity than profitable banks. In sales of illiquid assets, account is taken of the quality of the bank's assets as measured by the credit portfolio risk costs.

The scenario was applied individually to 23 banks having their registered offices in the Czech Republic at the one-month and three-month horizons. To assess balance-sheet liquidity, the liquidity buffer[96] (LB) was selected. It was calculated at its initial value and after the application of the two rounds of liquidity shocks (see Chart V.11). The initial liquidity buffers (the full columns) suggest a high level of quick assets in the banking sector as a whole (over 20%). The lowest level of quick assets is held by building societies (see section 4).

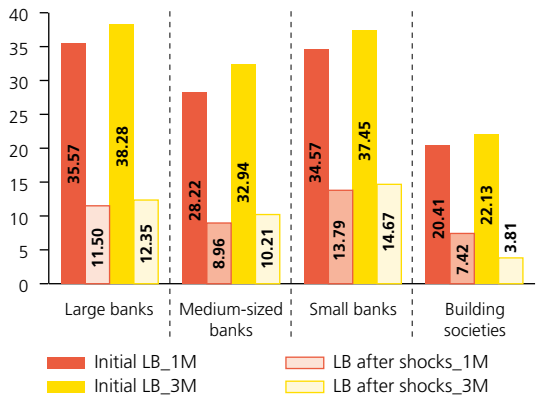
The impacts of the negative shocks on the balance sheets of the groups of banks monitored were very balanced (see Chart V.11). On average, medium-sized banks would be hit hardest at the one-month horizon, followed by large banks, while building societies followed by medium-sized banks would be hit hardest at the three-month horizon. The liquidity buffer would decline by roughly two-thirds on average. If the three-month horizon was applied, the volume of quick assets of the building society sector would fall by more than 80%. This is due to the configuration of the building savings system, where a significant share of time deposits consists of deposits redeemable at notice of three months. The liquidity buffer would be fully exhausted by one bank in the case of the one-month test and by two banks in the case of the three-month test. This is due to the types of business model chosen by individual banks and the total volume of quick assets held. Very specific business models (especially in the case of some medium-sized banks) where long-term assets financed by issues of own securities stand against the minimum liquidity buffer cannot withstand the simulated stress by definition. If banks with specific business models were taken out of the test, medium-sized banks would pass the tests for the above scenarios on average at a level comparable with large banks.

The composition of the liquidity buffer varies from bank to bank. While large banks and most building societies hold the largest part of their buffer in the form of Czech government bonds, small and medium-sized banks hold most of their quick assets in the form of short-term claims on credit institutions. Small banks were the best performers on average in this test; however, if a larger stress was applied to uncollectibility of short-term claims, the results of these banks would not be so favourable. Similarly, if a scenario similar to the Greek crisis was applied, with Czech government debt being subject to high write-offs, the results would not be favourable for large banks and other banks with high concentrations of Czech government bonds in their balance sheets.

Although the conditions of the scenario were relatively tough, the banks tested withstood the simulated shock and would be able to close the potential liquidity gap within one month or three months even under worse market conditions.

CHART V.11

Results of the liquidity test
(%; share in total assets)



Source: CNB, CNB calculation
Note: LB = liquidity buffer; 1M = one-month; 3M = three-month.

96 The liquidity buffer is analogous to quick assets, which are one of the basic indicators of liquidity risk used in microprudential supervision. For the one-month horizon, the liquidity buffer is defined as the sum of cash, claims on the central bank, Czech government bonds and claims maturing within one month, while claims maturing within three months are taken into account for the three-month horizon. Given this definition, the liquidity buffer for the three-month horizon is equal to or greater than the liquidity buffer for the one-month horizon.

Table V.6

Results of the pension fund stress tests
(one-year horizon)

	Baseline Scenario	*Europe in Depression and Loss of Confidence*
Equity (as of end of 2011)		
CZK billions	12.5	12.5
% of assets	5.0	5.0
Allocation of 2011 earnings for policyholders		
CZK billions	-3.9	-3.9
% of assets	-1.6	-1.6
Gains/losses arising from interest rate risk		
CZK billions	-0.9	-4.0
% of equity	-6.9	-31.9
Gains/losses from changes in share and unit value		
CZK billions	-0.4	-1.8
% of equity	-3.2	-14.4
Exchange rate gains/losses		
CZK billions	-0.4	0.6
% of equity	-3.2	4.8
Gains/losses from changes in property value		
CZK billions	-0.1	-0.2
% of equity	-0.5	-1.6
Impact of risks on equity		
CZK billions	-1.7	-5.4
% of assets	-0.7	-2.2
Equity (as of end of 2012)		
CZK billions	6.9	3.2
% of assets	2.9	1.3

Source: CNB, CNB calculation

Table V.7

Ad-hoc sensitivity analysis in the pension fund tests
(one-year horizon, additional shocks in individual scenarios)

	Baseline Scenario	*Europe in Depression and Loss of Confidence*
Release of accrued expenses in 2012		
CZK billions	-2.7	-2.7
% of assets	-1.1	-1.1
Equity (as of end of 2012)		
CZK billions	4.2	0.5
% of assets	1.7	0.2
Revaluation of instruments held to maturity		
CZK billions	-1.3	-11.5
% of assets	-0.5	-4.6
Equity (as of end of 2012)		
CZK billions	5.6	-8.3
% of assets	2.3	-3.3
Exposure impairment risk		
CZK billions	-1.6	-1.6
% of assets	-0.6	-0.6
Equity (as of end of 2012)		
CZK billions	5.3	1.6
% of assets	2.1	0.7

Source: CNB, CNB calculation

Stress tests of pension funds confirm the significance of market risks

The stress tests of pension funds focus on assessing the risks to the sector at the one-year horizon. In addition to the *Baseline Scenario,* the resilience of the sector to adverse developments – a sharp rise in interest rates and depreciation of the exchange rate – was tested. Since the decline in the value of bond holdings due to the rise in interest rates is a significant stress for the market-risk-sensitive pension fund sector, an extended variant of the *Europe in Depression* scenario – called *Europe in Depression and Loss of Confidence* – was used to assess the sector's resilience to adverse developments.

The same as last year, we conservatively assume that yields in 2012 will not foster any increase in equity. Although pension funds must hedge exchange rate risk in line with the legislation in force, we assume partial inefficiency of this hedging in the stress scenario, with 50% of the potential losses (losses excluding hedging) stemming from changes in the exchange rate being reflected in pension funds' performance. The calculation of potential capital injections is based on the assumption that pension funds should maintain equity of around 2% of assets.[97]

The test results show that the equity of pension funds would fall below the set threshold of 2% in the adverse scenario (see Table V.6). Capital injections of almost CZK 2 billion (less than 0.05% of GDP) would be needed to top up the equity to this threshold. The sector's biggest losses arise from interest rate risk. This is linked with the structure of the funds' assets (see section 4). By contrast, depreciation of the koruna would have a favourable effect on the funds' performance (if not fully offset by hedging). On the other hand, real estate risk is minimal due to long-running low investment of funds in assets of this type. Equity risk becomes significant only in the event of a sharp 30% fall. In the *Baseline Scenario,* the capital position of the sector falls mainly because of the change in long-term interest rates and the appreciation of the exchange rate, but the sector remains sufficiently capitalised.

The sector is also tested for other risks that might imply additional losses for the sector

In addition to the risks arising from the assumptions of the baseline and adverse scenarios, sensitivity analyses regarding other potential risks were performed for the pension fund segment (see Table V.7).[98] The first analysis focuses on assessing the risks related to the upcoming pension reform. In this context, the impact of the release of accumulated accrued expenses in 2012 (see Box 5, section 4) was analysed. This would mean losses of CZK 2.7 billion for the sector. The second analysis focuses on assessing the losses from a decline in bond prices if these bonds were revalued to the market price. Although the regulatory rules allow pension funds to value selected government bonds as held to maturity,

97 This value was estimated on the basis of the parameters of the prudential mechanism agreed between the CNB and the Association of Pension Funds in 2009.
98 Losses arising from the ad-hoc sensitivity analysis are deducted from equity, which is already reduced by losses in line with the scenario.

pension funds would have to value these instruments at market value if they suddenly needed to obtain liquidity. The loss of CZK 11.5 billion shows that the necessary bond revaluation would have a significant impact on the funds' performance. The final sensitivity analysis focuses on the risks arising from exposures to European countries with general government debt exceeding 60% of GDP. As in the banking sector tests, the haircuts listed in Table V.1 are applied to the securities of these European countries. The analysis does not indicate any major risks in this respect. This can be explained mainly by the strict legislative rules applying to the investment activities of pension funds.

Stress tests of insurance companies confirm the sufficient resilience of this sector

Like the pension fund tests, the stress tests of insurance companies were performed for the *Baseline scenario* and for the extended adverse *Europe in Depression and Loss of Confidence* scenario. The tests use the end-2011 data and focus on the one-year horizon. The sample of institutions tested contained the 11 insurance companies that take part in the joint stress test project of the CNB and selected insurance companies.[99]

In the adverse *Europe in Depression and Loss of Confidence* scenario, insurance companies would be hit hardest by losses of around CZK 20 billion arising from interest rate risk and losses of CZK 4.5 billion arising from a decline in share and unit value (see Table V.8). The cumulative impact of all the risks considered on the available solvency margin (ASM) in this scenario would be CZK 27.4 billion, or 7.9% of the assets of the institutions tested. Given the expected profit of CZK 15.5 billion in 2012 and planned dividends of around CZK 9 billion, the ASM would drop from CZK 50.8 billion (14.3%) to CZK 33.2 billion (9.4%). As a result, the aggregate solvency ratio would decline from 265% to 176% but would stay above the regulatory minimum of 100%. In the event of adverse market developments, two insurance companies could fall below the regulatory solvency minimum and would have to top up their capital. The necessary capital injections would amount to CZK 320 million (i.e. less than 0.01% of GDP). Despite these losses, the insurance company sector can be assessed as stable and resilient to adverse developments.

Stability can be expected in this sector under the *Baseline Scenario*. Losses from the revaluation of bonds and from the fall in non-life insurance premiums should be offset by retained earnings (planned dividend payments declined by 55% compared to those planned last year), and the aggregate solvency rate at the end of the test horizon should be similar to that observed at the end of 2011.

Table V.8

Results of the insurance company stress tests

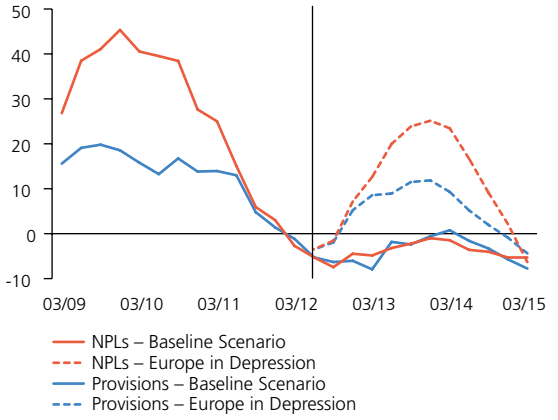
	Baseline Scenario	*Europe in Depression and Loss of Confidence*
Gains/losses arising from interest rate risk		
CZK billions	-2.05	-19.66
% of ASM	-4.04	-38.73
Gains/losses from change in technical provision		
CZK billions	0.20	2.52
% of ASM	0.39	3.73
Gains/losses from changes in share and unit value		
CZK billions	-0.61	-4.51
% of ASM	-1.20	-8.89
Exchange rate gains/losses		
CZK billions	0.05	-0.23
% of ASM	0.09	-0.46
Gains/losses from changes in property value		
CZK billions	-0.14	-0.51
% of ASM	-0.27	-1.00
Gains/losses from fall in non-life insurance premium		
CZK billions	-2.31	-2.31
% of ASM	-4.55	-4.55
Impact of risks on ASM		
CZK billions	-7.74	-27.38
% of assets	-2.18	-7.90
Projected earnings from insurance activities in 2012		
CZK billions	15.53	15.53
% of assets	4.38	4.38
Planned dividends for payment in 2012		
CZK billions	-8.97	-8.97
% of assets	-2.53	-2.53
Other impacts (tax)		
CZK billions	-0.38	1.50
% of assets	-0.11	0.45
ASM (as of end of 2011)		
CZK billions	50.75	50.75
% of assets	14.31	14.31
ASM (as of end of 2012)		
CZK billions	51.51	33.22
% of assets	14.52	9.37
Solvency ratio		
as of end of 2011	265%	265%
as of end of 2012	269%	176%

Source: CNB

99 The tests use internal CNB data supplemented by preliminary results from the joint stress tests of the CNB and selected insurance companies. These joint stress tests also analyse the impacts of insurance risks in addition to market risks.

CHART V.12

NPLs and provisions
(year-on-year changes in CZK billions)



Source: CNB

5.3 SYSTEMIC RISKS AND MACROPRUDENTIAL POLICY RECOMMENDATIONS

Credit risk remains the focus of the CNB's attention

A potential deterioration of the credit portfolio resulting from adverse developments in the real economy remains the main risk to the Czech banking sector (see section 2). Banks' balance sheets still contain quite a large stock of NPLs, most of which were provided either before the crisis or in its first phase. It can be deduced from the stock of NPLs and the related provisioning that the inflow of new NPLs has gradually slowed in recent quarters and – in combination with the write-off of default loans – growth in total NPLs has halted. However, the slowdown in economic activity and in particular the unfavourable evolution of household income may now reverse this positive trend. Loans provided after the economy started to recover following the 2009 recession might then become non-performing to an increasing extent. If the *Europe in Depression* scenario materialises, the NPLs and provisions could increase significantly again (see Chart V.12).

Banks must maintain a high loss-absorbing capacity

To maintain high public and investor confidence in the stability of the Czech banking sector, banks must maintain a high capacity to absorb potential credit and market losses. In an environment of high uncertainty about the future economic development and increased sensitivity of financial analysts to the links between parent and subsidiary banks, it will also be necessary to continue regularly monitoring banks' capital adequacy on both a solo and consolidated basis. In the medium term, it will also be necessary in the Czech Republic to evaluate a risk that is currently a subject of debate among many foreign regulators and supervisors, namely the possibility that banks, in their efforts to comply with the new Basel III capital requirements, might rely too much on reducing their risk-weighted assets by softening the risk parameters in their internal risk models or on creatively "restructuring" some assets in order to reduce their risk weight.[100] When managing risks, banks should consider scenarios containing long-term adverse trends in the macroeconomic environment showing up as flat or slow income growth. The settings of internal models should not be based on time series primarily covering the pre-crisis period of rapid economic growth and on inappropriate quantitative methods that result in underestimation of the risks of adverse scenarios.

The CNB's strategy for the near future will consist mainly in paying increased attention to credit risk and the links between domestic banks and their parent groups

The CNB will continue to pay increased attention to the quality of the credit portfolios of banks and credit unions. The main emphasis will be put on prudential categorisation of claims, sufficient provisioning and correct collateral valuation. With regard to the growth in mortgage

100 See, for example, Das, S., Sy, A. N. R. (2012): *How Risky Are Banks' Risk Weighted Assets? Evidence from the Financial Crisis*, IMF Working Paper WP/12/36.

loans, which is going on in an environment of low interest rates, the CNB will also focus on the sensitivity of mortgage portfolios to possible interest rate growth.

On the basis of credit risk analyses, the CNB is also taking regulatory measures. In April 2012, the CNB decree on prudential rules for banks, credit unions and investment firms was amended to tighten the qualitative requirements for the lending activities of banks and credit unions. It can be expected to take effect in July 2012. In the area of credit risk, new obligatorily assessed features of transactions have been specified and the scope of the existing features has been extended. Specifically, credit institutions are required to assess and take into account the macroeconomic conditions in the country of residence of the counterparty, including the phase of the business cycle, the level of the counterparty's own funds, the ratio of the exposure to the counterparty's free cash flows (LTI) and the ratio of the exposure to the value of the collateral used (LTV). At the same time, however, appropriate scope is left for taking into account the specific conditions of the transaction and no binding quantitative values are specified for those parameters. As regards provisioning, qualitative requirements are set for collateral for the purposes of valuing claims when determining asset impairment losses. Previously, these qualitative requirements were explicitly specified only in the capital adequacy and exposure rules. Now, a consistent approach must also be applied in the calculation of credit losses.

The CNB has prepared a new supervisory procedure for verifying the sufficiency of provisioning

In connection with previously conducted credit risk analyses (see section 4) and with discussions not only within the CNB, but also with IMF experts in the FSAP mission in late 2011, and also given the less-than-satisfactory coverage of credit risks in some institutions, the CNB prepared draft official information and submitted it to the Ministry of Finance and the relevant associations for consultation in April 2012. The document, which is expected to be promulgated during June 2012, describes the CNB's procedure for assessing the sufficiency of provisioning. The CNB intends to apply this procedure in the supervision of credit institutions (i.e. banks and credit unions). It can be regarded as a microprudential – and to a certain extent also macroprudential – tool aimed at supporting financial stability at a time of persisting risk of worse-than-expected economic developments.

The main objective of this procedure is to facilitate a structured discussion about the amount of provisions mainly with institutions that do not apply the advanced IRB approach to credit risk management. Institutions that do apply the IRB approach normally conduct a so-called provisioning sufficiency test. This involves comparing the expected loss (calculated as the product of PD, LGD and EAD for all relevant portfolios) and the amount of provisions. Any shortfall in provisions is then subtracted from capital. Institutions that apply the standard approach to the calculation of capital requirements do not perform this test. The new CNB procedure consists in comparing the expected loss

– calculated using PD and LGD parameters specified by the CNB on the basis of sector averages – and the amount of provisions. Any difference will then be discussed with the credit institution concerned. If the credit institution fails to provide a satisfactory explanation of the difference, statutory supervisory tools (e.g. a requirement to create additional provisions, increase capital adequacy or limit dividend payments) may be activated. On the other hand, any excess provisioning found using this procedure cannot be interpreted as a signal to release provisions.

The CNB is tightening the rules for exposures to parent banks and introducing an information duty for non-standard intra-group credit risk transfers

The stress tests conducted for this Report and during the 2011 FSAP mission reacted among other things to the fact that credit default of a parent bank is a risk that would have a significant impact on the soundness of the banking sector.[101] In response to potential risks stemming from the links between Czech banks and their parent companies, the CNB decree governing the exposures of Czech banks to their foreign parents and affiliates was amended in April 2012. The value of the exposure excluded from the overall limit on the institution's exposure to a foreign parent or affiliate for the calculation of the regulatory ("net") exposure has been reduced from 75% to 50%. With the limit for (net) exposure remaining at 25% of capital, this reduction implies a decrease in the gross exposure limit from 100% of regulatory capital to 50%. Furthermore, an information duty to the CNB has been stipulated regarding the assumption of credit risk exceeding 1% of total assets from a group member and regarding the execution of a "structural change", e.g. the purchase of only part of a business from a group member or a capital investment exceeding 10% of its equity capital.

The CNB continues to formalise macroprudential policy in 2012

The CNB was one of the first central banks to establish a formal structure for assessing risks to financial stability and pursuing macroprudential policy. Since 2009 the members of the CNB Bank Board have met quarterly with experts from key departments in so-called macro-financial panels. In 2010 and 2011, similar or more formal macroprudential policy structures started to be established at national and international level. A joint institution for the identification of systemic risks and macroprudential policy – the European Systemic Risk Board (ESRB) – started operating in the EU in early 2011. Subsequently, European central banks, including the CNB, discussed possible directions for the development of macroprudential policy. The IMF FSAP mission which took place in the Czech Republic in the second half of 2011 recommended strengthening the CNB's financial stability mandate and putting the objective to oversee the stability of the financial system into the Act

101 The risk that Czech banks could suffer losses from exposures to their foreign parents was emphasised by foreign analysts in 2011. On 1 December, for example, Moody's changed the outlook for the Czech banking sector to negative, stating links to parent banks as one of the reasons. However, analysts tend to overstate the potential risks associated with the possibility of parent banks using the liquidity of their Czech subsidiaries, as they overlook the potential support of parent banks by their governments and the exchange rate factor, which significantly restricts the rapid transfer of large volumes of funds.

on the CNB on almost the same footing as the CNB's primary objective to maintain price stability. At the EU level, the ESRB in January 2012 issued a recommendation on the macroprudential mandate of national authorities[102] proposing that EU Member States stipulate a mandate for financial stability and macroprudential policy at national level (ideally in their legislation) and ensure effective institutional arrangements for the conduct of macroprudential policy (including the issues of independence, transparency and accountability), with the central bank playing a leading role. The recommended measures should be in force not later than 1 July 2013.

A draft amendment of the Act on the CNB was prepared in response to these recommendations. This strengthens the mandate of the CNB in the area of financial stability and macroprudential policy. The objective of overseeing financial stability is seen in a broader sense as a catch-all objective for macroprudential and microprudential regulation and supervision and a number of other CNB functions (e.g. financial market operations) which, together with monetary policy, contribute to the stability of the macroeconomic environment and the financial system. To maintain financial stability, the CNB is authorised to use the tools at its disposal, be they standard tools of microprudential supervision or specific macroprudential tools or recommendations and warnings issued to relevant recipients. The CNB also made internal adjustments to its macroprudential policy decision-making system to bring it closer into line with its monetary policy decision-making system.

BOX 7:
MACROPRUDENTIAL POLICY AND COUNTERCYCLICAL CAPITAL BUFFERS IN THE EUROPEAN IMPLEMENTATION OF BASEL III

Basel III will be implemented in the EU by means of a directive (Capital Requirements Directive, CRD) and a regulation (Capital Requirements Regulation, CRR), each with the suffix IV (CRD/CRR IV). The key parts of Basel III – pertaining primarily to capital requirements and required capital quality – will be part of the regulation and therefore directly applicable throughout the EU with no possibility of national discretion in implementation into national legislation. The requirement for uniform application of the main areas of banking regulation throughout the EU reflects efforts to make the regulatory environment for banks in the EU more transparent and remove national specificities and discretions (a "single rulebook"). In light of the increasing emphasis on the possibility of conducting macroprudential policy, however, this requirement is somewhat in conflict with the requirement to allow national regulators to set stricter requirements (e.g. for capital or liquidity) than laid down in EU law in order to contain systemic risks at the national level.

102 See the Recommendation of the ESRB of 16 January 2012 on the ESRB website: http://www.esrb.europa.eu/recommendations/html/index.en.html.

One of the tools which, in the original Basel III, gives national authorities some discretion in the setting of capital adequacy requirements is the countercyclical capital buffer.[103] It allows the setting of a national rate of between 0 and 2.5% (and in justified cases even higher) which will be added to the minimum capital ratio stipulated by law to serve as a new minimum during times that the regulator judges to be "too good" – periods of high growth in lending and asset prices and optimistic expectations, during which systemic risks for the future usually accumulate. The original Basel III contains an international reciprocity rule for this tool: if a national regulator sets a rate for this buffer for exposures in its jurisdiction, regulators in other countries where Basel III is implemented must use this rate for the relevant cross-border exposures of banks regulated by them in the relevant jurisdiction. International reciprocity is guaranteed for rates of up to 2.5%, but the proposed EU implementation of CRD IV (currently the "Danish Presidency Compromise") goes beyond this and introduces the possibility of voluntary reciprocity above this limit in the EU.

The CNB intends to make active use of the countercyclical buffer and welcomes the current compromise CRD/CRR IV proposal, which gives Member States sufficient flexibility in the setting and application of the variables and methods on which the buffer rate will be based. The EU legislation requires the calculation of a guide indicator of the credit gap in per cent of GDP under Basel III methodology, which – as demonstrated in FSR 2010/2011 – is not very suitable for converging countries like the Czech Republic. However, the rate may be based on other analyses using a range of variables relating to the credit cycle. These variables, which will be assessed quarterly by the CNB, include the credit gap in per cent of GDP calculated using alternative methods to determine overindebtedness of the real economy, credit growth itself, interest margins, property prices, credit risks measured by various indicators, changes in credit standards according to the Bank Lending Survey, and the profitability of banks. Countercyclical logic will be applied strictly in the assessment of the indicators: if growth in credit or property prices is excessive, margins are too low, profits are too high or credit risk is too low, the countercyclical capital buffer will have to be activated and so banks will have to create a capital reserve for worse times.

A discussion at EU level in 2011 and the first two months of 2012 revealed that most national authorities consider the countercyclical capital buffer to be very useful but not entirely

103 This tool gives discretion to national regulators and is therefore part of the directive (CRD IV), not the regulation. For details on the countercyclical capital buffer in Basel III, see Geršl, A., Seidler, J. (2011): *Excessive Credit Growth as an Indicator of Financial (In)Stability and its Use in Macroprudential Policy* in last year's FSR.

sufficient to limit potential systemic risk in individual EU Member States. Many Member States, supported by the ESRB, are demanding minimum harmonisation of the requirements and are advocating flexibility in the conduct of macroprudential policy under CRD/CRR IV, in the sense of being able to make the requirements (especially for capital) tighter than the minimum, but never easier. By contrast, the European Commission, supported by some Member States, is insisting on maximum harmonisation of key required variables such as capital adequacy, pointing out that under CRD/CRR IV regulators will be able to apply the Pillar II tools (simply put, they will be able to tighten the requirements for individual institutions or groups of institutions on the basis of supervisory findings) and will possibly also have some freedom to set tighter risk weights for exposures secured by property. In this debate, the CNB is siding with the countries calling for greater national flexibility, as it believes that the current crisis in some EU countries reflects the fact that their authorities lacked a sufficient legislative mandate to use the tools to counter the build-up of systemic risk during the credit boom.

The third version of the CRD/CRR IV compromise, prepared by the Danish Presidency in March 2012, attempts to find a middle ground and proposes to allow flexibility in order to limit systemic risk at national level in the following areas. First, in the event of a tightening of the Pillar II requirements – previously viewed as a tool of microprudential supervision – explicit reference may be made to the objective of limiting systemic risk. Second, a new type of systemic risk buffer is being introduced, which national authorities can use up to a CAR of 3% (with ex post notification of the European Commission and the ESRB), and in exceptional cases above this level (with the approval of the European Commission and the ESRB). If the combination of the countercyclical buffer, the systemic risk buffer and the Pillar II tools is demonstrably insufficient for the national authority, it may also tighten some other requirements listed in the regulation (e.g. the minimum CAR, certain risk weights) for a limited period of time and with subsequent assessment by the European Commission and the ESRB. This option is also given to the European Commission, which may impose such a tightening usually on a group of EU Member States. Although this rather complicates the implementation of Basel III in the EU, and although the proposed procedures may reduce the transparency of the practical conduct of macroprudential policy, the CNB regards this compromise as sufficient for macroprudential policy making in the Czech Republic. Together with the tools of microprudential supervision, it should lay a solid foundation for the pursuit of the financial stability objective.

PART II – THEMATIC ARTICLES

HOW TO IDENTIFY SYSTEMICALLY IMPORTANT FINANCIAL INSTITUTIONS

Zlatuše Komárková, Václav Hausenblas and Jan Frait

The crisis has brought the issue of regulating large, complex and highly interconnected financial institutions back into the spotlight. Supervisory and other competent authorities have discovered that they have only limited ways of preventing an idiosyncratic shock in one institution from turning into a system-wide shock and of stopping the contagion spreading to other domestic and foreign financial institutions. This article aims to draw attention to the risks associated with the existence of systemically important financial institutions. It discusses methods for identifying systemically important financial institutions, including the approach proposed by BCBS (2011b), which is applied to the Czech banking system for illustration. Overall, our systemic importance results show that there is a large number of normally important financial institutions on average and a very small number of more important institutions. Moreover, there is high variance among the most important institutions in the results. In connection with the newly proposed regulation, the article presents possible instruments for increasing the resilience of such institutions to systemic risk.

1. INTRODUCTION

The current financial crisis has revealed significant risks associated with the activities of large, complex and interconnected financial institutions, known as systemically important financial institutions (SIFIs[1]), and with the inadequate regulation and supervision of such institutions (IMF, 2010). Over the last two decades, banks in advanced economies have expanded to significant sizes, in many cases crossing the boundary at which economies of scale stop increasing. In many cases they have abandoned their traditional local or regional banking model and have started operating on a global scale. Most cross-border financial transactions are now intermediated by just a few financial institutions, between which there are very numerous and non-transparent links. Common trends in the behaviour of these institutions include a sharp increase in leverage, a reliance on short-term funding sources, significant growth in off-balance-sheet activities and maturity mismatches, and a high proportion of income from trading in complex structured products. The regulatory and supervisory regulations have been unable to react to the accumulating risks associated with the activities of such institutions, and their capital, which was supposed to act as a buffer against risks, has turned out to be not only too small, but also of poor quality.

A debate has been renewed at the international and national level about how to fix the regulatory and supervisory shortcomings and failures and to safeguard the stability of the financial system going forward. The G20 summit in April 2009 agreed to reform and strengthen the financial system and in particular to increase the resilience of individual financial institutions and the sector as a whole. The Financial Stability Board (FSB), the International Monetary Fund (IMF), the Bank for International Settlements (BIS) and, under it, the Basel Committee on Banking Supervision (BCBS) were tasked with implementing these objectives. In response to the G20 call, a general guidance document was issued in October 2009 to help national authorities identify global systemically important financial institutions, markets and infrastructures (FSB, IMF, BIS, 2009). This framework was updated at the October 2010 G20 summit by a set of recommendations for reducing the moral hazard posed by SIFIs (FSB, 2010). The BCBS also responded to the need to change the existing SIFI regulations in its new Basel III regulatory framework for the banking sector (BCBS, 2009 and 2011a) and in a document specifically targeted at the regulation of SIFIs (BCBS, 2011b) produced in response to the decisions adopted at the G20 level. And finally, at the G20 summit in November 2011, the FSB in consultation with the BCBS Macroprudential Supervision Group was asked to prepare guidelines for applying the framework for global institutions (G-SIFIs) to institutions that are systemically important at the domestic level (D-SIFIs).

The methodology for setting the instruments used to regulate the risks associated with SIFIs is closely linked to the identification of SIFIs. On a basic level, the instrument should be set as a function of the size of the institution, its interconnectedness with other institutions, the correlation

1 The SIFI category includes both independent institutions and consolidated entities in the form of financial groups. Independent SIFIs are usually banks, but can also be large insurance companies or other types of institutions. Likewise, SIFIs in the form of financial groups can be concentrated not only around banks, but also around non-bank institutions. Given the nature of the Czech financial market, the debate about SIFIs in the Czech environment mainly concerns banks. In the case of systemically important banks, the abbreviation SIB (systemically important bank) is generally used in the literature.

between the balance sheets of individual institutions, and other factors. It is assumed that purpose of the instrument is to reduce the probability of failure of SIFIs and mitigate the adverse effects of failures on the financial system. We are therefore seeing a shift in the debate on the new regulation of SIFIs, as the focus is no longer solely on how to effectively prevent the collapse of already impaired SIFIs, but on how to keep SIFIs sufficiently resilient to systemic risk.

This article is concerned with the identification and subsequent regulation of SIFIs. In Section 2 we look at the definition of SIFIs and the categorisation of their key characteristics. In Section 3 we focus on the methods that can be used to identify SIFIs and apply some of them to the Czech banking sector. Section 4 focuses primarily on prudential instruments for suppressing the contribution of SIFIs to systemic risk. The final section concludes.

2. DEFINING SYSTEMIC IMPORTANCE

The expansion of large and complex financial institutions (primarily in the form of large and complex banking groups) is associated with the global integration of markets and can therefore be regarded as a natural phenomenon. The constant push to obtain funds more easily, to smooth them over time, to diversify them and to use them effectively to finance global operations has essentially necessitated the creation of a large cross-border banks. The services of these financial institutions are used not only by large international non-financial corporations and investors, but also indirectly by governments seeking new creditors to fund their already high and still rising debt. The global banking industry is also highly concentrated, as evidenced by a high ratio of total cross-border transactions to the number of international financial institutions executing them.[2] In connection with this trend, a complex structure of linkages has formed between financial institutions. This offers the benefit of credit and liquidity risk-sharing on the one hand, but poses an increased risk of contagion on the other (Rochet and Tirole, 1996; ECB, 2006). Contagion risk, also known as network risk, represents the main contribution of SIFIs to systemic risk (e.g. Frait and Komárková, 2011; Haldane, 2009; ECB, 2010). The potential direct crisis response by authorities to contagion risk is a significant source of moral hazard (FSB, 2010), as the expected bail-out of large and complex financial system institutions that become unstable causes markets to believe that they cannot fail. It also gives them easy access to cheap funds and encourages them to engage in riskier activities. The greater the risks these institutions accept, the more they contribute to systemic risk.

Defining the term *systemically important institution* is not straightforward given the widely varying conditions, regulations and levels of development of different financial markets. For the purposes of microprudential supervision a SIFI can be defined as an institution whose failure would cause its creditors and shareholders to suffer large losses in the form of direct costs. From the macroprudential perspective, a SIFI is a system component that contributes significantly to the accumulation of systemic risk and whose failure would impose large losses on its surroundings and would threaten the smooth functioning of the system as a whole and have adverse knock-on effects on the real economy. This macroprudential factor is larger, since it is the indirect impacts on the SIFI's surroundings which have the potential to trigger a major and protracted crisis. A SIFI can be defined from the negative point of view as an institution whose uncontrolled failure has the potential to seriously damage the financial system, but it can also be defined from the positive point of view as an institution whose viability is crucial for the smooth functioning of the financial system and the real economy (Weistroffer, 2011).

From the perspective of microprudential and macroprudential policy instruments it is useful to create a practical definition of systemic importance (Thomson, 2009) that will give supervisory authorities room in reality to apply their instruments in order to influence the relevant financial institutions. In this sense it has been proposed to identify SIFIs by classifying their funding sources and measuring their contribution to systemic risk or events. The standard classification for identifying systemic importance (Brunnermeier et al., 2009; Thomson, 2009) is based on (i) the size of the financial institution, (ii) its interconnectedness, (iii) the correlation between financial institutions' balance sheets, (iv) the concentration of financial institutions' activities, and (v) the macrofinancial conditions and overall context (such as the structure of the financial industry and the political system).

The reason for this complicated classification is the existence of various factors that shape the systemic character of institutions. The original method for identifying

2 Goldstein and Véron (2011) state that the share of the five largest global banks in global banking assets doubled from 8% in 1998 to 16% in 2008. They also point out that this increase in concentration was particularly pronounced during the crisis, with the share of the 10 largest global banks in total global assets rising from 14% in 1999, to 19% in 2007, to 26% in 2009.

systemic importance was based solely on institution size, but this approach is inadequate for the current regulatory identification of SIFIs. The current crisis has shown that smaller financial institutions can also contribute significantly to systemic risk if, for example, they are financially too interconnected within the sector or have the potential to trigger a systemic event in some other way. Even a relatively small bank can have such potential if it has a significant share of an important market segment (e.g. mortgages), as distress at such a bank can cast doubt on the soundness of the entire segment. On the other hand, a large financial institution can act as a stabiliser of the financial sector thanks to its ability to absorb a large part of systemic risk. The identification of individual SIFIs and the subsequent application of combined instruments to enhance their resilience or suppress their contribution to systemic risk requires a higher degree of judgement (FSB, IMF, BIS, 2009).

The first criterion for classing a financial institution as a SIFI is the simple size ("too big to fail") and/or concentration of its activities[3], or its lack of substitutability (as a dominant player in an economically significant financial market or a provider of a unique service, e.g. a central counterparty or clearing and settlement institution.). The size-based assessment of a financial institution's systemic importance is related to the amount of financial services it provides (such as the volume of transactions it executes in various markets or the volume of assets it holds or manages, which are indicative of the extent to which its clients depend on its funds) and to its estimated negative impact on the system were it unable to provide them.

The second criterion is the interconnectedness of the financial institutions within and across the financial system ("too interconnected to fail"). Strong interconnectedness between financial institutions resulting from too many and too large inter-institution exposures creates a risk of direct contagion in the form of the transmission of idiosyncratic risk from one institution to another. The result is growth in systemic risk and ultimately also a reduction in the aggregate amount of financial services provided.

The third criterion for classing financial institutions as SIFIs is the degree of similarity and correlation of their balance sheets ("too many to fail").[4] If two or more institutions hold the same or similar assets, i.e. assets whose values are strongly correlated, a systemic shock to the value of those assets will affect the balance sheets of all those institutions simultaneously. Examples of such assets include claims on a common debtor or issuer (e.g. the public sector) and the concentration of lending in a single sector of the real economy (e.g. the property market). Correlation also represents a channel of indirect contagion in the time dimension of systemic risk. In the event of a systemic (idiosyncratic) shock, some institutions (one important institution) can, in an emergency, sell assets prematurely (fire sales). Depending on the size of the relevant market, this will drive down the price of those assets, further intensifying the crisis and increasing the risk of default of those and other institutions. Another symptom of correlation is herd behaviour, where several institutions behave in the same way. Balance sheets can also be correlated through the liability side. If too many financial institutions fund themselves through a single type of credit market, all of them will suddenly become vulnerable at the moment this market ceases to function. Simply put, in all these cases, multiple institutions behave like a single institution and need to be analysed and supervised as a single entity or cluster.

The fourth criterion is the macrofinancial or political conditions/context in which an institution can be identified as a SIFI. In difficult economic and financial conditions, a supervisory authority tends to be reluctant to identify financial institutions as distressed if it is sure that their solvency would improve significantly under normal conditions. So, a financial institution does not have to be extremely large or complex to be offered a bail-out (e.g. Bear Stearns and Long-Term Capital Management; see Thomson, 2009). The SIFI identification methods described above will not necessarily draw attention to financial institutions that are marginally important in terms of systemic risk in good times but whose failure can exacerbate bad financial conditions in markets during crises. Such institutions are relatively difficult – and sometimes even impossible – to identify ex ante.

Using the criteria described above, financial institutions can be allocated to categories according to how much they contribute to the build-up of systemic risk or the triggering of systemic events. Generally, a high level of prudential supervision is applied to financial institutions that satisfy the largest number of systemic importance criteria.

3 In addition to simple size, it is important to monitor the relative size of the institution in relation to individual markets. An example is the multinational insurance corporation AIG with its significant position on the CDS market.

4 The problem of the correlation of risky exposures across financial institutions is linked primarily with the time dimension of systemic risk (Frait and Komárková, 2011).

3. METHODS FOR IDENTIFYING SIFIS IN THE CZECH BANKING SECTOR

There are several ways of measuring systemic importance. They fall into two main categories: dynamic and static. The dynamic approach is based either on statistical modelling of the losses of the system as a whole and their subsequent allocation to its individual components in order to determine the largest contributor to systemic risk[5] (e.g. Tarashev et al., 2010), or on simulation modelling (e.g. Upper, 2011) of channels of contagion between components and over time (network analysis of exposures inside and outside the system). This is largely an academic approach and generally suffers from an absence of the data needed to construct or calibrate the individual models. Another downside of these models is that they do not account for the bias in market prices caused by the fact that systemic importance is already implicitly included in market pricing, as market participants assume that such institutions will be rescued by the government if they are at risk of failing (Berg, 2011).

For the reasons given above, the static approach is more practical for effective microprudential and macroprudential policy-making. This approach uses static quantitative and qualitative indicators which allow for simple comparison and further analysis of the individual components of the system.[6] In addition, this method is flexible, simple and transparent, making it easier to communicate to system participants. It has been used to identify global systemically important banks (G-SIBs; see BCBS, 2011b). Drehmann and Tarashev (2011b) additionally show that correctly set simple indicators can proxy quite well for measures based on more complex models. On the other hand, it is clear that this method does not cover all forms of systemic risk. A major handicap is its inability to cover the time dimension of systemic risk, i.e. the rise and fall of systemic importance over the financial cycle. So, for example, it is no good for analysing the too-many-to-fail syndrome and other manifestations of herd behaviour, which increase the risk of indirect contagion.

The assessment of the results obtained from the above methods is conditioned by a number of considerations, and it is vital to interpret the results adequately.[7] While some categories and their weights entering the systemic importance measure (such as size) can be assessed uniformly across financial institutions as regards the size of their contribution to systemic risk, others have to be treated differently from sector to sector to a large extent (e.g. interconnectedness). The assessment of systemic importance is also time-varying and depends on the current economic conditions. Simply put, the assessment of an institution's systemic importance can differ in good times and crisis times because it is influenced by structural trends and cyclical factors.[8] This implies the need for more frequent assessments of systemic importance in specific institutions. Finally, the methods for measuring and criteria for assessing systemic importance can differ according to whether the outcome is used primarily for (i) defining the regulatory perimeter, (ii) calibrating the intensity of oversight, or (iii) guiding decisions during a crisis, and also on whether they are measuring local, regional or international systemic importance. All the factors described above make it difficult to make measurements mechanically and demand a high degree of judgement by those assessing the results.

To analyse systemic importance in the Czech financial system in this article we used the composite quantitative indicator-based approach (Table 1, right-hand column) based on the recommendations in the FSB/IMF/BIS (2009) report submitted to G20 finance ministers and central bank governors in October 2009 (BCBS, 2011b; Table 1, middle column). The composite quantitative indicators are supplemented with two indicators obtained from network

5 This technique is referred to as the "top-down" approach. It is, however, possible to proceed in the opposite direction, expressing systemic risk as the sum of the contributions of the individual system components. This is known as the "bottom-up" approach.

6 Static indicators are useful, for example, for defining the regulatory perimeter.

7 The criteria of institution size and intra-sector connectedness can contribute differently to systemic risk. In this specific case, the weighting of these two criteria can depend heavily on the dependence of financial institutions on the financial market. If financial institutions in the system are dependent primarily on market sources of funding, the interconnectedness criterion may play a larger role than in a system where financial institutions are funded primarily by deposits or insurance premiums.

8 In worse economic conditions, the probability of financial institutions suffering correlated losses is significantly higher and the potential failure of financial institutions can trigger a general loss of confidence with all that that entails. By contrast, in good times the categories of complexity and cross-border interconnectedness can play a larger role.

Table 1

SUMMARY OF COMPOSITE QUANTITATIVE INDICATORS

Category	BCBS (2011b)	This study
Size and activity Represents the factor of concentration.	• total exposures	• gross credit exposure • interest income and fee and commission income
Interconnectedness Represents the factor of direct contamination. Distress at highly interconnected institutions directly endangers the rest of the system through mutual exposures.	• claims on credit institutions • liabilities to credit institutions • wholesale funding ratio	• claims on credit institutions • liabilities to credit institutions • mean centrality in interbank market network
Cross-border activity Represents the potential channel of direct contagion from abroad.	• claims on non-residents • liabilities to non-residents	• claims on non-residents • liabilities to non-residents
Substitutability A non-substitutable institution is one whose place cannot be taken by another in the short run. Market participants and clients are therefore heavily dependent on its services and products.	• assets under custody • payments cleared and settled through payment systems • values of underwritten transactions in debt and equity markets	• assets under custody • payments cleared and settled through payment system • mean centrality in CERTIS network
Complexity Not a systemic importance criterion, but creates a risk of inadequate supervision and regulatory arbitrage. Supervisory judgement should form a substantial part of this measure.	• trading book value and available for sale value • level III assets • OTC derivatives notional value	• trading book value and available for sale value

Source: Authors, BCBS (2011b)

analysis.[9] For the sake of clarity, the eleven indicators selected were grouped into five categories: size, cross-border activity, interconnectedness, substitutability and complexity in order to stick as closely as possible to the general classification described in section 2 of this article (Table 1, left-hand column). For the sake of simplicity, the scope of the article is limited to the Czech banking sector (D-SIB analysis) using data as of 30 September 2011.[10]

The individual indicators were calculated for each bank separately. The score for each indicator was generally computed by dividing the amount of the relevant variable for the individual bank by the aggregate amount for the entire system. Finally, the composite indicator of systemic importance was calculated as the weighted average of these indicators.[11]

In the method applied to the Czech banking system we initially – following BCBS (2011b) – assumed equal weights for each category and equal weights for the relevant indicators within each category. So, each category was given a weight of 20% and this was subdivided according to the number of indicators (i.e. where there are two indicators in a category each indicator was given a 10% weight, and where there were three the indicators were each weighted by 6.67%).

However, the allocation of weights in order to obtain the composite indicator of systemic importance is subject to numerous assumptions. Important roles are played by the current economic conditions, regulatory diversity, and the structure and level of development of the financial system.

9 Network analysis is a suite of methods for analysing the interconnectedness of the components in a system. It can be used to determine the importance of the components in relation to their position in the network. A network consists of nodes connected by links; in our case, the nodes are banks on the interbank market or in the CERTIS payment system and the links are the mutual exposures and payment operations between them (see Charts 3 and 4). The importance of a bank in the network is measured by its centrality, which is determined by its degree, betweenness, closeness and prestige in the network. According to network analysis, the importance of a node/bank increases with the number of links going in and out of it (degree), the number of other nodes it connects (betweenness), its proximity to other nodes (closeness) and the number of links it has with other important nodes (prestige). For more details on types of centralities, see von Peter (2007).

10 The reference system consists of 23 banks domiciled in the Czech Republic on a non-consolidated basis. The network analysis covers the entire interbank market/CERTIS payment system network, i.e. including branches of foreign banks operating in the Czech Republic.

11 For example, the score for the first indicator – gross credit exposure – was calculated by dividing the gross credit exposures of a particular bank by the total exposures across all the banks under analysis, and then giving the result a 10% weight. Simply put, this means that 10% of the share of the bank's gross credit exposures in the aggregated sum of exposures enters the bank's total systemic importance score (composite indicator).

For these reasons, we performed a further two estimates of the systemic importance of Czech banks using alternative category weightings.

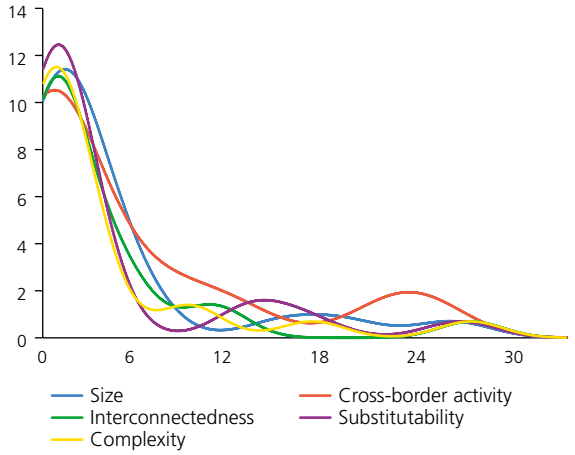
For the first alternative estimate, we changed the weights so that they better reflected the conservative nature of the Czech banking sector. Retail deposits remain its primary funding source, while market activities – especially on the international scale – play a minor role. The categories were reorganised and their weights changed while keeping the weights of the indicators within each category equal: substitutability (33.33%), size and activity (26.67%), interconnectedness (20%), cross-border activity (13.33%) and complexity (6.67%).

For the second alternative estimate, we assumed a medium-term growth phase of the Czech economy amid very low returns on domestic assets. Under these conditions one can expect depositors to be less interested in traditional bank products and depositors and financial institutions to focus more on financial markets, especially in other countries. Bigger weights were given to interconnectedness, cross-border activity and complexity (each 26%) and smaller weights to size and substitutability (both 11%). The weights on the indicators within each category remained equal in this second variant.

Chart 1 illustrates the statistical distribution of the resulting indicators. It shows that the categories of quantitative indicators all have relatively similar distributions. So, in each category separately we find a large number of institutions that have normal importance in the given respect (the left-hand part of the chart) and a small number of institutions that can be described as very important (the right-hand part of the chart). The correlation matrix of the relations among the analysed categories (see Chart 2) reveals that systemic importance cannot be entirely simplified to institution size. Nevertheless, it is evident from comparing the two parts of the matrix – the lower left-hand part, which covers the entire sample of banks under analysis, and the upper right-hand part, which excludes the five most important institutions on average – that the indicators for these five institutions are strongly correlated. Such strong correlations cannot be observed among less and medium-important institutions.

Chart 1

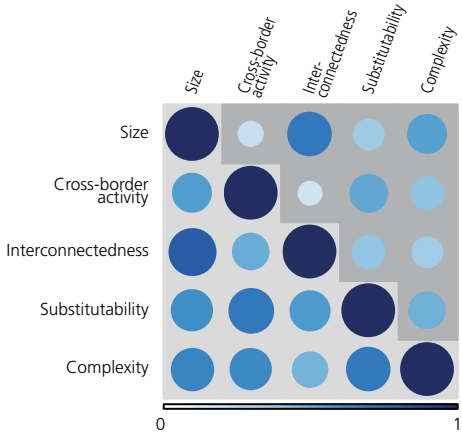
ESTIMATED DISTRIBUTION OF QUANTITATIVE INDICATORS
(x-axis: average score; y-axis: number of banks)



Source: CNB, authors
Note: The chart plots the kernel density estimates for the scores aggregated by categories (see Table 1).

Chart 2

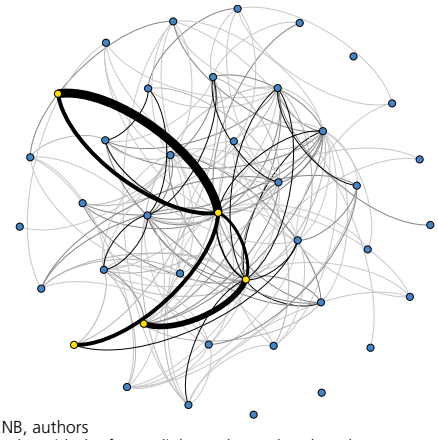
CORRELATION MATRIX OF INDICATORS AGGREGATED INTO CATEGORIES



Source: CNB, authors
Note: The size and colour of the circle represent the correlation coefficient between the corresponding two scores. As the scores are not normally distributed, Spearman's coefficient of rank correlation was used for greater robustness and comparability of the two samples. The lower left-hand part covers the entire sample of banks under analysis, and the upper right-hand part excludes the five most important institutions on average.

Chart 3

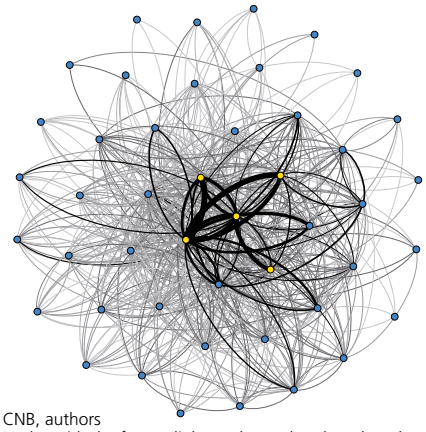
STRUCTURE OF THE INTERBANK MARKET NETWORK



Source: CNB, authors
Note: Nodes with the fewest links are located at the edge; the interconnectedness of the nodes increases towards the centre. Account is taken of the number, size (indicated by the thickness of the link) and frequency of the links. A total of 40 banks were analysed on the interbank market. For more details see footnote 9.

Chart 4

STRUCTURE OF THE CERTIS NETWORK



Source: CNB, authors
Note: Nodes with the fewest links are located at the edge; the interconnectedness of the nodes increases towards the centre. Account is taken of the number, size and frequency of the links. A total of 46 participants (40 banks and six credit unions) were analysed in CERTIS. For the sake of clarity, only payments exceeding CZK 500,000 are plotted. For more details see footnote 9.

Two indicators from the set of interest were obtained using network analysis: (1) the mean centrality in the interbank market network in the interconnectedness category, and (2) the mean centrality in the CERTIS payment system network in the substitutability category. Simply put, the bank's importance (centrality) in the interbank market and in CERTIS was measured. From the network structure it can be seen that the interconnectedness category is important for five banks (see Chart 3), as is the substitutability category (see Chart 4). When analysing a network one needs to take its structure (topology) into account, as this provides vital information on its effectiveness and stability (Barabási and Bonabeau, 2003). The interbank market and CERTIS are both "scale-free" networks[12] (see Chart 5), which display high effectiveness and stability in the event of random failures (Callaway et al., 2000). Simply put, the stability of a scale-free network depends strongly on a few key nodes, but most nodes present no risk to its stability. The key nodes (i.e. important banks) in this network function as stabilising components of the system, but their failure theoretically has catastrophic consequences in the form of a domino effect. Owing to this network risk, it is vital to include the bank's network centrality – i.e. its importance in the interbank market and CERTIS – among the indicators for assessing systemic importance.

The results of the composite quantitative indicator-based approach indicate that there are just a few banks operating in the Czech banking sector which have a strong position both in the individual categories and overall. However, the ranking of the banks according to the resulting composite indicators does not match their asset ranking. The results therefore confirmed that size is not the deciding factor for determining systemic importance but does play an important role. Apart from two exceptions,[13] this is evidenced by the generally stable scores across all three alternatives and confirmed by the closer correlation between the indicators for large banks (see Chart 2).

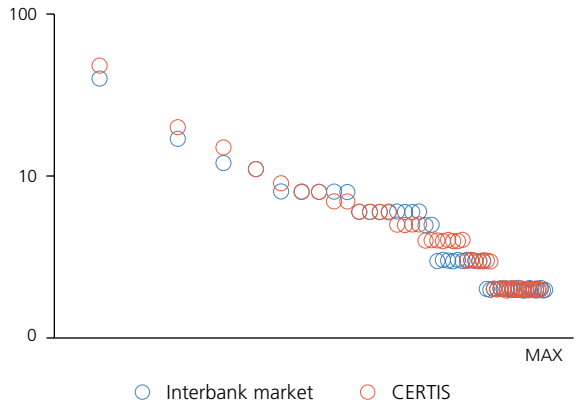
For four banks the composite indicator exceeded the mean score of the indicators for the whole system for all three estimates (see Chart 6). The cumulative sum of their

12 Unlike other (random or small-world) networks, scale-free networks have an exponential degree distribution and the observed points form an approximately straight line on a logarithmic plot of the cumulative distribution (see Chart 5).
13 The fourth and fifth-ranked banks in Chart 6; differences between the blue, red and green points.

Chart 5

DEGREE DISTRIBUTION IN THE INTERBANK MARKET AND CERTIS NETWORKS

(x-axis: degree; y-axis: cumulative number of banks, logarithmic scales)

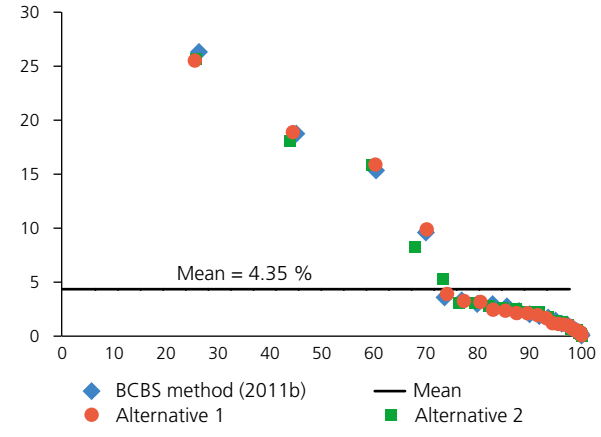


Source: CNB, authors
Note: For scale-free networks $P(k) = ck^{-\alpha}$, i.e. degree k is exponentially distributed. In the logarithmic plot of the cumulative distribution (left), the observed points therefore form an approximately straight line. In both cases, the degrees were weighted by exposure volumes/daily payments.

Chart 6

COMPOSITE INDICATORS FOR INDIVIDUAL BANKS IN ALL THREE VARIANTS

(x-axis: cumulative sum in variant; y-axis: score)



Source: CNB, authors

scores represents 70% of the whole system. These banks can contribute significantly to systemic risk in the banking sector both separately and in particular as a group. The mean value of the assets of these four banks is not very high in international terms (13% of GDP and around 35% of state budget revenue), but under the assumption of strong interconnectedness and correlation of their balance sheets, the failure of these banks as a whole would have a significant impact on public finances.[14] Different distances are apparent between the composite indicators for individual banks. Banks with above-average scores display a relatively high spread of their composite indicators, while banks with below-average scores tend to form clusters. According to this approach, banks forming clusters do not make a significant contribution to systemic risk individually, but together the score for their composite indicators (around 30% of the total) would exceed the highest individual bank score obtained (around 26%).

The method used to quantitatively determine D-SIBs helped us to rank the analysed banks by systemic importance in descending order using the defined key and identified banks with a high deviation from the average importance, but it did not adequately reveal which of these banks are systemically important due to their high risk absorbency and which are systemically important due to their ability to propagate risk quickly, directly or indirectly, within the system or to the real sector. The former stabilise the system, while the latter destabilise it. Moreover, it is impossible to discern from the results obtained whether an analysed bank contributes significantly to systemic risk by itself or via a group of banks; group failure can generate far higher systemic costs. For the final quantitative determination of systemically important institutions or systemically important groups which might potentially be subject to the new prudential regulations (see section 4), we need to further refine the quantitative indicator-based approach (especially in the complexity[15] and substitutability categories) and also conduct further additional analyses (in particular an analysis of balance sheet correlation across banks and sectors). Such additional analyses could change the current quantitatively determined bank rankings and the deviations from the average importance.[16]

14 Expressing the costs of the negative externalities caused to SIFIs through the 100% write-off of their assets is an extreme assumption but yields information on the upper bound on the costs.
15 One way of further extending the analysis of the complexity of Czech financial institutions is to take into account their ownership structure, i.e. their links to parents and subsidiaries.
16 Owing to the complexity of the additional analyses they are not included in this article and will form part of further CNB research.

The quantitative determination of systemic importance is followed by qualitative determination, or supervisory judgement. This should primarily involve setting limits on the deviation of the importance of a particular bank from the mean or median importance. Qualitative judgement should therefore just confirm the quantitative results. In our case, it involves determining whether the quantitative indicator score for the first-ranked bank (over 26%; see Chart 6) is far enough from the mean (4.35%). However, qualitative judgements can be made only after sufficient results have been obtained for the quantitative determination of systemic importance.

4. SIFI REGULATION AND ITS INSTRUMENTS

The regulatory and supervisory standards for the banking sector developed by the Basel Committee were and still are mostly microprudentially oriented. This framework is based mostly on empirical experience with the operations of individual banks in advanced countries. However, in response to the recent financial crisis, Basel III and other Basel Committee initiatives are trying to expand the framework systematically to include instruments of a macroprudential nature. The first is the countercyclical capital buffer, targeted at the time dimension of systemic risk (Geršl and Seidler, 2011). The second are systemic capital surcharges (SCSs), aimed at the cross-dimensional component of systemic risk (BCBS, 2011b).[17] Specifically, they are focused on the negative externalities associated with the potential failure of SIFIs.[18]

It was agreed at the G20 summits that regulators would, within the framework of G-SIFI supervision, push for SIFIs to hold capital in excess of the level stipulated in Basel III to enable them to better absorb the additional losses arising from the higher risk associated with their failure. The first group of institutions that is supposed to meet these enhanced requirements is the G-SIBs. At the G20 summit in November 2011 an initial list of 29 G-SIBs was published. This list will be revised every year. The capital surcharges will start to be applied in 2016, with full implementation of the new regulations in 2019. In addition, the authorities in a number of countries (in Europe, for example, the Netherlands, Ireland and Sweden) have already announced that they will also introduce SCSs at national level for D-SIBs. The UK is planning to apply a similar approach as part of a reform of its banking sector.

When setting SCSs it is vital to start by realising that the objective is primarily macroprudential. The aim is not to stop SIFIs from getting into trouble or failing, but to at least partially reduce the likelihood of systemic crises, and in particular (as in the case of countercyclical capital buffers) to reduce the intensity of such crises by absorbing the negative impacts of SIFI failures. SCSs should therefore enhance the resilience of the system in terms of loss absorbency so that it is capable of performing its core functions even in the event of severe distress. In other words, the point of SCSs should be to prevent the kind of dramatic rise in uncertainty that occurred after the collapse of Lehman Brothers in 2008, which crippled the global financial system and disrupted global economic activity.

The usual objection to SCSs is that capital is costly and SCSs force banks to downsize their balance sheets. This could mean worse availability of credit to the private sector and slower economic growth. The advocates of higher capital adequacy and of SCSs usually respond to this objection by saying that investors in bank shares are currently demanding a higher rate of return than investors in non-financial corporations' shares, because banks are more leveraged and therefore more risky (BCBS, 2010). This applies to SIFIs much more than it does to other institutions. If SCSs cause leverage to fall, banks will become less risky and investors will not demand such high returns on their shares. And if SIFIs decide not to provide some types of loans because of SCSs, they will be substituted by smaller non-SIFI banks subject to lower capital requirements. Another argument against the introduction of SCSs is based on economies of scale and states that the global financial system needs SIFIs. This argument is undermined by the fact that some global banks have expanded well beyond the point at which the economies of scale can increase any further and which is needed to fund activities in the global economy. The problem in assessing this debate is that the opinions of neither side are backed up by sufficient economic research. Consequently, the main argument against identifying SIFIs

17 Other types of instruments feature in the debate: liquidity surcharges, greater transparency of some types of exposures, limits on large exposures, etc.

18 Tarullo (2011) points out that SIFIs do not themselves have any incentive to hold capital to minimise the negative externalities of their own failure. With SCSs, Basel III should at least partly remedy this problem.

and imposing SCSs is still that labelling an institution as a SIFI leads to growth in the moral hazard associated with it, since both it and the public are being told de facto that it is "too important to fail" and that even if it becomes insolvent the government or central bank will give it the funds or guarantees it needs to keep going. The counter-argument is that market participants do not need a formal label to know which institutions are systemically important. In this situation, imposing capital surcharges on such an institution can only reduce its riskiness, as they will cause individual and economy-wide expectations of its profitability to converge. This is because the surcharges will increase the institution's funding costs, which were previously held down because the market regarded it as being too important to fail.

Numerous papers investigating the possible methods for setting SCSs have appeared in the literature over the last three years (see, for example, Gauthier et al., 2010 for a review). In principle, SCSs should be set to reflect the difference between the private and social profitability of the SIFI. In other words, the size of the SCSs should create an incentive for SIFIs to stop expanding, to stop becoming more interconnected and to stop taking on more risks if there are no related benefits for the economy as a whole. On the general level, the calibration of SCSs should be based on an estimate of the potential impact of SIFI failures on the entire financial system, which should be compared with the costs of additional regulation. This implies that the principal factors when setting SCSs should be those which determine the potential impact of failures: the institution's size and interconnectedness and the other factors discussed in sections 2 and 3.

However, the discussion in section 3 showed that estimating the impact of SIFI failures on the financial system and subsequently estimating the additional capital needed to reduce the probability of failure and the strength of the impact is a very difficult exercise. Berg (2011) describes the main complications in making such estimates. He points out that the existing methods do not consider the trade-off between the costs of regulation and the costs of SIFI failures and that they do not take into account how the costs of failure depend on the manner of regulation and on the resolution regime. In reality, SIFIs are usually rescued rather than being allowed to fail, and this affects the resolution costs. This is a crucial insight, because the key challenge for the planned regulation of SIFIs is to reduce systemic risk and the probability of events to which SIFIs contribute, and not to excessively curb the intermediary activity of regulated financial institutions and thereby cause unintended transfer of systemic risk to an unregulated segment of the domestic financial market or drive domestic financial activities out of the country.[19]

If we accept the aforementioned arguments of Berg (2011) and adopt the assumption that SIFI failures are the exception rather than the rule since most SIFI resolution situations end in rescue, the expected social costs of a SIFI rescue operation should be relevant for determining the SCS. And on a basic level those costs can be determined by the institution's expected losses in the worst case scenario. This is why the Basel Committee focused directly on the additional capital needed to absorb SIFIs' losses when formulating its SCS recommendations. The quantitative models used to estimate this capital produced results lying in a wide range of 1–8% of risk-weighted assets in terms of CET1 equivalent, with a central tendency of around 2–4%. The final recommended calibration of 1–2.5%[20] was therefore in the lower half of the range of estimates. This low SCS calibration assumes coverage by high-quality capital capable of fully absorbing losses. If the risks of SIFIs are to be covered also by lower-quality capital, the total SCSs should be set at a higher level.[21]

SCSs are just one of the elements that can mitigate the systemic risks associated with SIFIs. The resolution framework occupies first place in the overall G-SIFI supervisory framework.[22] The specific resolution rules should allow a SIFI to remain a going concern during a crisis, and the shareholders must accept losses associated with the institution's poor financial condition. The risks associated with SIFIs can also, of course, be mitigated by supervisory instruments, which are primarily

19 International cooperation between national supervisory authorities and central banks in the development and implementation of the new SIFI regulations is very important in this regard.

20 BCBS (2011b) proposes to group SIFIs lying within the range of 1% to 2.5% into four categories ("buckets") based on their systemic importance. In addition, it is keeping one initially empty bucket of 3.5% in reserve.

21 The national authorities that are intending to introduce SCSs at the domestic level have not chosen identical approaches. In Switzerland, both large banks will additionally be required to maintain an SCS of 8.5% of risk-weighted assets, of which at least 5.5% will have to be held as CET1 and the remainder as convertible capital. The Swedish authorities have announced that they will introduce an SCS of 3% of CET1 for major banking groups in 2013, increasing to 5% in 2015.

22 In addition to SCSs and resolution rules, the components of the overall framework should include more intensive supervision of SIFIs, robust core infrastructure components reducing the risk of contagion, and additional prudential requirements of national authorities.

microprudential in nature. These include stricter, more regular and more detailed supervision of their operations and other instruments aimed at reducing the probability of failure of important institutions. It is important to realise, however, that it is naive to imagine that every future SIFI failure can be prevented. Moreover, stricter supervision is meaningless in situations where other institutions are afraid to do business with each other in reaction to distress at a SIFI. By contrast, if they are set at an economically important level, SCSs can reduce the uncertainty about the loss absorbency of a SIFI and significantly boost expectations that it will remain a going concern. To sum up, there is a significant relationship between the size of an SCS and the effectiveness of other instruments, especially resolution regimes. The more effective the other instruments are, the lower the SCS can be. However, advocates of SCSs argue that they can be introduced relatively quickly, whereas it can take years or even decades to introduce other instruments. They therefore suggest introducing SCSs over the next few years and then reducing them at a later stage, depending on the progress made with implementing other measures.

5. CONCLUSION

The current crisis, and in particular the collapse of Lehman Brothers, has led to a renewed national and international debate about enhancing the stability of systemically important financial institutions (SIFIs). The G20 summit in April 2009 agreed, among other things, to strengthen the resilience of international financial institutions. This agreement led first of all to the publication of a general guidance document for identifying global systemically important financial institutions, markets and infrastructures (G-SIFIs) and subsequently to regulatory documents specifically targeted at the regulation of SIFIs. It also gave rise to a debate about the possibility of transferring the SIFI identification and regulation methodology from the global level to individual domestic financial sectors (D-SIFIs).

In this article, we applied the BCBS-recommended method of static quantitative indicators for identifying SIFIs to the Czech banking sector for the purposes of pilot identification of domestic systemically important banks (D-SIBs). Using the results for 11 quantitative indicators combined into a single composite one, we ranked the 23 analysed banks in descending order from the most to the least systemically important. This method identified banks in the Czech banking sector which deviate significantly from the average importance in the sector and revealed several institutions which tend to form clusters in the sector. For the final identification of D-SIBs to which SIFI regulatory instruments might be applied, however, the method needs to be refined further. This is because it does not adequately capture some of the contributions of individual institutions (or groups of institutions operating together as SIFIs) to systemic risk (such as correlated activities of institutions in the system).

Besides refining the statistical method for identifying D-SIBs for the Czech banking sector, the remaining challenges include qualitative identification of D-SIBs by supervisory judgement and the allocation of individual potentially identified D-SIBs into categories based on their systemic importance and the subsequent setting of systemic capital surcharges.

6. REFERENCES

BARABÁSI, A. L., BONABEAU, E. (2003): *Scale-Free Networks,* Scientific American 288(5), pp. 50–59.

BCBS (2009): *Strengthening the Resilience of the Banking Sector – Consultative Document*, Basel Committee on Banking Supervision, 17 December.

BCBS (2010): *An Assessment of the Long-Term Economic Impact of Stronger Capital and Liquidity Requirements,* Basel Committee on Banking Supervision, 18 August.

BCBS (2011a): *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems*, Basel Committee on Banking Supervision, June.

BCBS (2011b): *Global Systemically Important Banks: Assessment Methodology and the Additional Loss Absorbency Requirement*, Basel Committee on Banking Supervision, November.

BERG, S. A. (2011): *Systemic Surcharges and Measures of Systemic Importance,* Journal of Financial Regulation and Compliance 19(4), pp. 383–395.

BRUNNERMEIER, M., CROCKET, A., GOODHART, C., PERSAUD, A. D., SHIN, H. (2009): *The Fundamental Principles of Financial Regulation,* Geneva Reports on the World Economy 11, International Center for Monetary and Banking Studies.

CALLAWAY, D. S., NEWMAN, M. E. J., STROGATZ, S. H., WATTS, D. J. (2000): *Network Robustness and Fragility: Percolation on Random Graphs*, Physical Review Letters 85(25), pp. 5468–5471.

DREHMANN, M., TARASHEV, N. (2011): *Systemic Importance: Some Simple Indicators*, BIS Quarterly Review, March.

ECB (2006): *Identifying Large and Complex Banking Groups for Financial System Stability Assessment*, in: Financial Stability Review, December 2006, pp. 131–139.

ECB (2010): *Financial Networks and Financial Stability*, in: Financial Stability Review, June 2010, pp. 155–160.

FRAIT, J., KOMÁRKOVÁ, Z. (2011): *Financial Stability, Systemic Risk and Macroprudential Policy*, Financial Stability Report 2010/2011, Czech National Bank, pp. 96–111.

FSB (2010): *Reducing the Moral Hazard Posed by Systemically Important Financial Institutions, FSB Recommendations and Time Lines*, Financial Stability Board, October 2010.

FSB, IMF, BIS (2009): *Guidance to Assess the Systemic Importance of Financial Institutions, Markets and Instruments: Initial Considerations*, Financial Stability Board, International Monetary Fund and Bank for International Settlements, Report to G20 Finance Ministers and Governors, October 2009.

GAUTHIER, C., LEHAR, A., SOUISSI, M. (2010): *Macroprudential Regulation and Systemic Capital Requirements,* Bank of Canada Working Paper 2010-4, April.

GERŠL, A., SEIDLER, J. (2011): *Excessive Credit Growth as an Indicator of Financial (In)Stability and Its Use in Macroprudential Policy*, Financial Stability Report 2010/2011, Czech National Bank, pp. 112–122.

GOLDSTEIN, M., VÉRON, N. (2011): *Too Big to Fail: The Transatlantic Debate*, Peterson Institute for International Economics Working Paper 11–2.

IMF (2010): *Systemic Risk and the Redesign of Financial Regulation*, in: Global Financial Stability Report, April 2010, pp. 63–90.

ROCHET, J. C., TIROLE, J. (1996): *Interbank Lending and Systemic Risk*, Journal of Money, Credit and Banking 28(4), pp. 733–762.

SPRAGUE, I. (1986): *Bailout: An Insider's Account of Bank Failures and Rescues,* N.Y.: Basic Books.

TARASHEV, N., BORIO, C., TSATSARONIS, K. (2010): *Attributing Systemic Risk to Individual Institutions,* BIS Working Paper 308.

TARULLO, D. K. (2011): *Industrial Organization and Systemic Risk: An Agenda for Further Research*, speech delivered at the Conference on the Regulation of Systemic Risk, Federal Reserve Board, Washington, D.C., September 15.

THOMSON, J. B. (2009): *On Systemically Important Financial Institutions and Progressive Systemic Mitigation*, Federal Reserve Bank of Cleveland Policy Discussion Paper No. 27.

UPPER, C. (2011): *Simulation Methods to Assess the Danger of Contagion in Interbank Markets,* Journal of Financial Stability 7(3), pp. 111–125.

von PETER, G. (2007): *International Banking Centres: A Network Perspective*, BIS Quarterly Review, December.

WEISTROFFER, C. (2011): *Identifying Systemically Important Financial Institutions (SIFIs),* Deutsche Bank Research, August.

EARLY WARNING INDICATORS OF ECONOMIC CRISES[1]

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Monitoring a suitable set of early warning indicators is crucial for the optimal timing of macroprudential measures aimed at reducing the risk of financial crises or at least mitigating their impact on the economy. This article sets out to identify the indicators that should be monitored and to show how to overcome some problems in identifying them. As it is important to focus on robust indicators that are independent of the choice of model, the article combines two mutually complementary crisis measures: the timing of crisis occurrence and the intensity of the impact of crises on the economy. The article goes on to demonstrate that it is appropriate to rely on a system of several complementary models. For a set of 40 advanced EU and OECD countries, our two-model system identifies rising house prices and external debt as the best performing early warning indicators. Global variables, such as the volume of credit, global GDP and crude oil prices, form another useful set of indicators.

1. INTRODUCTION

The 2008–2009 financial crisis stimulated the development of a new generation of early warning systems. Whereas the creators of the first-generation systems focused mainly on developing countries and exchange rate crises (Kaminsky, 1999), the new generation of early warning systems accounts for different causes as well as the fact that advanced countries were the hardest hit by the crisis (Rose and Spiegel, 2009).

The new-generation systems have to address a series of methodological problems. This article sets out to demonstrate how certain problems associated with the definition of crisis and with the choice of sufficiently effective early warning indicators can be overcome. The article is structured as follows. Section 2 presents a discrete early warning model explaining the occurrence of crises. Section 3 is devoted to a continuous model describing the impacts of crises on the real economy. Section 4 assesses the practical applicability of early warning indicators.

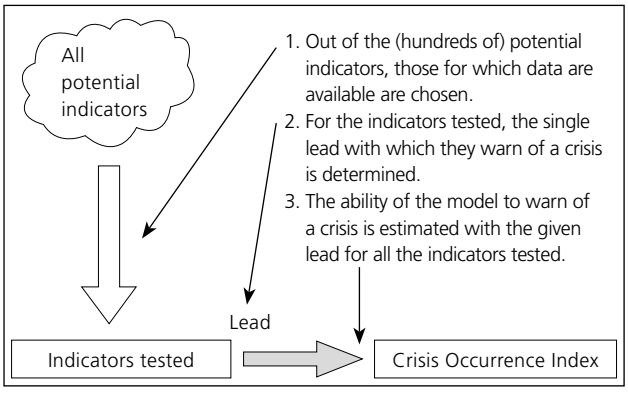
2. DISCRETE MODEL – CRISIS OCCURRENCE MODEL

The discrete model looks for early warning indicators through the lens of crisis occurrence. It does so using an index that takes a value of one if a crisis occurs and zero otherwise. Such an index is not easy to compile, as the literature does not provide a complete database of crises in advanced countries. The first step of the analysis, therefore, was to build a database of crises in individual EU and OECD countries over the period 1970–2010 at quarterly frequency. The following three main types of crises were identified: currency crises (balance of payments crises), financial (banking) crises and debt crises (inability to repay government debt, debt restructuring).

In the literature used,[2] these crises were defined either on the basis of the authors' calculations (for example if a particular indicator exceeds a critical value – see, for example, Kaminsky and Reinhart, 1999, and Kaminsky, 2006) or on the basis of the authors' expert judgement (Caprio and Klingebiel, 2003; Laeven and Valencia, 2008). By aggregating the available studies and supplementing them in collaboration with other central banks of EU and OECD countries[3] we put together a complete database of crises allowing more reliable identification of early warning indicators. The subsequently calculated Crisis Occurrence

Chart 1

SCHEME OF THE DISCRETE EARLY WARNING MODEL



1 This article is based on CNB research project C3/2011, the results of which are described in detail in Babecký et al. (2011).
2 See Caprio and Klingebiel (2003), Reinhart and Rogoff (2008), Laeven and Valencia (2008, 2010), Kaminsky and Reinhart (1999) and Kaminsky (2006).
3 Within the ESCB's Macroprudential Research Network (MaRs) – see http://www.ecb.europa.eu/home/html/researcher_mars.en.html.

Index is the subject of research of the discrete econometric model shown schematically in Chart 1.

The creation of the discrete model illustrated in Chart 1 starts with the choice of the early warning indicators to be tested. Several different approaches are used in the literature to identify these indicators. The first option is to use indicators derived from a single specific theoretical model (Kaminsky and Reinhart, 1999). The second option is to select the indicators on the basis of a systematic review of the literature (Rose and Spiegel, 2009; Frankel and Saravelos, 2010). Finally, one can use all the indicators (and their transformations) available in a selected database and test whether at least some of them will be useful for explaining crises (Alessi and Detken, 2009).

Each of these indicator selection techniques has its strengths and weaknesses. For example, a set of indicators based on a single specific model generally makes up only a small subset of all the potentially important indicators. In this article, the early warning indicators tested were chosen on the basis of systematic literature reviews (e.g. Alessi and Detken, 2009; Rose and Spiegel, 2009; Frankel and Saravelos, 2010) and were supplemented with several other important indicators based on the authors' judgement. Over 100 potential macroeconomic and financial indicators were identified using databases published by the IMF, the OECD, the World Bank and the Bank for International Settlements. Taking into account the availability of data for individual countries, a total of 50 indicators were left in the sample.

In the second step of creation of the discrete model, we need to determine the lead with which the chosen tested indicators are able to warn of a crisis. The lead is usually chosen on the basis of the authors' expert, but subjective, judgement. Most early warning models use the same lead (generally 1–2 years) for all indicators. This assumption stems from the observed facts about the evolution of important macroeconomic indicators before, during and after crises (Kaminsky et al., 1998; Grammatikos and Vermeulen, 2010). On the basis of the literature, the lead with which the indicators warn of a crisis in our discrete model was set at two years and, alternatively, at three years (to analyse the sensitivity of the results).

The third step is to estimate the econometric model and build an early warning index describing the probability of future crisis occurrence. The model presented in this article was estimated using the dynamic panel logit technique. Although the data sample ends in 2010, data were available only up to the end of 2009 for some individual countries, so the forecast horizon stretches only to the end of 2012 at the most. It is worth noting that setting an identical lead length for all the indicators is a very restrictive assumption. In reality, different indicators can provide information about an approaching crisis with different leads. The ability of the model to warn of a crisis was then tested. The discrete model sends out a crisis warning by calculating the probability of a crisis occurring in the next one or two years on the basis of the observed values of all the indicators tested.

The ability of this model, which contains approximately 50 indicators, to warn of a crisis while not issuing false alarms is shown in Table 1. Type I errors (missed crises) and type II errors (false alarms) are used for illustration. The probability of a type I error is defined by C/(A+C) and that of a type II error by B/(B+D). The discrete model therefore missed 17.3% of crises and issued false alarms in 9.5% of cases. Also interesting from the monetary policy-makers' perspective is A/(A+B), which describes the probability that the model issued a warning signal and a crisis actually occurred (64.0%). The complementary indicator is B/(A+B), namely the probability that the model issued a warning signal but no crisis occurred (36.0%).

Table 1

ABILITY OF THE DISCRETE MODEL TO WARN OF A CRISIS

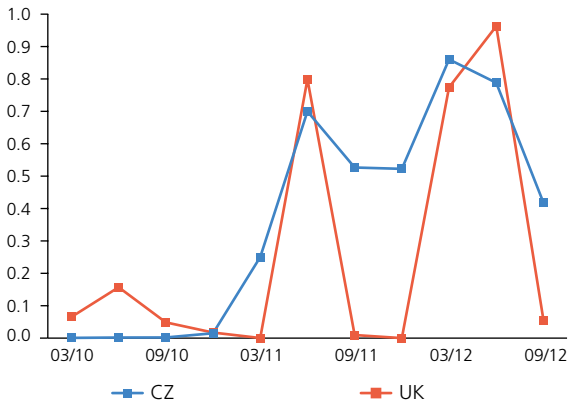
	Crisis occurred	No crisis occurred
Warning signal issued	A (477)	B (268)
No warning signal issued	C (100)	D (2566)

Note: "Warning signal issued" refers to the predicted probability of a crisis occurring in the following two years.

To illustrate the crisis occurrence probability for 2010 and for two years beyond the period for which data are available, we present here predictions for the Czech Republic and the United Kingdom (see Chart 2).[4] In 2010 the crisis probability seems relatively low, while from 2011 onwards it rises in both countries in the shape of a capital "M". Two waves of crisis are visible – in the second half of 2011 and in the middle of 2012. This may be a result of a deterioration in the global outlook combined with the effects of restrictive fiscal policy. The certain similarity in the crisis predictions for the Czech Republic and the UK underlines the importance of common (global) factors. In the case of the UK, however, national factors evidently play an important role, causing the crisis probability to leap from 0% to almost 100% in two quarters (as the global variables change very little from one quarter to the next).

Chart 2

ECONOMIC CRISIS PREDICTIONS: CZECH REPUBLIC AND UNITED KINGDOM



Note: Model predictions for 2010 Q1–2012 Q3. The actual data end in 2010. The y-axis shows the crisis occurrence probability.

The model also shows that the most useful early warning indicators – besides global factors, which play a major role – include growth in housing prices, low domestic interest rates on loans and growth in loans provided to the corporate sector. Growth in long-term government bond yields is also associated with a higher crisis probability. Conversely, a low debt ratio contributes to stability of the economy.

3. CONTINUOUS MODEL – IMPACTS OF CRISES ON THE ECONOMY

An alternative to the discrete model is the continuous model, which looks for early warning indicators that can predict crises that are very costly to the real economy. There are various different ways of describing such costs. One important indicator is the impact on gross domestic product (GDP), or, more precisely, on real GDP growth. Other indicators of real costs include the state budget balance and the unemployment rate. A decline in GDP growth and growth in unemployment and the fiscal deficit represent an increase in real costs to the economy. On the basis of these three variables one can create a continuous index of the impacts of crises on the real economy. In this article, higher index values mean higher real costs.

First of all, we need to establish whether rising real economic costs are a consequence or a cause of crises. For instance, the fiscal deficit may rise as a result of the adoption of anticrisis measures (such as spending cuts, employment support and government assistance for manufacturers and major financial institutions). On the other hand, an increase in the debt ratio may induce a crisis. Costs to the real economy will not necessarily be accompanied by a crisis if they arise as part of the normal cycle (for example, seasonal changes in production and unemployment). This means that not every decline in economic growth, rise in unemployment or increase in deficit is a consequence of a financial or other crisis. The index of the impact of crises on the real economy is derived from the observation that for "large" crises the causality runs from the occurrence of the crisis to a sharp deterioration in the real economy. Examples include the Great Depression of the 1930s and the economic slump of 2008–2009, which came in the wake of financial crises. In order to distinguish between normal cyclical movements in the economy and real economic downturns caused by crises, we used a panel data structure and a long data sample. A systemic crisis involves a deterioration in real economic growth occurring in several countries at the same time, as happened, for example, in 2008–2009.[5]

Chart 3 illustrates how the continuous early warning model was put together. This model is estimated for the same sample of 40 EU and OECD countries for which

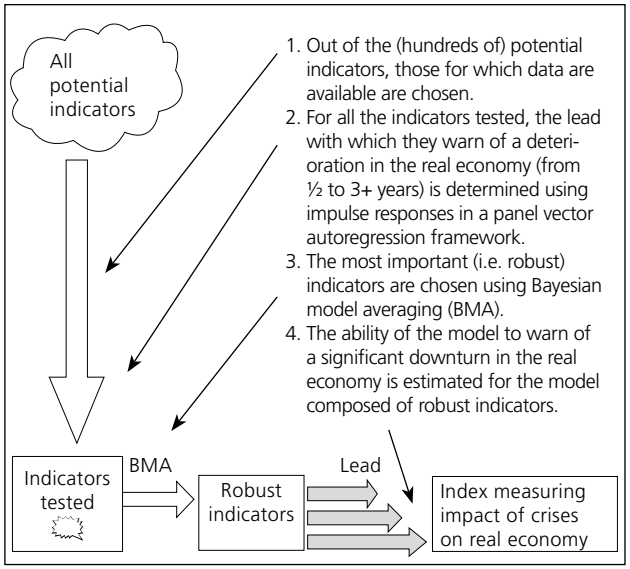
4 The results for the other countries are available in an online appendix to Babecký et al. (2011). The UK was chosen as an economy with a significant financial sector and with a similar monetary policy regime as the Czech Republic (inflation targeting, its own currency). Both the UK and the Czech Republic were affected by the 2008/2009 crisis, although neither was among the hardest hit economies.

5 Clearly this is not the only way of differentiating cyclicality from crisis effects. We are currently working on another version of the model in which we try to combine information on the occurrence of crises with downturns in economic activity. An alternative approach is to cyclically adjust economic activity for each country separately using filtration methods.

the discrete model described in the previous section was created. All the potential indicators that were identified for the purposes of the discrete model can be used for the continuous model as well.

Chart 3

SCHEME OF THE CONTINUOUS EARLY WARNING MODEL



The use of a continuous index describing the condition of the real economy on an ongoing basis opens the way to a series of methodological refinements of the early warning model. The first is the choice of the lead (see step 2 in Chart 3) with which the indicators warn of the impact of a crisis on the real economy, or of a massive increase in real costs in the countries of interest. Instead of the arbitrary assumption of an identical fixed lead for all indicators, the setting of the optimal lead length individually for each indicator was proposed. The optimal lead with which an indicator explains the intensity of the impact of a crisis on the economy was determined at between 4 and 16 quarters using impulse responses in a panel vector autoregression framework where each of the variable pairs formed by the index of the impact of crises on the real economy and each of the 50 indicators tested was analysed in turn.[6] The minimum lead length was set so that the chosen indicators were true early warning indicators, i.e. they issued a signal at least a year before the crisis erupted. (The resulting lead lengths for all the indicators tested are shown in Table A1 in Annex IV.2 in Babecký et al., 2011.)

We then identified the most useful indicators for predicting the costs of a crisis (see step 3 in Chart 3). Although the number of potential indicators had already been reduced on the basis of availability, it was still important to find the most appropriate ones. It is common practice in the literature to use all the available indicators based on theory or the authors' judgement. However, including indicators that have only a weak (or no) relationship to the explained event reduces the power of the early warning model to a similar extent as excluding important indicators.[7] So how should the important indicators be chosen? We used Bayesian model averaging (BMA[8]) for this purpose. The BMA method allows us to select the best performing combinations from all the possible combinations of explanatory indicators. To the best of our knowledge, this is the first time this modern method for selecting variables has been applied in the early warning literature. Finally, we obtained a regression model whose explanatory variables consisted solely of robust indicators (approximately half of the total of 50).

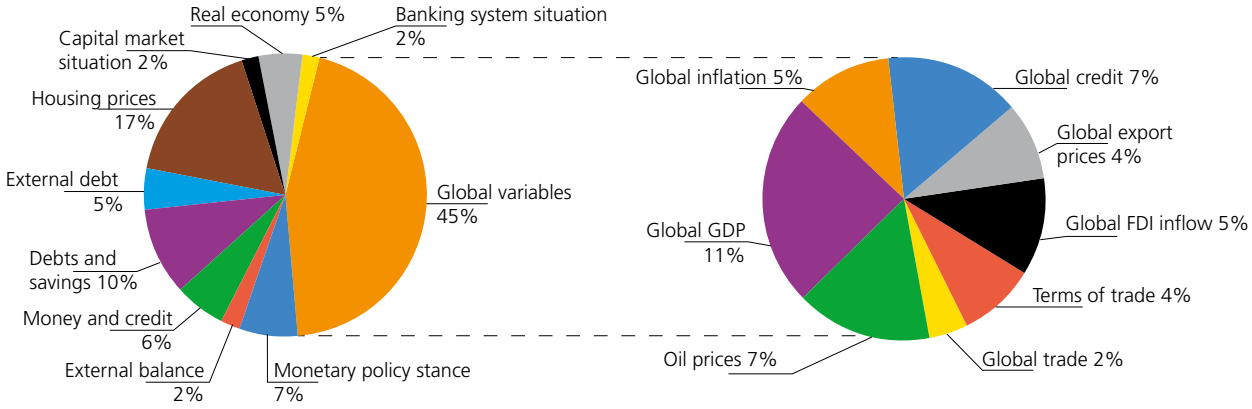
The resulting specification (i.e. the explanation of the crisis impact intensity by robust indicators) was estimated using the generalised method of moments (GMM), which is robust to the possible endogeneity of the estimate, i.e. bidirectional causality between the dependent and explanatory variables. The results of the continuous model allow us to discuss the sources of risk to the stability of the real economy and to compare the importance of different sets of variables, such as national and global indicators.

To identify the main sources of risks to macroeconomic and financial stability we need to look at the ability of the individual indicators to explain the variation in the dependent variable, i.e. the impact of crises on the real economy. The continuous model in this study is able to explain 37% of the variation in the impact of crises on the real economy over the past 40 years in the panel of 40 countries; the left-hand diagram in Chart 4 presents the percentage shares of the individual sets of indicators in the explanatory power of the overall model. As is clear from the chart, global variables are the most important set of early warning indicators. The right-hand diagram illustrates the performance of the individual global variables.

6 Analysis of the combined effects of indicators is a possible topic for future research.
7 Excluding an important indicator is generally the worst option statistically; including insignificant indicators "only" increases the volatility.
8 See Koop (2003) for a general description of the BMA method and Feldkircher and Zeugner (2009) for technical details on how it can be applied in practice.

CHART 4

THE MOST IMPORTANT EARLY WARNING INDICATORS



Note: Shares of individual indicators in explaining the variation in the impact of crises on the real economy

These results imply that macroprudential policy should monitor both global indicators (such as global GDP, global credit and global inflation) and selected domestic indicators in order to identify risk sources. Among the domestic factors, house prices represent the most significant source of risk to macroeconomic stability. The important indicators also include the price of crude oil and internal and external debt.

4. CONCLUSION

The existing literature does not offer a consensus on how to define crisis for the purposes of early warning systems. It is therefore appropriate to work with a discrete index and a continuous index in parallel so that the choice of useful early warning indicators is as robust as possible. The literature also does not offer a complete list of all crises for the advanced countries, so it was necessary to update and extend the list for the purposes of the discrete model.

Despite the differences in defining crises, it was possible to identify which potential indicators are the most useful. In practice, it is important to track rising house prices, sovereign debt and global variables. However, in the case of the discrete model, which estimates the crisis occurrence probability, national variables (such as loan interest rates, the volume of loans provided to the corporate sector and government bond yields) play a rather more prominent role; for the continuous model, which describes the impacts of crises on the real economy, global variables (such as the volume of global credit, global production and crude oil prices) are the most important category of early warning indicators owing to the interconnectedness of economies.

The results of the continuous model also reveal that early warning signals of the impacts of future crises emanate from different indicators with different leads. One set of indicators indicates the risk of crisis four or more years before a crisis breaks out, whereas another set triggers the alarm only shortly before the crisis, when it is probably too late to stop it. It is therefore important to account for differences in the predictive power of the individual indicators when building an early warning system.

5. REFERENCES

ALESSI, L., DETKEN, C. (2009): *"Real Time" Early Warning Indicators for Costly Asset Price Boom/Bust Cycles: A Role for Global Liquidity*, ECB Working Paper No. 1039.

BABECKÝ, J., HAVRÁNEK, T., MATĚJŮ, J., RUSNÁK, M., ŠMÍDKOVÁ, K., VAŠÍČEK, B. (2011): *Early Warning Indicators of Economic Crises: Evidence from a Panel of 40 Developed Countries*, CNB Working Paper No. 8/2011.

CAPRIO, G., KLINGEBIEL, D. (2003): *Episodes of Systemic and Borderline Financial Crises*, World Bank, January 22.

FELDKIRCHER, M., ZEUGNER, S. (2009): *Benchmark Priors Revisited: On Adaptive Shrinkage and the Supermodel Effect in Bayesian Model Averaging*, IMF Working Paper No. 09202.

FRANKEL, J. A., SARAVELOS, G. (2010): *Are Leading Indicators of Financial Crisis Useful for Assessing Country Vulnerability? Evidence from the 2008–09 Global Crisis,* NBER Working Paper No. 16047.

GRAMMATIKOS, T., VERMEULEN, R. (2010): *Transmission of the Financial and Sovereign Debt Crises to the EMU: Stock Prices, CDS Spreads and Exchange Rates*, DNB Working Paper No. 287.

KAMINSKY, G. L. (2006): *Currency Crises: Are They All the Same?* Journal of International Money and Finance 25(3), pp. 503–527.

KAMINSKY, G. L. (1999): *Currency and Banking Crises: The Early Warnings of Distress*, IMF Working Paper No. 99/178.

KAMINSKY, G. L., LIZONDO, S., REINHART, C. M. (1998): *The Leading Indicators of Currency Crises*, IMF Staff Papers 45(1), pp. 1–48.

KAMINSKY, G. L., REINHART, C. M. (1999): *The Twin Crises: The Causes of Banking and Balance-of-Payments Problems*, American Economic Review 89(3), pp. 473–500.

KOOP, G. (2003): *Bayesian Econometrics*, John Wiley and Sons.

LAEVEN, L., VALENCIA, F. (2010): *Resolution of Banking Crises: The Good, the Bad and the Ugly*, IMF Working Paper No. 10146.

LAEVEN, L., VALENCIA, F. (2008): *Systemic Banking Crises: A New Database*, IMF Working Paper No. 08224.

REINHART, C. M., ROGOFF, K. S. (2008): *Banking Crises: An Equal Opportunity Menace*, NBER Working Paper No. 14587.

ROSE, A. K., SPIEGEL, M. M. (2009): *Cross-Country Causes and Consequences of the 2008 Crisis: Early Warning*, NBER Working Paper No. 15357.

IMPACTS OF THE SOVEREIGN DEFAULT CRISIS ON THE CZECH FINANCIAL SECTOR

Kamil Janáček, Zlatuše Komárková, Michal Hlaváček and Luboš Komárek[1]

This article discusses the experience of countries hit by debt crises as well as the channels of contagion of sovereign default risk to the financial system. It focuses primarily on identifying channels of contagion that might represent a relevant threat to the Czech economy and discusses their significance. Although sovereign default risk is currently relatively low for the Czech Republic thanks to its low level of government debt, an escalation of this risk would have significant impacts on the financial system given the comparatively high proportion of government bonds in banks' balance sheets. The article also illustrates the significance of cross-country contagion to sovereign credit premiums. Here, the transmission from the countries hit hardest by the debt crisis has weakened, but the Czech Republic's credit premium is diverging from the most stable countries at a time of market stress. The risk of heightened sensitivity of credit premiums to a country's debt may increase the costs of irresponsible fiscal policy in the future. It is therefore another factor that should be covered by financial stability analysis.

1. INTRODUCTION

Sovereign default risk is an old type of risk that has been brought back into the spotlight by the persisting financial (debt) crisis in advanced economies. The materialisation of this risk can be described in the narrower sense as a situation in which a central authority (usually a national government) is unable to honour its pre-agreed financial obligations unaided and the country therefore defaults. In the wider sense, an escalation of sovereign default risk can be seen as an excessive rise in the costs of financing government debt, manifesting itself either in repayment difficulties or in secondary macroeconomic costs of resolving the situation. In the strict sense, sovereign default risk should not arise, because central authorities (central banks) can print money in order to pay their debts. This solution, however, generates macroeconomic destabilisation in the form of escalating inflation, which can grow into hyperinflation with negative impacts on long-term economic prosperity. There have been many cases of sovereign default in history. The most recent include Argentina (2001), Russia (1998) and Ukraine (1998). Crises in Mexico (1982), Greece (2011), Iceland (2008) and other countries have also had strong features of debt crisis. However, the current problems associated with the euro area debt crisis have increased perceptions of sovereign default risk, as the existence and threat of transmission of sovereign default risk pertain to a group of countries (the euro area) of greater economic strength than was the case in the past. At the same time, the current debt crisis in some euro area countries shows that there can be a strong interaction between the sovereign default risk situation and the situation of the financial sector. On the one hand, an escalation of sovereign default risk causes difficulties for financial institutions. On the other hand, the need to rescue ailing financial institutions can lead to sizeable government expenditures and to an increase in sovereign default risk.

The purpose of this article is to summarise countries' experience of tackling sovereign default risk and to point out potential channels of contagion that represent a real threat to the Czech economy. The article is structured as follows. Section 2 briefly summarises the experiences of individual countries for which sovereign default risk turned into a fundamental risk and also contains a general assessment of the extent of sovereign default risk in the Czech Republic. Section 3 describes the channels through which sovereign default risk propagates and discusses their relevance to the Czech Republic. Section 4 provides a summary and recommendations.

2. THE PHENOMENON OF SOVEREIGN DEFAULT RISK

The history of modern debt crises[2] shows that contagion very often spreads internationally from the country of origin of a crisis to geographically and economically similar economies. Asset (and especially housing) price bubbles have played a significant role in the escalation of crises. For many countries dependent on commodity exports (for example Russia) crises have been caused by, among other things, falls in the world (dollar) prices of those commodities. Both over-regulation of financial sectors and precipitous

1 The opinions expressed in this article are those of the authors and do not necessarily reflect the official position of the CNB.
2 An overview of individual episodes can be found, for example, in Reinhart and Rogoff (2009).

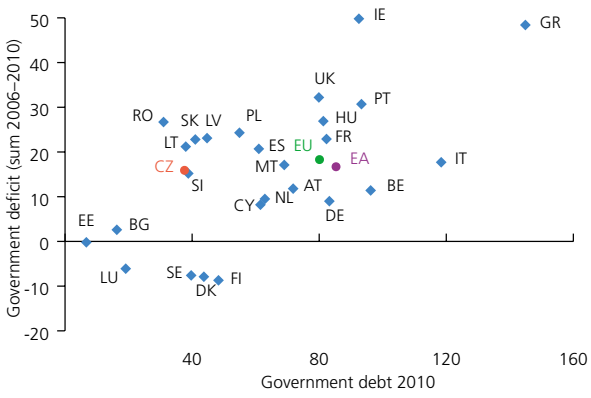
abandonment of such regulation have contributed to the escalation of crises. Sovereign debt crisis have often been by triggered by currency crises, especially following attacks on fixed exchange rate regimes, or by a combination of currency and banking crises. The most recent crises (Iceland and Ireland 2008–2011) have shown that sovereign debt crises can stem from previous excessive growth of the financial sector, from an excessively large financial sector relative to the size of the economy, and from excessive links to other countries. Analyses of public sector debt sustainability (see, for example, Gray et al., 2008) point to, among other things, the role of uncertainty and non-linear changes in credit risk and account for the market value and currency composition of debt. Studies attempting to predict debt crises (see, for example, Manasse et al., 2003) emphasise the role of macroeconomic variables (such as high foreign debt levels, debt-servicing measures and profiles, low GDP growth, current account imbalances and tight liquidity and monetary conditions), fiscal variables (such as the ratio of debt to GDP) and political economy variables (political uncertainty and the effect of the political cycle on the economy). The consequences of sovereign debt crises tend to last longer and be more persistent than those of currency crises.

The ways of eliminating sovereign default risk range from bankruptcy declaration (Argentina), to forced debt restructuring (Ukraine 2000, Pakistan 2001, Uruguay 2003) to debt forgiveness by London and Paris Club[3] creditors (Poland and Hungary in the early 1990s as well as, for example, Montenegro). Another method – and, in a way, also a means of preventing sovereign default – is for an international financial institution to provide financial assistance. This approach has been applied in countries that were still relatively solvent but were illiquid at a particular point in time (Mexico 1994–95, South Korea 1997–98, Brazil 1999 and 2002, Turkey 2001, Uruguay 2002 and the recent example of Iceland). Nevertheless, empirical studies (see, for example, Cruces and Trebesch, 2011) show that debt restructuring is associated with a long period of restricted access to global financial markets for the countries concerned, as there is a link between haircut size and bond spreads after a crisis.

In the history of the independent Czech Republic (as well as its predecessor, Czechoslovakia) sovereign default risk has been negligible (there has been no sovereign default since the establishment of Czechoslovakia in 1918). Even now this risk is relatively slight in the Czech Republic, thanks mainly to its relatively low level of debt (see the position of point CZ in the left-hand part of Chart 1; the Czech Republic has the fourth-lowest debt-to-GDP ratio in the EU, although the recent debt dynamics are not optimistic). However, the transmission of a shock caused by a debt crisis in another country would certainly have a non-zero impact on the Czech economy. Note also that although the Czech Republic's debt level is relatively low, easy fiscal policy could significantly worsen this situation in the medium run via the accumulation of government deficits. And if financial markets are sufficiently forward-looking, a change in situation (a deterioration in public finances, i.e. an increase in the public finance deficit) may be more important for them than the current relatively good ratio of public debt to GDP. It is also important to realise that the current low debt level is due in part to past privatisation revenues, which will not be repeated. Conversely, the implicit public debt linked with the deferral of several key reforms (in particular pension system reform[4]) and with projected population ageing[5] can be expected to materialise over the next few decades.

Chart 1

PUBLIC FINANCE SUSTAINABILITY RATIOS IN EU COUNTRIES
(in % of GDP)



Source: Eurostat

3 The London Club is an informal group of around 1,000 international commercial banks which negotiates as a creditor with debtor countries regarding private loans (without public guarantees). The Paris Club is currently a group of 19 creditor governments whose role is to negotiate debt restructuring and debt relief.
4 The pension system reform is scheduled to enter into force in 2013 (see Box 5).
5 According to the CZSO's demographic predictions, the proportion of over-65s is set to rise from the current 15.9% to 33.0% in 2060.

Table 1

BOND MARKET PRICING OF SOVEREIGN DEFAULT RISK (EU country groups)

Country	Rating	Govt debt/ GDP (%)	Credit premium volatility	5Y govt bond yield
SE	1	33	29.3	1.3
FI	1	50	24.1	1.4
DE	1	82	28.0	0.8
UK	1	85	40.9	1.1
CZ	3	43	63.3	2.0
AT	2	74	57.1	1.8
FR	2	89	57.0	1.7
BE	3	94	89.1	2.4
PL	6	56	90.8	4.9
ES	6	70	130.0	3.6
IT	8	121	134.3	3.4
HU	11	75	174.4	8.3
IE	8	115	276.5	5.2
PT	12	112	354.7	17.2
GR	23	189	1,026.3	54.9

Source: Eurostat, Bloomberg LP
Note: S&P rating conversion scale: 1 = AAA, 6 = A, 11 = BB+, 23 = D. Country abbreviations according to list of abbreviations. Highlighting indicates country groups ("SE, FI, DE, UK" together, etc.). Credit premium volatility is measured with the aid of CDS spreads by the standard deviation on the data set from 10 August 2006 to 29 February 2012.

Other indicators besides the debt level itself are important in assessing the level of sovereign default risk. In Table 1, selected EU countries are classed into groups with similar levels of sovereign default risk (this classification is then used for the analysis in section 3.2). It is evident from the table that although some countries are much more indebted than the Czech Republic, the depth, size and liquidity of their markets, assisted by their currencies accepted as reserve currencies, help them achieve lower risk premiums (e.g. DE and UK; the same goes for US and JP). According to the criteria in Table 1, the Czech Republic is in the same group as France, Austria and Belgium, whose sovereign default risk is assessed by the markets as being similar to that of the Czech Republic. In this classification, Poland could be classed alongside Spain and Italy, and Hungary alongside Ireland and Portugal, but they are analysed separately because they are both in the Central European region.

3. SOVEREIGN DEFAULT RISK CONTAGION CHANNELS

In this section we identify – on the basis of CGFS (2011) – eight main types of sovereign risk transmission channels affecting the cost and availability of bank funding. These channels can also be triggered purely by external events and their effects can be significantly reinforced by international transmission. We also try to identify the relevance of each contagion channel to the situation in the Czech Republic and we start with the channels that are relevant to the Czech Republic (sections 3.1–3.3). Special attention is given to the channel of cross-country contagion via CDS markets (section 3.2). In line with CGFS (2011), our discussion of sovereign risk contagion channels also covers channels of contagion linked primarily with banks' funding costs (sections 3.4–3.8). Given the specific conditions of the Czech banking sector (in particular its surplus liquidity) most of these channels are not currently relevant to the Czech Republic, but any major escalation of sovereign default risk could lead to them being activated.

3.1 The channel of sovereign debt in the financial sector's asset holdings

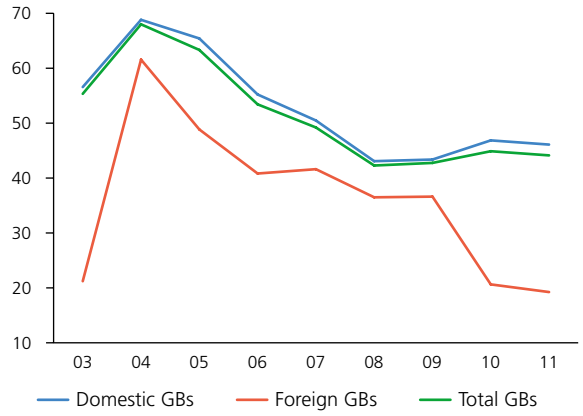
The close relationship between the financial sector and the government sector has proved to be a growing systemic problem in recent years (OECD, 2012). The financial sector – consisting largely of the banking sector – is a major government creditor. Increases in sovereign default risk can therefore affect banks through direct holdings of sovereign debt in balance sheets. Losses on government bond portfolios weaken banks' balance sheets and expose them to increased risks, especially on the funding source side. The impact on individual banks' balance sheets depends on how banks value their government bonds – i.e. at market prices or at amortised cost. If a bank holds government bonds for trading, it revalues them at market prices and a fall in their value has a direct effect on its profit-and-loss statement and on its equity and funding sources. If, however, a bank holds government bonds to maturity, it values them at amortised cost and a change in value is recorded only if the securities become permanently impaired (e.g. when sovereign restructuring or default becomes highly likely). Nonetheless, even these exposures may affect bank funding conditions well before a negative public finance event occurs. Acting out of caution and on the basis of historical experience, banking sector creditors may revise their investment plans and initiate a run on the bank or restrict their credit lines over concerns about the solidity of a banking sector that is over-exposed to the public sector.

Since 2007, the Czech banking sector has been holding roughly half of its government bonds to maturity (see Chart 2). This is a quite a low level compared with other countries (CGFS, 2011).[6] The comparatively high average share of government bonds held to maturity by European banks may be linked with the current debt crisis, as the increased uncertainty in primary and secondary government bond markets in some euro area countries together with the constant fear of spillover of this uncertainty to other countries (see the international contagion channel below) may be motivating the European banking sector to hold a larger proportion of its government bonds in held-to-maturity books. Nevertheless, this may be masking existing problems. It should be said in this context, however, that the share of bonds held to maturity in the Czech Republic is significantly lower for riskier foreign bonds than for domestic bonds (see Chart 2).

In advanced economies, the banking sector mostly holds domestic government bonds (CGFS, 2011). Insufficient risk diversification in banking sector balance sheets – especially during a crisis – can increase the risks of illiquidity and insolvency and start a vicious circle between the banking sector and the government sector. On the one hand, the banking sector is a major government creditor and often uses government bonds as security in money markets. On the other hand, during a crisis some banks may need help from their home government in the form of guarantees and recapitalisation (OECD, 2012). The government's ability to help the banking sector during a crisis depends on it having high enough budget revenues in relation to the size of the banking sector and a sustainable level of government debt.[7] Otherwise, helping the banking sector would involve excessively high costs in the form of excessive debt (excessive growth in debt as a percentage of GDP) accompanied by unsustainably high debt servicing costs (excessive growth in debt interest). The government, being unable to issue new debt and facing a rapid fall in the market value of previously issued government bonds, could become insolvent. As said earlier, the principal government bond holder is the banking sector, to which these problems would feed back. In simple terms, while the government can try to help some ailing banks, the situation

Chart 2

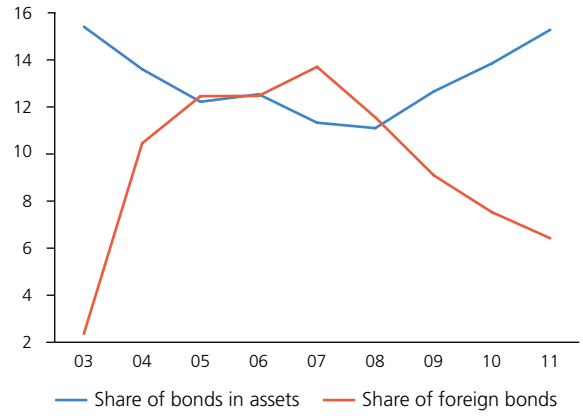
SHARE OF GOVERNMENT BONDS HELD TO MATURITY BY THE CZECH BANKING SECTOR
(in % of total government bond holdings in balance sheets)



Source: CNB
Note: Values as of last day of month for 2003–2011.

Chart 3

CONCENTRATION OF THE DOMESTIC GOVERNMENT BOND PORTFOLIO IN CZECH BANKS' BALANCE SHEETS
(in % of total assets of banks holding domestic government bonds)



Source: CNB
Note: Values as of last day of month for 2003–2011.

6 According to CGFS (2011), the average share of government bonds held to maturity in total government bond holdings in the EU is just above 80% (p. 12, Graph 13).

7 Ireland is an example of a small country which has a large banking sector relative to its public budget and whose banking sector has needed help. On the other hand, Greece is an example of a country which had an extremely high debt level, exposed its banking sector as the main creditor to difficult liquidity conditions, and became unable to help its banking sector in any way. In the first case the adverse spiral went from the banking sector to the public sector, whereas in the second case it went in the opposite direction. An adverse spiral arises between these two sectors due to the inability of neither of them to absorb the credit risk of extreme debt. Both countries were forced to seek international financial assistance.

can lead to a systemic crisis across the entire banking sector due to subsequent sovereign debt unsustainability or even government insolvency.

The empirical evidence shows that the escalation of contagion between the banking sector and the government sector depends to a large extent on the size of the banking sector's exposures to the public sector (CGFS, 2011). Derivatives market data show an increased correlation between the CDS spreads of some European banks and those of ailing countries to which those banks had high exposures, or for which the risk of sovereign debt concentration in their balance sheets was high.[8] The transmission of foreign public sector funding problems to the local banking sector through open exposures is another potential channel of contagion (see the international contagion channel below). Nonetheless, by its nature it, too, belongs in the first channel of shock transmission via sovereign debt holdings. However, there can be a difference from the point of view of the implications of shocks for the local banking sector. The local banking sector may get into a difficult liquidity situation as a result of holding troubled countries' government bonds. If, however, its domestic public sector does not have problems (i.e. its public finances are sustainable), it can help the local banking sector with liquidity in emergencies and fend off contagion from abroad.

The Czech banking sector is also a major government creditor and inclines strongly towards holding domestic sovereign debt (see Chart 3). At present, the local banking sector holds around 44% of domestic sovereign debt (Quarterly Financial Accounts data for Q3), which makes up around 15% of its total aggregate balance sheet (see Chart 3).[9] In the case of the Czech Republic, the channel of propagation of sovereign risk via government debt holdings is clearly relevant but is not acute at the current ratio of government debt to GDP (around 40%). A protracted financial crisis may motivate the banking sector to flee to quality, i.e. to prefer government bonds to more risky assets. Chart 3 shows that the share of government bonds in the balance sheets of the Czech banking sector began to rise (and the share of foreign bond holdings began to fall) when the debt crisis erupted in 2009.

3.2 The cross-country contagion channel

Due to the close links among the financial markets of advanced economies, distress of one sovereign can spill over indirectly but quickly to other countries and their financial institutions. Key roles – in addition to direct holdings of foreign government bonds (see the channel of sovereign debt in the financial sector's asset holdings) – are played by banks' cross-country exposures, banks' claims on foreign non-financial entities and the vulnerability of other public sectors to foreign sovereign risk shocks. Global interbank exposures are particularly large for banks in key advanced economies. Banks with sizeable exposures to the banking sector of a country in distress are more exposed to contagion risk, since on the asset side they face increased credit risk stemming from potential default and on the liability side they face increased funding risk (the high risk of counterparties holding bad debt can make interbank markets too expensive or cause them to freeze up). Both these risks expose banks with international exposures to a more difficult liquidity position. Cross-country contagion can also spread through banks' irrecoverable claims on non-financial corporations in troubled countries. However, this contagion is longer term in nature. Both these indirect cross-country contagion effects play only a minor role in the Czech Republic, because the Czech banking sector's exposures to the financial and real sectors in other countries are currently low.

Cross-country transmission of sovereign risk can also occur through contagion among sovereign markets of countries whose public sectors are perceived to be vulnerable. Some studies have found that the transmission of shocks from one sovereign market to another strengthens considerably in periods of turbulence (Diebold and Yilmaz, 2010). This transmission channel may therefore be relevant to any country, including the Czech Republic. During the recent crisis, the correlation between European sovereign CDS premiums increased sharply, albeit temporarily, after the collapse of Lehman Brothers, owing mainly to psychological contagion (BdF, 2009). After a time, negative sovereign risk perceptions transferred to countries, such as the Czech Republic, whose financial systems had been hit either not at all or only marginally by the crisis. Several empirical studies (Schuknecht et al., 2010; Ebner, 2009) attempt to quantify cross-country contagion. The transmission of negative shocks to the Czech Republic is analysed by Vašíček et al. (2012). Using a method based on a vector

8 This relationship strengthened after the publication of the CEBS stress test results in July 2010.
9 This is one of the highest shares in the EU.

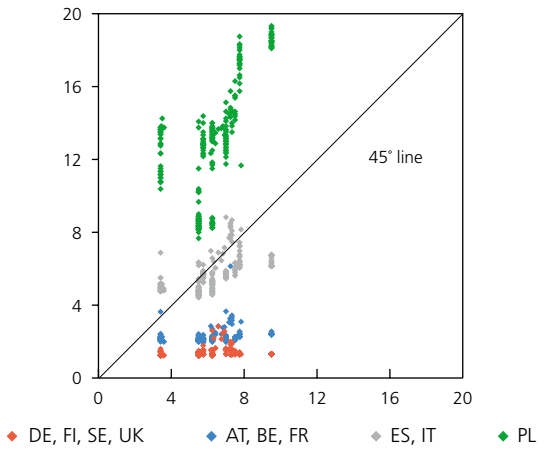
autoregression model, they conclude that up to 44% of the dynamics of Czech credit premiums can be explained by the dynamics of foreign premiums.

Another contribution of our article is that it shows – using quantile analysis following IMF (2009) and CNB (2011) – to what extent fiscal problems in other countries can spill over to the Czech government bond market, or to what extent the Czech sovereign debt default risk is affected by the default risk of other countries. As the analysis in question is conducted on a data sample covering "only" the current crisis, we follow the transmission of fiscal problems from the euro area periphery. The reason for analysing contagion using quantile analysis is that there is a non-linear relationship between the sovereign risk of individual countries in different periods.[10] It is clear from Charts 4–7 that the co-movement of the risk premiums of the Czech Republic and the selected countries (see the country groups in Table 1) is non-linear, as in the period of higher credit risk (expertly described as the crisis period; see Charts 5 and 7) the credit premiums of the Czech Republic react more or less than proportionately in relation to the credit premiums for the other countries/country groups by comparison with the period when the credit risk level is lower (expertly described as the period of calm; see Charts 4 and 6).

Charts 4–7 show that the slopes of the notional regression functions between the Czech risk premium (x-axis) and European sovereigns' premiums (y-axis) became steeper during the crisis. This increasing co-movement can be explained to some extent by rising market volatility in crisis periods. Nonetheless, the magnitude of the change in slope across countries and time is also significant. The charts clearly show a flatter slope of the notional regression equation for fiscally stable countries (DE, FI, SE, UK) and a small change in that slope across periods, and conversely a steeper slope for fiscally troubled countries (GR, IE, PT) or potentially fiscally troubled countries (ES, IT) and a relatively large change in slope across periods. A stable relationship between periods can be seen for regionally related countries (HU, PL). Their credit premiums are higher than the Czech ones, but it is evident from this simple dependence that the slope of the notional regression function between Czech and Polish/Hungarian premiums has not been significantly affected by the current euro area debt crisis.

Chart 4

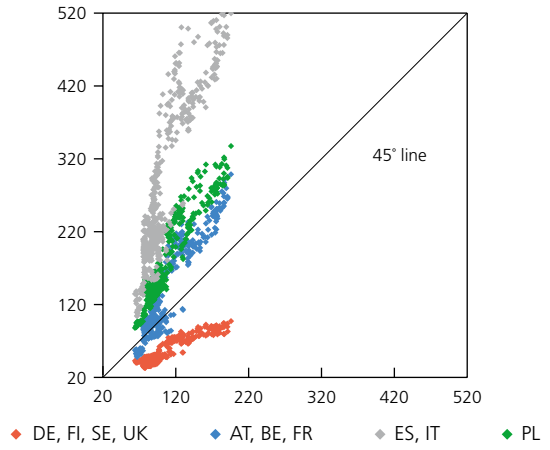
PRE-CRISIS RELATIONSHIP OF SOVEREIGN CDS SPREADS BETWEEN SELECTED COUNTRY GROUPS AND THE CZECH REPUBLIC
(bp; x-axis: CZ; y-axis: selected country groups; August 2006–August 2007)



Source: Bloomberg LP, CNB calculations
Note: 5Y CDS spreads of sovereign debt of relevant countries or mean for country group.

Chart 5

RELATIONSHIP OF SOVEREIGN CDS SPREADS BETWEEN SELECTED COUNTRY GROUPS AND THE CZECH REPUBLIC DURING THE CRISIS
(bp; x-axis: CZ; y-axis: selected country groups; March 2010–February 2012)

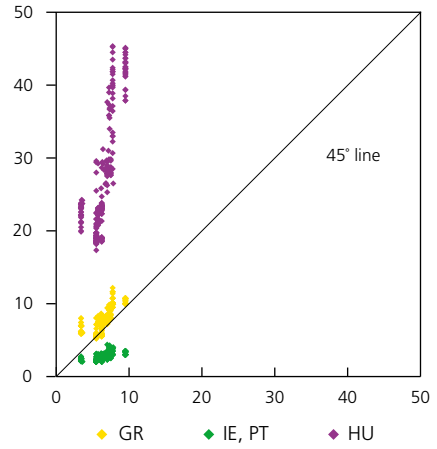


Source: Bloomberg LP, CNB calculations
Note: 5Y CDS spreads of sovereign debt of relevant countries or mean for country group.

10 Quantile analysis is a suitable technique that can explain the apparent non-linearities in the data. Standard regression can only provide information about the mean relationship between the variables over the entire period of analysis and does not yield additional information on any change in the relationship within a non-standard time period such as a financial crisis. This situation manifests itself in an increased difference between the relationship obtained in the 1st–5th quantile relative to the 95th–100th percentile, or in a greater deviation from the mean of the distribution function.

Chart 6

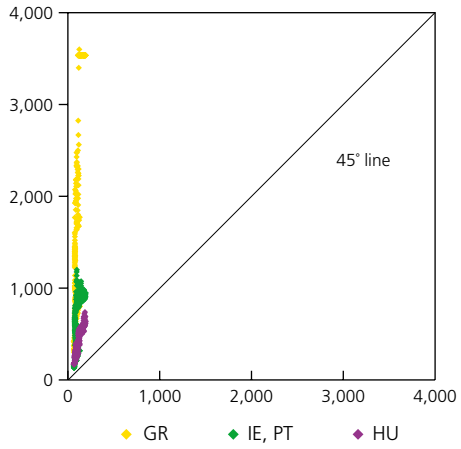
PRE-CRISIS RELATIONSHIP OF SOVEREIGN CDS SPREADS BETWEEN SELECTED COUNTRY GROUPS AND THE CZECH REPUBLIC
(bp; x-axis: CZ; y-axis: selected country groups; August 2006–August 2007)



Source: Bloomberg LP, CNB calculations
Note: 5Y CDS spreads of sovereign debt of relevant countries or mean for country group.

Chart 7

RELATIONSHIP OF SOVEREIGN CDS SPREADS BETWEEN SELECTED COUNTRY GROUPS AND THE CZECH REPUBLIC DURING THE CRISIS
(bp; x-axis: CZ; y-axis: selected country groups; March 2010–February 2012)



Source: Bloomberg LP, CNB calculations
Note: 5Y CDS spreads of sovereign debt of relevant countries or mean for country group.

To obtain a more precise knowledge of the relationships between the credit premiums of the countries under review across periods we applied the regression equation[11] separately for five separate quantiles (IMF, 2009, Box 2.2) and estimated the risk transmission parameter. In simple terms, this parameter expresses how the sovereign risk of a particular country or country group affects (directly or indirectly) Czech sovereign risk in the individual quantiles.

Table 2[12]

CO-MOVEMENT OF SOVEREIGN CREDIT RISKS OF VARIOUS COUNTRY GROUPS AND THE CZECH REPUBLIC

	Quantile				
Country group	5th	25th	50th	75th	95th
DE, FI, SE, UK	0.82	0.75	0.69	0.61	0.42
AT, BE, FR	0.80	0.76	0.67	0.61	0.58
ES, IT	0.80	0.79	0.70	0.64	0.59
GR, IE, PT	0.59	0.54	0.45	0.43	0.41

Source: Bloomberg LP, CNB calculations
Note: The results are significant at the 1% level.

The results of the analysis confirmed a non-linear regression relationship between the monitored risk premiums across quantiles (see Table 1), while in the period of calm (defined as the 5th percentile) the regression coefficients turned out be higher across all the relationships analysed than for the case of market stress (defined as the 95th percentile). The co-movement of the sovereign default risk of the Czech Republic and that of the other countries under review decreases with increasing percentile number. The Czech premium reacts differently to the selected countries, i.e. it displays different sensitivity to the current adverse market situation compared to the other countries under review. This can be interpreted in simple terms as meaning that the Czech Republic is viewed neither as a "safe haven" (e.g. DE, FI, SE, UK), nor as fiscally troubled (e.g. GR, IE, PT and ES, IT). The onset of the crisis was accompanied by the market effects of flight to quality and liquidity by investors, and the government bond markets of fiscally stable countries (e.g. DE, FI, SE, UK) faced increased demand by comparison with other countries, giving rise to a sharp decline in their credit premiums. On the other hand, countries with a high future probability of debt

11 The estimated equation took the form $CDS_{CZ} = \alpha_\tau + \sum_k^K \beta_{\tau,k} R_k + \beta_{\tau,j} CDS_j$, where the credit premium for Czech sovereign debt (CDS_{CZ}) is expressed as a function of the credit premium for the sovereign debt of the other country under analysis (CDS_j) after correcting for the effect of common aggregate risk factors (R_k) for different quantiles (τ). Among the common aggregate risk factors we included a volatility index to proxy for general market risk aversion and a combination of different spreads by maturity or different types of markets to proxy for the market liquidity and credit premium (similarly as in IMF, 2009, Chapter 2, p. 16).

12 The co-movement parameters for the individual quantiles were also estimated for HU and PL. The results were similar to those obtained for the Czech Republic, therefore supporting the above contention that these regionally related countries have reacted similarly to the current debt crisis.

restructuring or potential fiscal problems (e.g. GR, PT and IT) saw an increase in their risk premiums. However, it should also be borne in mind that co-movement can also be affected by market factors such as market liquidity as well as by the size of the country and the soundness of its financial sector (see section 3.1).

From the information above one can tentatively conclude that the shock arising from the current debt crisis will transmit to the Czech sovereign credit premium, but only to a limited extent. The fundamental or market factors explaining its level still dominate. Nonetheless, this market channel of sovereign risk transmission is clearly relevant and would probably increase in significance if market perceptions of the Czech Republic's sovereign default risk were to take a turn for the worse.

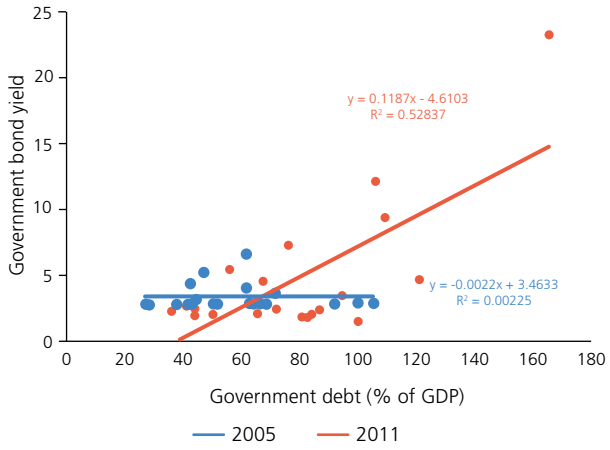
3.3 The channel of change in the attitude to risk

Sovereign tensions may cause a rise in investors' risk aversion, which in turn may increase the risk premiums demanded on sovereign and bank securities and reduce banks' funding availability. An increase in risk aversion can, in the short run, cause a decline in asset prices, reflected in lower profits or in losses for banks. Heightened risk aversion can also be expected to have a larger effect on banks than on non-financial corporations, as the former are more leveraged than the latter. Empirically, changes in the attitude to risk can be followed by means of the difference between the banking sector's stock market returns and options, which represent risk-neutral behaviour. Sovereign default risk problems can also lead to complete loss of availability of the "risk-free asset" on whose existence most market risk management models are based. A loss of power of such models can in turn lead to a further increase in risk aversion and to knock-on effects on banks' portfolios.

As the Czech Republic is a small, open economy strongly dependent on external developments, and given that most foreign investors view it as quite a risky country, the channel of change in the attitude to risk and the impact of heightened risk aversion are important for its financial sector. As is clear from Chart 8, the link between government bond yields and government debt has increased significantly in the EU countries during the current financial crisis. In 2005 this relationship was insignificant, whereas during the crisis financial markets started to put a higher price on sovereign default risk.[13] So, although the current level of public debt in the Czech Republic is relatively low (see Chart 1), the comparatively high rate of growth of debt, in combination with these stronger perceptions of sovereign default risk, may significantly increase the costs of poor budget discipline (see the relatively high government deficits in recent years).[14]

CHART 8

RELATIONSHIP BETWEEN THE GOVERNMENT BOND YIELD AND GOVERNMENT DEBT



Source: Thomson Reuters, Eurostat, CNB calculation

3.4 The sovereign and bank rating channel

Sovereign ratings are important for commercial banks in two main respects. Sovereign downgrades have direct negative repercussions on the cost of banks' debt and equity funding and also often lead to downgrades of domestic banks. Sovereign ratings generally represent a ceiling for the ratings of domestic banks. Rating downgrades cause banks to pay higher spreads on their bond funding, which, in the event of large downgrades,

13 Nonetheless, as stated in De Grauwe and Ji (2012), whereas before the crisis markets wrongly neglected government debt when pricing sovereign risk, now they might be overreacting.

14 However, the link between the sovereign default risk and the debt-to-GDP ratio of an economy may be non-trivial. On the one hand, there are sovereigns with extremely high debt ratios which do not affect their funding costs (mostly countries whose currencies are regarded as reserve currencies, such as Japan with its government debt of over 220% of GDP). On the other hand, sovereign default risk has escalated in the past even in countries with relatively low debt ratios (Argentina 2001).

may reduce access to funding in financial markets. Sovereign downgrades also affect the behaviour of institutional investors, who are restricted by regulations to investing in high-quality securities. This narrows the set of securities eligible as collateral, which are therefore more in demand. It would seem at first glance that this channel has not been active in the Czech Republic so far during the current financial crisis. The Czech Republic is one of the only two EU countries whose rating has been upgraded during the financial and debt crisis; most other EU countries have seen theirs downgraded.[15] However, given the Czech banking sector's strong international ownership links (96% of the assets of the Czech banking sector are controlled by foreign owners), there has been contagion from sovereign ratings to bank ratings via downgrades of parent banks. So, although the Czech banking sector has been stable over the course of the financial crisis, the potential costs of funding Czech banks through bond markets are going up. On the other hand, is fair to say that the real impacts of these increased funding costs have so far been minimal, because the Czech banking sector traditionally has surplus liquidity and does not need bond funding. Recently, moreover, the relationship between the rating and the credit premium has become less close.

3.5 The channel of assets as collateral

Sovereign securities are used extensively by banks as collateral to secure funding from central banks and repo markets. Increases in sovereign risk and haircuts can both cause the value of collateral to fall. Increases in sovereign risk reduce the availability or eligibility of collateral, and hence banks' funding capacity. The haircuts applied to sovereign securities are determined by collateral valuation uncertainty, market liquidity and credit risk. The central bank's liquidity-providing policy, and in particular its eligible collateral policy, plays a significant role here. The central bank faces a dilemma – on the one hand it may face problems with insufficient liquidity in some financial institutions, but on the other hand it should not take on the credit risk associated with such liquidity provision. However, given the liquidity surplus in the Czech banking sector, and given that the CNB's liquidity-providing facilities introduced in 2008 are used to only a limited extent, this channel is currently not very relevant to the Czech Republic.

3.6 The channel of the effects of government guarantees on bank funding

Explicit and implicit government guarantees can significantly affect banks' funding options. Systemically important financial institutions have traditionally had implicit government guarantees, which have lowered their funding costs relative to other institutions. After the escalation of the financial crisis, authorities have also explicitly codified these guarantees in law. The worsening of sovereign fiscal positions could reduce the value of both implicit and explicit guarantees. The potential liabilities of deposit insurance funds, which generally do not have enough money to cover the majority of insured deposits, can also be regarded as an implicit government guarantee. Disruption of the perceived risk-free nature of insured deposits could undermine depositors' confidence in the local banking sector and lead to massive outflows of deposits abroad or into cash.[16] Although this risk is not very likely to materialise in the Czech Republic given its relatively low government debt level and the sound condition of the Czech banking sector, a sharp deterioration of public finances coupled with a downturn in the banking sector could lead to a change in the current environment of surplus bank liquidity and activate other currently inactive sovereign risk contagion channels.

3.7 The channel of the impact on banks' non-interest income

Sovereign tensions may also negatively affect banks' fee and trading income. Higher sovereign risk is associated with greater investor risk aversion and lower asset prices and financial market transactions, which together reduce banks' revenues. The effect of higher sovereign risk also reduces the value of the portfolios which banks manage on behalf of customers, which implies lower bank income from fees from clients. This effect may be exacerbated by investors rebalancing their portfolios towards low-risk assets, which have lower management fees. However, given that investors in the Czech Republic are already very conservative and that most bank fees already tend to be associated with traditional banking products (loans, deposits and money circulation), this channel is unlikely to play a major role in the Czech financial sector. It may, however, manifest itself in slower development of the use of modern financial instruments and in lower competitive pressures in the financial sector.

15 In August 2011, S&P upgraded the Czech Republic's long-term foreign currency rating by two notches to AA-, whereas between 2008 and 2012, for example, it downgraded Greece by 14, Portugal by eight, Ireland by seven, Spain by five and Hungary by two notches. French and Austrian government bonds were also downgraded.

16 For example, Greece recorded an outflow of deposits from the banking sector of more than 20% in 2011. According to the Financial Times, Greeks transferred as much as EUR 200 billion abroad.

3.8 The channel of crowding-out effects on banking sector debt issuance

The rise of sovereign issues may crowd out private debt issuance by increasing the cost or reducing the availability of funding. This effect is not limited to the banking sector, but could be more relevant for banks given their sizeable funding needs. The extent of crowding out depends on whether investors view government bonds as substitutes for bank debt, and on the overall supply of savings. Given the aforementioned liquidity surplus, however, Czech banks do not currently need bond market funding, so this channel is also not relevant to the Czech Republic for the time being.

4. CONCLUSION

Sovereign default risk is currently low for the Czech Republic thanks to its relatively low level of government debt, but it is not zero and may increase in the future. An escalation of this risk would have significant impacts on the financial system given the comparatively high proportion of government bonds (mostly domestic ones) in the balance sheets of Czech banks. In this article we show that government debt funding costs are a relatively significant channel of cross-country contagion for the Czech Republic. Our analysis demonstrated that in the period of calm the Czech sovereign credit premium reacted similarly to the premiums of Germany, Finland, France, Sweden and the United Kingdom, whereas at the time of market stress it diverged from these stable countries. On the other hand, however, the co-movement of Czech sovereign risk and the risk of troubled countries also decreased (in the period of calm only around 50% of the effect transmitted from Greece to the Czech Republic, and in the crisis period the figure was only 40%). The most stable relationship of Czech credit premiums can be observed with countries such as Belgium, Italy and Austria, which are more indebted than the Czech Republic but have more liquid and deeper financial markets. This means that the Czech sovereign credit premium is affected more by market conditions and effects than by concerns about possible debt restructuring.

The sovereign risk transmission channels which, owing to the observed liquidity surplus in the Czech financial sector and the conservativism of Czech investors, are not very relevant include, for example, the effect of sovereign risk on collateral value, the bank downgrading channel, the effect of government guarantees, the reduction in banks' non-interest income and the crowding-out of banking sector debt issuance. The likelihood of an escalation of sovereign default risk is also reduced by the relatively small imbalance in the currency structure of assets and liabilities on both the government side (a relatively small amount of foreign currency bonds) and the side of local financial institutions.

The change in global investors' attitude to sovereign default risk, reflected, among other things, in increased sensitivity of credit premiums to sovereign debt, may significantly increase the costs of irresponsible fiscal policy in the future. This is another factor which has a role in the monitoring of financial stability. The interconnectedness of the various risk transmission channels both within single countries and across national boundaries means that sovereign default risk can have significant implications for systemic risk.

5. REFERENCES

BANQUE DE FRANCE (2009): *Financial Stability Review*, September 2009.

COMMITTEE ON THE GLOBAL FINANCIAL SYSTEM (2011): *The Impact of Sovereign Credit Risk on Bank Funding Conditions*, CGS Papers, No. 43.

CNB (2011): *Financial Stability Report 2010/2011*, Czech National Bank.

DE GRAUWE, P., JI, Y. (2012): *Mispricing of Sovereign Risk and Multiple Equilibria in the Eurozone,* CEPS Working Document No. 361, January 2012.

DIEBOLD, F. X., YILMAZ, K. (2010): *Better to Give than to Receive: Predictive Directional Measurement of Volatility Spillovers*, International Journal of Forecasting, forthcoming.

EBNER, A. (2009): *An Empirical Analysis on the Determinants of CEE Government Bond Spreads*, Emerging Markets Review 10, pp. 97–121.

FONTANA, A., SCHEICHER, M. (2010): *An Analysis of Euro Area Sovereign CDS and Their Relation with Government Bonds*, European Central Bank Working Paper No. 1271.

FRAIT, J., KOMÁRKOVÁ, Z., KOMÁREK, L. (2011): *Monetary Policy in a Small Economy after Tsunami: A New Consensus on the Horizon?* Czech Journal of Economics and Finance 61(1), pp. 5–33.

GANDE, A., PERSEY, D. C. (2005): *New Spillovers in the Sovereign Debt Market*, Journal of Financial Economics 75(3), pp. 691–734.

GAPEN, M., GRAY, D., LIM, C. H., XIAO, Y. (2008): *Measuring and Analyzing Sovereign Risk with Contingent Claims*, IMF Staff Papers 55(1), pp. 109–148.

GRAY, D., LIM, T., LOUKOIANOVA, A., MALONE, T. (2008): *A Risk-Based Debt Sustainability Framework: Incorporating Balance Sheets and Uncertainty,* IMF Working Paper No. 08/40.

IMF (2009): *Global Financial Stability Report,* April.

KELLER, C., KUNZEL, P., SOUTO, M. (2007): *Measuring Sovereign Risk in Turkey: An Application of the Contingent Claims Approach*, IMF Working Paper No. 07/233.

MANASSE, P., ROUBINI, N., SCHIMMELPFENNIG, A. (2003): *Predicting Sovereign Debt Crises*, IMF Working Paper No. 03/221.

OECD (2012): *2012 Economic Review – Euro Area,* forthcoming.

REINHART, C. M., ROGOFF, K. (2009): *This Time is Different: Eight Centuries of Financial Folly*, Princeton: Princeton University Press.

SCHUKNECHT, L., VON HAGEN, J., WOLSWIJK, G. (2010): *Government Bond Risk Premiums in the EU Revisited: The Impact of the Financial Crisis*, European Central Bank Working Paper No. 1152.

CONTINGENT CLAIMS ANALYSIS AND THE INTER-SECTOR TRANSMISSION OF CREDIT RISK

Miroslav Plašil and Ivana Kubicová

The purpose of this article is to contribute to the modelling of the cross-sectional dimension of systemic risk. First, the network of financial linkages in the Czech economy is mapped and then a model of inter-sector transmission of financial contagion is presented. The model is used to quantify the results of two different risk scenarios. It is demonstrated that mutual exposures can amplify the consequences of negative shocks at times of increased financial stress. The magnitude of those consequences depends on which sector is primarily hit by the shock

1. INTRODUCTION

The financial crisis has shown that the consequences of financial turmoil can be fully quantified only in an environment in which the individual components of the system are explicitly analysed for their interrelations and interactions in addition to their financial soundness. The financial links between economic agents are a source of systemic risk commonly referred to as the *cross-sectional* dimension (for more details see Frait and Komárková, 2011). Analysis of the links between economic sectors fosters a better understanding of the process of contagion across the economy and helps to reveal potential weak spots in the system. The increasing strength of inter-sector exposures on the one hand creates the infrastructure necessary for further financial development and economic growth, but on the other hand can make the economic system more vulnerable, especially in the event of increased financial stress. In adverse conditions, inter-sector linkages generally contribute to the spread of contagion across the economy and amplify the direct impacts of risks that materialise.

This article sets out to describe the features of the Czech economy from the perspective of the cross-sectional dimension of systemic risk and to present a formalised approach to modelling inter-sector contagion via financial linkages. The model proposed in Castrén and Kavonius (2009) and extended in Silva (2010) is used to this end. This approach combines the analysis of the *network* of financial exposures with sector-level contingent claims analysis (CCA), which is used to assess credit risk. Although the model is based on several overly strong assumptions (see below), it is a useful tool for describing the propagation of the initial shock and quantifying the economic impacts on sectors hit directly or indirectly by the shock.

The article is divided into three sections. Section 2 examines the basic features of the Czech economy in terms of inter-sector financial exposures. Section 3 describes the CCA method and presents the model, which is used to simulate the impacts of various types of negative shocks. Section 4 summarises the results and briefly assesses the limitations and the power of the model.

2. INTER-SECTOR FINANCIAL LINKAGES IN THE CZECH ECONOMY

In the course of their activities, economic agents enter into financial relations with other agents and thereby form a *network* of financial linkages. To describe the structure of the network sensibly, it is first necessary to simplify it somewhat and to group agents with similar types of economic behaviour into larger units, or sectors. The network of financial linkages between sectors is fully specified if the magnitude of all the bilateral exposures between them is known. The system of interlinkages can be expressed in matrix notation as:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1S} \\ x_{21} & \ddots & \iddots & x_{2S} \\ \vdots & \iddots & \ddots & \vdots \\ x_{S1} & x_{S2} & \cdots & x_{SS} \end{bmatrix}, \quad \sum_{j=1}^{S} x_{ij} = P_i \text{ and } \sum_{j=1}^{S} x_{ij} = A_j \qquad (1)$$

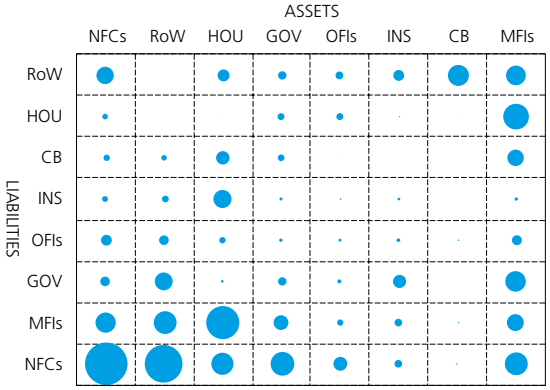
where elements x_{ij} represent the magnitude of the exposures between the debtor's sector i and the creditor's sector j.[1] The row sums P_i correspond to the total liabilities of sector i to all creditor sectors (the liability side), and the column sums A_j correspond to the total financial assets of sector j regardless of the debtor's sector (the asset side). The text below considers the financial linkages between

1 The relationship between the two sectors is not symmetrical with regard to financial assets and liabilities. If one sector is a major creditor of another sector, it does not mean that it is also its debtor in the same amount.

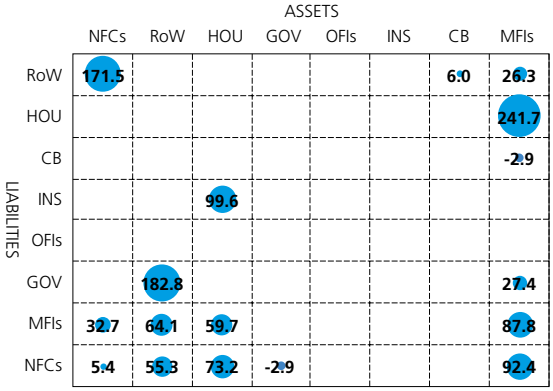
Chart 1

INTER-SECTOR FINANCIAL LINKAGES IN THE CZECH ECONOMY

a) Inter-sector financial exposure levels
(2011 2Q)



b) Exposure dynamics 2004 Q4–2011 Q2
(in %)



CB Central bank
MFIs Monetary financial institutions
INS Ins. companies and pen. funds
OFIs Other fin. intermediaries
NFCs Non-fin. corporations
HOU Households
GOV General government
RoW Rest of the world

Source: Quarterly financial accounts (CNB), authors' calculations
Note: The size of the bubble corresponds to the strength of the financial linkage between the creditor sector in the column and the debtor sector in the row. So, for example, the figure in the last column (MFIs) and the second row (HOU) corresponds to the total amount that households owe banks (most often as loans).

the following eight sectors: the central bank, monetary financial institutions[2] (banks, money market funds and credit unions), insurance companies and pension funds, other financial intermediaries (other financial institutions not mentioned above[3]), non-financial corporations, general government (central government plus municipalities and social security funds), households (including non-profit institutions serving households) and the rest of the world.

To construct matrix X we use the quarterly financial accounts statistics,[4] which, in addition to sector-level financial balance sheets, contain a detailed breakdown of financial assets and liabilities by creditor/debtor sector. The only exception is the instrument other accounts receivable/payable, for which bilateral inter-sector linkages are not compiled in the statistics,[5] so they had to be estimated. The estimation method is based on the simple balancing algorithm described in Silva (2010).

Matrix X is depicted in graphical form in Chart 1a), where the strength of the bilateral exposures corresponds to the bubble size. For clarity, the columns and rows of the matrix have been reordered so that sectors which share a similar pattern of financial investment and funding lie next to each other.[6] This allows for a better understanding of the information contained in the data and makes it easier to answer the following questions: *i*) What is the financial linkage structure of the Czech economy? *ii*) Which sectors have a similar sector structure of financial investment and, conversely, which sectors have a similar creditor structure?

The first important observation is that the banking sector plays a key role: the strength of its exposures is very high on both sides of the balance sheet, so the banking sector – in its role as intermediary – forms the backbone of the entire system. The dominant instruments on the sector's asset side are loans to non-financial sectors (non-financial corporations and households) and investment in debt securities (rest of

2 More specifically *Other* monetary financial institutions (see the ESA95 manual). Banks account for around 98% of the financial assets of this subsector.
3 In particular leasing companies and hire purchase companies, security dealers, investment companies and financial auxiliaries (e.g. the Stock Exchange).
4 The data are available in a time series starting in 2004 Q1 (see http://www.cnb.cz/en/statistics/fin_accounts_stat/).
5 However, some linkages can be obtained from additional statistics (such as the international investment position) or can be determined on the basis of elementary economic structure assumptions. For example, the relationship between the central bank and households in the area of trade credits, which fall into the category of other accounts receivable/payable, can be expected to be negligible and can be approximated by a "statistical zero". Some sorts of linkages are ruled out by definition.
6 The optimal ordering of the rows and columns of the matrix is based on Niermann (2005).

the world and government). The main funding sources on the liability side are deposits (households and non-financial corporations) and issues of shares (held almost exclusively by non-residents). High inter-sector exposures mean that financial problems in the banking sector can spill over to the balance sheets of other sectors, while local shocks that initially only affected non-financial sectors can directly also influence the behaviour of the banking sector. This does not always involve direct losses only, but can also include other consequences such as tighter lending conditions and a freeze on new financing.[7]

Besides the strength of the linkages between the financial sector and other sectors, a fairly strong linkage can be observed between the domestic sectors and the rest of the world sector, especially as regards financial investment by foreign entities. The rest of the world asset side is dominated by investment in non-financial corporations and the banking sector in the form of shares and other equity, while the main item on the liability side is the purchase of foreign debt securities by domestic financial institutions (including holdings of international reserves by the central bank). Among other things, the size of international bilateral exposures increases the speed at which the symptoms of crisis can spread to the economy from the external environment.

The most significant debtor sector is the non-financial corporations sector, where the intra-sector exposure is particularly strong. Its strength is affected to some extent by the ownership structure of corporations, but trade credits and advances – which represent a very significant form of financing within the sector – play the biggest role here. In addition to the non-financial corporations sector itself, the banking sector and the rest of the world are major creditors. The creditor relationship of the rest of the world vis-à-vis non-financial corporations again primarily reflects the ownership structure of corporations.

In terms of the sector structure of financial investment, a slightly different investment profile can be observed for financial institutions (the four right-hand columns of Chart 1a) compared to the other sectors. By contrast, from the financing perspective a difference can be seen between the debtor profile of the two biggest debtors (non-financial corporations and MFIs), which largely use funds from non-financial sectors, and the profile of the rest of the world sector on the opposite side, where above all the investments of domestic financial institutions are channelled. Between these two extremes, sectors that are generally funded mostly by just one sector can be found in the lines in the middle of the chart. They consist mainly of households, which are linked to the banking sector via loans, and insurance companies and pension funds, which by contrast are financed by households in the form of insurance technical reserves.

The financial exposures undergo dynamic changes over time (see Chart 1b[8]), signalling the growing financial interconnectedness of sectors and an increasing susceptibility to inter-sector transmission of credit risk. It is evident that the banking sector's significance as an intermediary of the flow of funds from sectors with free liquidity to those with financing needs increased sharply in the period under review. The dynamic growth in loans to households outpaces even the high growth in the banking sector's financial assets and liabilities.

The globalisation of the inflow of funds is giving rise to growth in the exposures between the domestic sectors and the rest of the world sector. A new feature is the increasing share of foreign investors in the rising government debt linked with deficit financing in recent years. Among the other linkages it is worth emphasising the growing financial investment by households in insurance companies and pension funds, which for historical reasons was very low in the past. At present, therefore, we are seeing a partial restructuring of households' portfolio and some (albeit still relatively slow) convergence towards the investment strategy typical of Western European countries.

3. BALANCE-SHEET SHOCK AND CREDIT RISK TRANSMISSION MODEL

In contrast to other sorts of assets, a financial asset is simultaneously a liability of another entity, so its existence implies a linkage between the two entities' balance sheets. If the debtor has repayment problems, the mutual exposures can serve as risk transmission channels. It is

7 These consequences are not directly observable from financial account data, nor are they captured by our model. However, they based on economic theory and were confirmed by the recent financial crisis.

8 To reduce the information noise, the chart only contains data on growth in linkages that are significant in the economy. The assessment of significance is rather arbitrary – in our case the percentage increases are depicted for linkages having shares of more than 2% in total financial assets in the economy.

on this concept that the simple model of inter-sector propagation of balance-sheet shocks is based.[9] The main assumption of the model is the use of mark-to-market balance sheet valuation, where losses caused by a shock show up directly in the affected entity's accounts via its profit-and-loss account. The loss will affect its equity and therefore also the market price of its shares.

Mark-to-market loss valuation and its impact on share prices is the basic inter-sector shock transmission mechanism in this model. Besides the sector primarily affected, shareholders from other sectors also suffer losses due to a fall in the value of their shareholdings. These losses, in turn, pass through to their balance sheets (shareholder equity positions) via accounting adjustments for the shares and again trigger a fall in the market prices of the shares, which, in the next round, shows up in the balance sheets of the relevant owners. This process continues until the primary shock has been fully absorbed by the entities in the system and no longer generates new losses in the next round. Full absorption of the shock is usually ensured thanks to the existence of sectors which do not issue shares (households and general government) and absorb the shock without spreading it further into the system. The role of these sectors is thus linked solely with losses due to shareholdings in other sectors. The role of the rest of the world is debatable in this respect, as foreign creditors do not necessarily correspond to foreign debtors and so any shock will not necessarily be transmitted back into the economy in its entirety.[10]

The assumption of mark-to-market valuation is connected with the rate at which losses propagate through the economic system. If loss valuation takes place quickly enough or immediately, the shock also transmits immediately to other sectors and the individual rounds of financial contagion will then take place (almost) simultaneously. In normal conditions, however, the mark-to-market assumption is usually not fully satisfied. Moreover, the time needed for reporting losses can vary significantly from sector to sector. Consequently, the time duration of inter-sector shock transmission is quite difficult to determine, hence the model helps us to uncover the shock propagation channels rather than to determine the specific time path of inter-sector contagion.

Another limitation of the model is that it abstracts from the accumulation of credit risk and the formation of risky exposures. Castrén and Kavonius (2009) therefore proposed to combine the said framework with sector-level credit risk indicators and enriched the inter-sector contagion model with a risk factor (the „risk channel"). The contingent claims analysis (CCA) approach is used to determine sector-level risk measures. Specifically, CCA can be used to determine a sector's probability of default and, using that probability, to estimate approximately[11] the riskiness of bilateral exposures. The larger is the probability of default, the greater is the risk that the debtor sector will not be able to honour its commitments to other sectors.

The algorithm of the credit-risk-enriched model can then be described as follows (Silva, 2010). In the first round, a shock occurs in one of the sectors. As in the previous model, this shock leads to an impact on equity via the profit-and-loss account and to a reduction in the market value of shares. However, the changes in the balance sheet of the sector concerned additionally trigger a change in its risk profile and there is a potential rise in the probability of default (or fall in the distance to distress – see below). If the probability of default becomes non-zero, the likelihood of bilateral obligations being honoured drops below 100%. In such conditions, losses are incurred not only by sectors that hold shares in firms from the shock-hit sector, but also by all sectors that are in a creditor position vis-à-vis that sector, because, under market pricing, if the repayment probability is not equal to one they have to adjust their claims for the amount which will probably not be paid back.[12] In the next round, on the basis of the same mechanism, all sectors incurring a loss in the previous round will again see a fall in the market prices of their shares and a potential change in their probability of default. In addition to the losses arising from the fall in the market prices of shares, this change can again lead to further losses arising from the decrease in the probability of repayment of obligations and from the need to

9 The idea of the model used in Castrén and Kavonius (2009) is based on earlier literature on credit chains and balance-sheet risk transmission (see Shin, 2008, and Kiyotaki and Moore, 2002).

10 We assume in the model that only one-fifth of the losses suffered by the rest of the world are transmitted back into the economy. This roughly corresponds to the ratio of residents' shares abroad to non-residents' shares in the Czech economy.

11 The riskiness of bilateral exposures can be roughly approximated by the probability of default. In practice, this can overstate the true risk, because even given default a creditor will usually get part of his claim back, i.e. the loss given default (LGD) is not equal to 100% in reality. It is also true that in the event of increased financial stress the debtor sector will not honour its commitments to other sectors in the same way (for example, a troubled debtor may prefer to make payments to a bank than pay premiums to an insurance company).

12 This can be calculated as the amount of the bilateral obligation to the affected sector multiplied by the probability of default.

write off a further portion of risky assets vis-à-vis the debtor sector. The inter-sector shock and credit risk transmission algorithm goes through further rounds until the shock has been fully absorbed by the system or until it becomes clear that without another positive shock the sectors are no longer capable of absorbing the original negative shock and the system heads towards complete collapse.

It should be emphasised that this model implies higher losses than the model that excludes credit risk. This is because sectors, besides incurring losses as a result of a fall in the market prices of their shareholdings (the "equity channel"), incur losses due to risky bilateral exposures (the "risk channel"). What is more, the two channels act in synergy, because in any given round of the algorithm the market price of shares is reduced by both types of losses, and the equity channel is thus amplified in the next round by the effect of the risk channel from the previous round. The existence of the risk channel better describes the formation of credit risk over time and enables the impacts of the initial shock to be distributed more realistically, since these impacts can directly influence not only the shareholder sectors, but also, as a result of the existence of credit risk, other sectors with bilateral exposures to the affected sector.

In order to apply the model to the Czech data it is first necessary to calculate the sector-level risk measure using contingent claims analysis (CCA). The CCA method is based on Merton's model (Merton, 1974), which extends the option pricing theory described in Black and Scholes (1973). Although this model is applied more often at the microeconomic level, where it is used to determine the probability of default of a firm, it has also been used successfully to analyse economic sectors (see, for example, Gray et al., 2007, and Gray and Malone, 2008). CCA is based on three main principles: (*i*) the value of liabilities is derived from the value of assets; (*ii*) liabilities are divided into two "classes" with different settlement priorities, where debt ("senior claims", B) has precedence over shareholders' claims ("junior claims", J); (*iii*) the value of assets is determined by a stochastic process that reflects market dynamics.

If the total value of the assets in a particular sector falls, the sector's debt becomes more risky for creditors owing to a decrease in the funds available for paying it back. The uncertainty regarding the value of assets at time t can be described by a probability distribution. At the end of period t, the asset value should ideally be above the "barrier" constituted by the debt repayments. If this does not happen and the asset value falls below this barrier, the debt can no longer be covered and default occurs. The degree of uncertainty associated with this happening is given by the probability of default (PD). This probability is non-zero if part of the asset value probability distribution lies below the barrier constituted by the value of the debt plus related interest. The distance to default (DD) is then determined by the difference (distance) between the implied market value of the assets and the default barrier. This distance is related (scaled) to the asset volatility.

The distance to default, DD, and the probability of default, PD, are the main outputs of CCA. Using Merton's model they can be expressed by the following relations:[13]

$$DD = \frac{ln(A_0 / B_t) + (\mu_A - \sigma_A^2 / 2)t}{\sigma_A \sqrt{t}}, \qquad (2)$$

$$PD = P(A_t < B_t) = F(-DD), \qquad (3)$$

where[14] A_0 is the implied market value of assets at time $t=0$, B_t is the book value of the debt (default barrier), $\mu_A = r^* \lambda \sigma_A$ is the expected rate of growth of the sector's assets, σ_A is the asset volatility, defined as the standard deviation of the return, r is the risk-free interest rate, t is the length of the time period (usually equal to one), λ is the market price of risk, $P(.)$ denotes probability and $F(.)$ denotes the cumulative distribution function of a standard normal distribution.

The asset volatility σ_A is not generally known but can be estimated from its relationship to the volatility of junior claims σ_J, which also ensues from Merton's model:

$$\sigma_J = \frac{F(DD + \sigma_A \sqrt{t})A}{J} \sigma_A . \qquad (4)$$

It can be derived (see Castrén and Kavonius, 2009) that the distance to default is decreasing (and the level of risk increasing) in asset volatility and/or leverage (B/A). The relationships between the variables are non-linear,

13 A detailed derivation of the relationships and their economic rationale can be found, for example, in Gapen et al. (2008) and Seidler (2008). The equations in the text indicate which variables enter the CCA. The construction of the variables on the basis of sector-level data is analysed in the subsequent text.

14 The solution to the resulting system of equations is found using iterative optimisation techniques. Our calculations were performed using Excel Solver.

and credit risk is particularly sensitive to changes in asset volatility when leverage is high.

At the sector level it can be difficult to find suitable data to fill equations (2)–(4) and it is often necessary to adopt somewhat simplified definitions. In line with earlier studies[15] junior claims are defined as the sum of equity and net financial assets.[16] The default barrier is set equal to the sum of short-term liabilities plus 50% of long-term liabilities. The risk-free interest rate is approximated by one-year interest-rate swaps. Parameter λ is fixed at 0.45, which corresponds to the long-term average as calculated by Moody's.[17] The volatility of junior claims for individual sectors can generally be obtained from stock indexes. Because the historical index volatility does not necessarily match the present volatility, forward-looking (implied) volatility measures, which are commonly available for economies with developed capital markets, tend to be preferred. However, they are not available for the Czech Republic, nor – owing to a shallow capital market – are stock sub-indexes available for individual (sub)sectors for the calculation of historical volatility.

The volatility of the junior claims of non-financial corporations is therefore approximated by the historical (time-varying) volatility of the PX 50 index as calculated by the exponentially weighted moving average (EWMA) method used by RiskMetrics (RiskMetrics, 1996). The same method was used to calculate the volatilities for the other sectors, although the weighted average of the stock price of domestic banks and the Eurostoxx bank sub-index was used for the monetary financial institutions sector. The relevant Eurostoxx sub-indexes were used for the other financial subsectors, and the aggregate Eurostoxx 50 index was used for the rest of the world. For the government and household sectors the volatility of junior claims is given by the historical volatility of ten-year government bond yields.

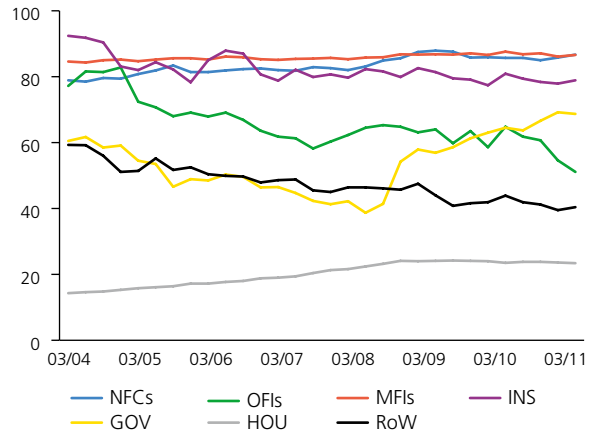
4. RESULTS AND SIMULATION OF INTER-SECTOR SHOCK TRANSMISSION

In the text below, the CCA outputs are first presented and, on the basis of those results, a simulation of two negative scenarios is performed using the model described in section 3.

Chart 2

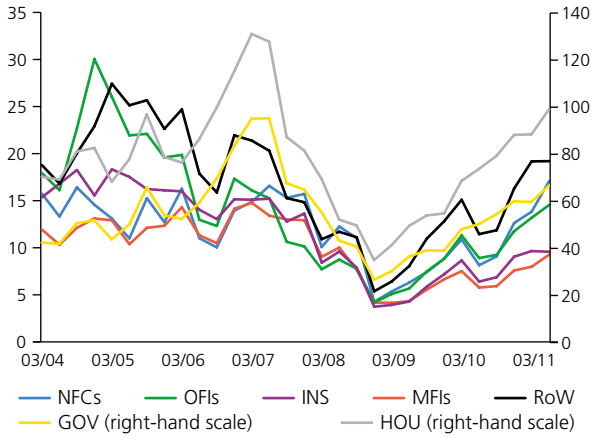
SELECTED CCA OUTPUTS

a) Implicit leverage (B/A)
(in %)



Source: Authors' calculations

b) Distance to default
(in standard deviations of asset volatility)



Source: Authors' calculations

15 See Gray et al. (2007), Castrén and Kavonius (2009) and Silva (2010). These papers also give a more detailed economic rationale for the definitions adopted, as well as alternative suggestions. However, their use (e.g. for the household sector) in the Czech case is prevented by a lack of the necessary data.
16 With the exception of the general government sector, which does not issue equity and whose net financial assets are negative in some periods. For general government, junior claims are therefore defined as the sum of government bonds and net financial assets (see Castrén and Kavonius, 2009).
17 For the Czech economy this choice may be rather subjective. However, the simulation does not indicate high sensitivity to changes in the parameter close to the value used.

4.1 CCA outputs

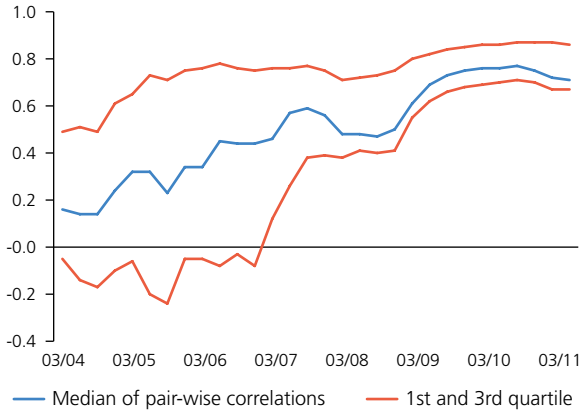
The evolution of leverage (Chart 2a), i.e. the ratio of the debt barrier to the implicit market value of assets calculated using the model (risk-adjusted assets), reveals that the household sector has the lowest leverage while banks and non-financial corporations currently have the highest. With regard to the dynamics it is interesting to note the relatively sharp growth in the government sector's leverage since 2008 Q2. This rise was fostered by increased issuance of government bonds and the sector's deficits and by a simultaneous decline in the market prices of its asset holdings.

Until mid-2007, the distance to default – documenting the evolution of credit risk (Chart 2b) – was relatively high[18] in all sectors. However, following the outbreak of the financial crisis it started to fall in aggregate terms, reaching its minimum (the highest credit risk) in late 2008/early 2009. This mainly reflects increased asset volatility during the crisis. A gradual recovery then started and the distance to default rose to its pre-crisis level. The highest credit risk during the crisis period was recorded by the most leveraged sectors (monetary financial institutions, non-financial corporations, and insurance companies and pension funds). This demonstrates the aforementioned (non-linear) property of the CCA model, as more leveraged sectors are significantly more sensitive to the materialisation of credit risk when asset volatility is high.

As part of the credit risk transmission analysis, it is interesting to look at the pair-wise correlations between the sector-level distances to default and their evolution over time (see Chart 3).[19] The fact that there was a noticeable rise in the correlations between all DDs in the period under review suggests an increased possibility of inter-sector credit risk transmission, as a deterioration in DD in one sector is highly likely to lead to an increase in risk in all other sectors if the correlations are high. It is important to emphasise, however, that this was caused mainly by increased correlation between stock index volatilities during the financial crisis. A slight decline in the overall correlation can be observed in recent quarters, as the closest links between DDs were seen during and immediately after the crisis.

CHART 3

PAIR-WISE CORRELATIONS BETWEEN SECTOR LEVEL DISTANCES TO DEFAULT
(descriptive statistics)



Source: Authors' calculations

4.2. Simulation of negative shocks

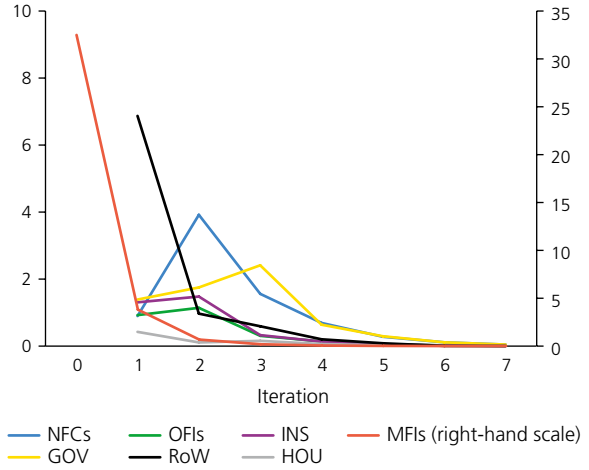
This section contains a simulation of two negative shocks, each primarily hitting a different sector. Both scenarios represent strong stresses intended to assess the economic system's ability to absorb very implausible and extreme shocks. The starting period for the simulation is 2011 Q2, but to increase the stress to the system it is also assumed that the shock was accompanied by an increase in the volatility of junior claims (and therefore also assets) to the level of 2008 Q4, when the volatility of the stock (sub) indexes peaked in the time period under review.

The first scenario assumes an unrecoverable loss of 15% in loans granted by monetary financial institutions to households ("*MFI shock*"), while the second stress scenario assumes problems in client-supplier relations within the non-financial corporations sector caused by a dramatic deterioration in economic conditions ("*NFC shock*"). These problems lead to insolvency and an unrecoverable loss of 10% in inter-company trade credits (or other accounts receivable/payable). In both scenarios, the magnitude of the primary shock is determined simultaneously by the change in the volatility of junior claims and by the loss incurred. Seven post-shock iterations are performed using the inter-sector transmission model.[20]

18 If the indicator takes a value of three, the probability of default is approximately 10%; a value of four represents a virtually zero probability of default.
19 The time-varying correlations were again estimated using the EWMA method.
20 The number of iterations is the same for both scenarios. The number cannot be increased owing to a fall in junior claims below zero in non-financial corporations in the second scenario.

Chart 4a

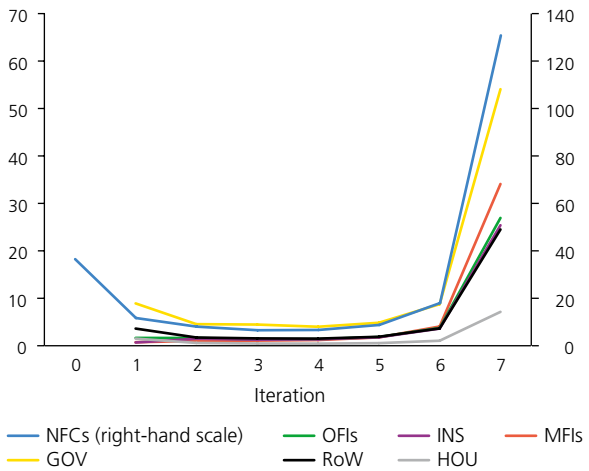
LOSSES IN EACH ITERATION, MFI SHOCK
(in % of junior claims in 2011 Q2)



Source: Authors' calculations

Chart 4b

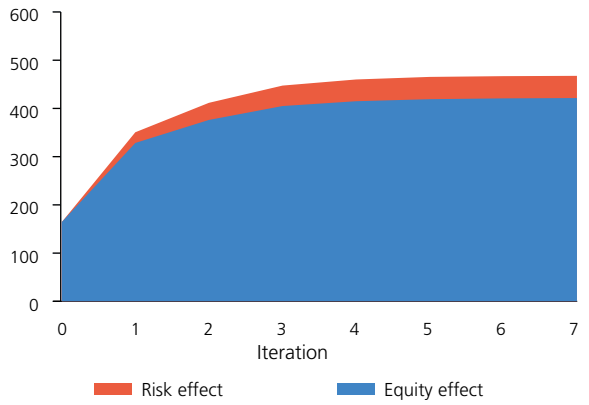
LOSSES IN EACH ITERATION, NFC SHOCK
(in % of junior claims in 2011 Q2)



Source: Authors' calculations

Chart 4c

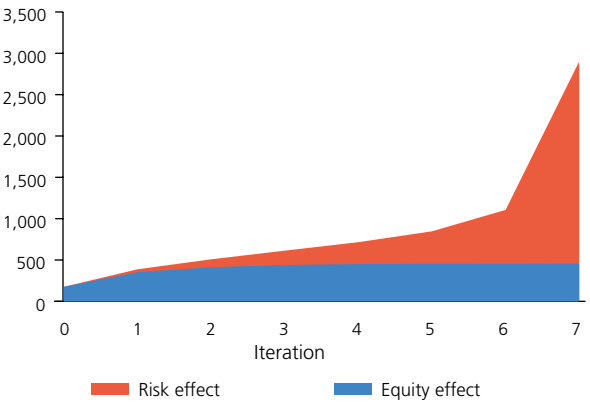
ACCUMULATED LOSSES IN SYSTEM, MFI SHOCK
(in CZK billions)



Source: Authors' calculations

Chart 4d

ACCUMULATED LOSSES IN SYSTEM, NFC SHOCK
(in CZK billions)



Source: Authors' calculations

The simulations (see Chart 4) indicate that given an initial shock of the same magnitude the ultimate effects on the financial system can be completely different depending on which sector is primarily affected and what exposures it has to other sectors. While in the first scenario the banking sector showed a high degree of resilience and was able to cope with the shock even amid increased financial stress (increased volatility + loss), in the second scenario in the case of non-financial corporations the losses initially accumulate within the sector and are subsequently also transmitted increasingly to other sectors up to the point where the entire system heads towards collapse (see Chart 4a–d).

In addition to general financial soundness, the different shock profiles are due mainly to the different natures of the bilateral exposures and ownership relations. In the case of a shock to the banking sector, it is foreign shareholders that incur the biggest losses in the first round. Owing to

the high resilience of the banking sector, however, bilateral exposures are not significantly threatened. The size of the losses in subsequent rounds therefore depends primarily on the transmission of losses caused by the fall in market prices of shares, with shareholders of sectors hit in the previous round gradually suffering losses. The overall magnitude of the risk effect[21] is low relative to the equity effect and it is evident (see Chart 4c) that the shock is gradually absorbed by the system in the subsequent iterations. Nevertheless, the total accumulated loss is almost three times as large as the primary shock.

By contrast, the sizeable intra-sector linkages in the non-financial corporations sector contribute to the accumulation of losses (both equity and risk) within the sector in the event of a extreme shock, leading to spiralling growth in credit risk. When a certain threshold is crossed, the accumulated risk quickly spills over to other sectors. The model indicates the government sector[22] and the banking sector (a key provider of funds to firms) as being the most strongly affected. In contrast to the first simulation, the importance of the credit risk effect in the second scenario increases gradually over time before suddenly becoming totally dominant in the final round. This suggests significant non-linearity in the propagation of credit risk – once a certain tipping point is crossed, the network of bilateral linkages, instead of being a shock absorber, becomes a massive propagator of the accumulated risk to all sectors (see Silva, 2010, and Haldane, 2009).

This fact is confirmed by Table 1, which shows the change in the distance to default between the initial moment and the situation after the primary shock as well as the change between the situation immediately after the primary shock and the final round of the algorithm. In the first scenario, the DDs decrease in all sectors because of increased junior claim volatility and in the banking sector also because of loan losses. Subsequently, however, the changes in DD are minimal. In the second scenario, by contrast, the DDs continue to decline in all sectors as a result of inter-balance sheet exposures, owing mainly to the accumulation of credit risk in the non-financial corporations sector.

The shock transmission model presented above is not limited to non-recurring shocks to a single sector. The impacts of full-blown scenarios where various types of risks crystallise in different sectors simultaneously can also be tested. These can be linked to macro-scenarios calculated in other models.

Table 1a

CHANGE IN DISTANCE TO DEFAULT DUE TO SHOCK
(Scenario: MFI shock)

2011 Q2		Primary shock		End of algorithm	
sector	DD	DD	ΔDD(%)	DD	ΔDD(%)
NFCs	17.1	3.5	79.7	3.5	0.2
MFIs	9.3	2.6	71.8	2.6	1.1
OFIs	14.5	4.2	71.2	4.2	0.4
INS	9.6	3.2	66.4	3.2	0.0
GOV	66.7	23.5	64.8	23.4	0.4
HOU	99.1	34.7	65.0	34.6	0.2
RoW	19.2	5.4	71.9	5.2	3.3

NFCs Non-financial corporations
MFIs Monetary financial institutions
GOV General government
HOU Households

Table 1b

CHANGE IN DISTANCE TO DEFAULT DUE TO SHOCK
(Scenario: NFC shock)

2011 Q2		Primary shock		End of algorithm	
sector	DD	DD	ΔDD(%)	DD	ΔDD(%)
NFCs	17.1	2.7	84.4	0.2	92.6
MFIs	9.3	3.3	64.6	2.5	23.7
OFIs	14.5	4.2	71.2	3.3	21.8
INS	9.6	3.2	66.4	2.6	18.7
GOV	66.7	23.5	64.8	5.6	75.9
HOU	99.1	34.7	65.0	33.2	4.5
RoW	19.2	5.4	71.9	4.3	20.8

OFIs Other financial intermediaries
INS Ins. companies and pen. funds
ROW Rest of the world

Source: Authors' calculations

21 As the equity and risk channels cannot be entirely separated owing to their mutual synergy, the risk effect is calculated as the difference between the losses in the model including credit risk and those in the accounting model excluding risk.
22 The government acts as a shareholder of non-financial corporations, but the losses also reflect the risk of non-payment with regard to other claims on non-financial corporations (loans and tax arrears).

On the other hand, the model has some limitations, since it abstracts from liquidity risk and from the possibility of rebalancing a sector's balance sheet by selling a proportion of its assets. The sale of assets and the settlement of short-term liabilities from the proceeds can lead the real losses caused by a shock to follow a different – often less pessimistic – trajectory. The simulations should therefore be viewed as overstated with respect to the true degree of contagion. Also linked with the high-stress nature of the model is the comparatively strong assumption of a 100% loss given default (LGD), i.e. the worst-case scenario of default on the entire debt. More sophisticated models allowing dynamic measurement of LGD across sectors over time or incorporating late payments have yet to be theoretically elaborated and provide an incentive for further development of the study of inter-sector linkages. Finally, it is necessary to take into consideration that the model only examines the amplification of primary shocks via the existing network of financial exposures and does not analyse their causes in any further detail. Likewise, the model is not capable of working with such shocks until they show up in a change in biliateral exposures. For this reason, the study of inter-sector contagion should be embedded in a wider analytical framework.

5. CONCLUSION

This article set out to map the network of inter-sector financial linkages in the Czech economy and to contribute to the study of the cross-sectional dimension of systemic risk. The article analyses whether inter-sector balance-sheet linkages can act as amplifiers of shocks and transmitters of contagion in the event of financial stress. A model that extends inter-sector shock transmission to include a description of credit risk based on contingent claims analysis was used to this end. Despite the simplicity of this approach, a need to study inter-sector linkages was demonstrated and their role in the transmission of contagion across the economy was identified.

The simulations indicated that the transmission of a primary shock differs depending on its sector of origin. From the financial stability perspective, it is significant that the results revealed strongly non-linear risk transmission. Once a tipping point is crossed, the gradual accumulation of risks can suddenly and dramatically switch into a situation that implies a significant stress for the system and – in the extreme worst case – collapse of the system. However, the simulations also demonstrated that the banking sector is strongly resilient to adverse shocks and indicated that it is capable of assisting in the complete absorption of shocks.

The CCA analysis also yielded interesting information as a separate output. It was demonstrated that the correlations between the sector-level measures of credit risk increased significantly in the period under review, peaking during and immediately after the financial crisis. This suggests an increased probability of inter-sector credit risk transmission in this period.

A promising avenue of future research would be to integrate the model described above with the suite of models used at the Czech National Bank. This would allow for the creation of consistent macro-scenarios and quantification of their impacts on systemic risk or its cross-sectional dimension. Alongside this there is a need to continue working on a subtler version of the model to eliminate some of the overly strong assumptions.

6. REFERENCES

BLACK, S., SCHOLES, M. (1973): *The Pricing of Options and Corporate Liabilities*, Journal of Political Economy 81(3), pp. 637–654.

CASTRÉN, O., KAVONIUS, I. K. (2009): *Balance Sheet Interlinkages and Macro-Financial Risk Analysis in the Euro Area*, ECB Working Paper No. 1124.

FRAIT, J., KOMÁRKOVÁ, Z. (2011): *Financial Stability, Systemic Risk and Macroprudential Policy,* Financial Stability Report 2010/2011, Czech National Bank, pp. 96–111.

GAPEN, M., GRAY, D., LIM, C. H., XIAO, Y. (2008): *Measuring and Analyzing Sovereign Risk with Contingent Claims*, IMF Staff Papers, Vol. 55, No. 1.

GRAY, D. F., MERTON, R. C., BODIE, Z. (2007): *New Framework for Measuring and Managing Macrofinancial Risk and Financial Stability*, NBER Working Paper No. 13607.

GRAY, D., MALONE, S. (2008): *Macrofinancial Risk Analysis,* Wiley Finance, UK.

GROENEN, P. J. F., FRANSES, P. H. (2000): *Visualizing Time-varying Correlations Across Stock Markets*, Journal of Empirical Finance 7(2), pp. 155–172.

HALDANE, A. (2009): *Rethinking the Financial Network*, speech delivered at the Financial Student Association, Amsterdam.

KIYOTAKI, N., MOORE, J. (2002): *Balance-Sheet Contagion*, American Economic Review 92(2), pp. 46–50.

MERTON, R. (1974): *On the Pricing of Corporate Debt: The Risk Structure of Interest Rates*, Journal of Finance 29(2), pp. 449–470.

NIERMANN, S. (2005): *Optimizing the Ordering of Tables With Evolutionary Computation*, The American Statistician 59(1), pp. 41–46.

RiskMetrics (1996): Technical Document, Fourth Edition.

SEIDLER, J. (2008): *Implied Market Loss Given Default: Structural-Model Approach*, IES Working Paper No. 26/2008.

SHIN, H. S. (2008): *Risk and Liquidity in a System Context*, Journal of Financial Intermediation 17(3), pp. 315–329.

SILVA, N. (2010): *Inter-Sector Relations in the Portuguese Economy: An Application of Contingent Claim Analysis*, Economic Bulletin and Financial Stability Report Articles, Banco de Portugal.

GLOSSARY

Acid-test ratio This indicator of corporate liquidity can be calculated as the ratio of total current assets excluding inventories to total liabilities. In general, the higher this indicator, the stronger the company's liquidity position. See also Cash ratio and Current ratio.

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.

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.

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.

Capital adequacy ratio
The ratio of regulatory capital to total risk-weighted assets. Tier 1 capital adequacy is the ratio of Tier 1 capital to total risk-weighted assets (see also Tier 1).

Cash ratio This indicator of corporate liquidity can be calculated as the ratio of total funds on accounts and in cash to total short-term liabilities. In general, the higher this indicator, the stronger the company's liquidity position. See also Acid-test ratio and Current ratio.

CERTIS A payment system processing all domestic interbank transfers in Czech koruna in real time. Banks, credit unions and foreign bank branches are participants in this system.

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.

Connectivity An indicator of the degree of interconnectedness of a network element with the other elements (e.g. in a network of interbank exposures); for each bank, connectivity is calculated as the number of relationships with other banks divided by the maximum possible number of relationships and takes values from 0 to 100%. The average connectivity of the entire network is calculated as the average across all banks.

Credit default swap (CDS)
A credit derivative in which the buyer of the collateral undertakes to pay the seller periodical fixed payments ("swap premium") for the duration of the contract in exchange for a conditional payment of the counterparty in the case of default of the "reference entity" to which the agreement refers. If default does not occur, the contract terminates at a specified time and the seller only gains a premium for taking on the potential credit risk.

Credit premium The premium on the return on a portfolio for credit risk.

Current ratio This indicator of corporate liquidity can be calculated as the ratio of total current assets to total liabilities. In general, the higher this indicator, the stronger the company's liquidity position. See also Acid-test ratio and Cash ratio.

Custody Banks offer their clients the service of safekeeping and management of securities and settlement of securities transactions on both domestic and foreign markets. The bank opens and maintains a securities owner account for the customer, on which it performs settlement of the customer's capital market trades as instructed by the customer. As the custodian, the bank performs activities directed at preserving the rights attaching to the securities in its custody.

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.

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.

Downward liquidity spiral
An inverse relationship between market risk and funding liquidity risk. A downward liquidity spiral may be triggered by a single financial institution which has insufficient liquidity and is unable to borrow on the money market. In this case, it might attempt to sell some of its assets. If tensions exist on the market for the given asset, the financial institution may cause the price of the asset to fall rapidly through aggressive attempts to sell (a "loss spiral"). The fall in the asset price affects the balance sheets of all holders of the asset and, owing to a rise in haircuts and margin calls, results in more and more attempts to sell and more and more price declines (a loss of market liquidity, a "margin spiral").

Eligible collateral An asset accepted to ensure fulfilment of an obligation to the central bank.

Equalisation provision
The equalisation provision is set aside for individual areas of non-life insurance and is intended to equalise increased insurance claim costs arising due to fluctuations in loss ratios as a result of facts independent of the will of the insurance company.

Euro area effective GDP growth

GDP growth in the 14 euro area countries weighted by Czech exports to those countries.

Financial repression

Policies and instruments that allow the government to fund its debt cheaply at the expense of domestic creditors by borrowing from them via banks, insurance companies and pension funds at artificially low interest rates or by imposing an inflation tax on them.

Forbearance A practice where banks, instead of recognising a deterioration in asset quality and reporting a loss, "restructure" the loan, for example by extending the repayments over a longer time horizon, allowing the debtor temporarily to pay interest only, or otherwise changing the lending conditions so that the debtor does not have to acknowledge open default.

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 index (HI)

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 HI, 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, an investment 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 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.

Jump-to-default risk

The risk of sudden default that arises before the market can reflect that risk in prices.

Liquidity Money in the broader sense (cash, short-term assets quickly exchangeable for cash, etc.).

Loan-to-value (LTV) ratio
The ratio of a loan to the value of pledged property.

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 (see also 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.

Marginal lending facility
A facility enabling banks to borrow overnight liquidity from the CNB in repo operations. A bank is entitled to access the lending facility if it asks for the transaction to be made no later than 25 minutes prior to the end of the CERTIS accounting day. The minimum volume is CZK 10 million and amounts exceeding this threshold are provided without further restrictions. Funds provided under this facility are charged interest at the Lombard rate.

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.

Monte Carlo simulation
A numerical technique based on repeated random sampling. It employs a large number of simulations of a particular random variable to determine its approximate distribution and thus also the most likely value it can take.

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. See also Total population increase.

Net financial assets
The difference between the sum of financial assets and the sum of liabilities.

Net international investment position
The surplus of financial assets over financial liabilities of residents vis-à-vis non-residents.

Non-performing loans
Substandard, doubtful and loss loans. Also called loans in default or default loans.

Overnight segment
The money market on which overnight funds are traded.

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 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 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). See also Property transaction 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 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. See also Property asking prices.

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. Japan has applied quantitative easing in the past decade, and the US Fed, for example, is to some extent pursuing a similar policy at present.

Recovery rate The percentage of the amount of a non-performing loan recovered by a creditor, e.g. by foreclosure.

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.

Risk premium The risk premium an investor demands on investments in riskier financial instruments.

RTGS Real-time gross settlement, i.e. each transaction is processed and settled on-line in real time. The CERTIS payment system operates on this principle.

Secondary market The market on which existing securities are traded.

SKD Short-Term Bond System. The system is used for issuing and registering all book-entry securities with maturities of up to one year and for settling trades in these securities. At present, T-bills and CNB bills are registered in SKD. The system enables sales of securities, repos and sell and buy operations, as well as pledges and exchanges of securities.

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.

Sovereign risk The risk that a government that issues a bond will not be able to meet its obligations.

Systemic risk The risk of the entire financial system or market collapsing.

Technical provisions
Under the Act on Insurance, an insurer must set aside technical provisions to meet insurance obligations which are either likely to be incurred or certain to be incurred but uncertain as to amount or as to the date on which they will arise.

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.

Value-at-risk The size of loss, with predefined probability, which a bank may suffer when holding a current portfolio for a certain period if market factors (e.g. interest rates, exchange rates) develop unfavourably.

Yield spread Also yield differential; the spread between the yield on a bond and the yield on a reference ("benchmark") bond.

AEX	Amsterdam Exchange index
ARAD	database of aggregated time series administered by the CNB
ASM	available solvency measure
ASW	asset-swap spread (difference between the swap yield curve and the government bond yield curve)
ATM	automated teller machine
BCBS	Basel Committee on Banking Supervision
BdF	Banque de France
bp	basis point
BIS	Bank for International Settlements
BLS	Bank Lending Survey
BMA	Bayesian model averaging
BRIC	Brazil, Russia, India and China
CAC 40	benchmark French stock market index
CAR	capital adequacy ratio
CB	central bank
CCA	contingent claims analysis
CCMA	Czech Capital Market Association
CCR	Central Credit Register
CDS	credit default swap
CEBS	Committee of European Banking Supervisors
CEE	Central and Eastern Europe
CEIOPS	Committee of European Insurance and Occupational Pensions Supervisors
CERTIS	Czech Express Real Time Interbank Gross Settlement System
CESR	Committee of European Securities Regulators
CET1	Common equity Tier 1
CGFS	Committee on the Global Financial System
CIFs	Collective Investment Funds
CIS	Commonwealth of Independent States
CLFA	Czech Leasing and Finance Association
CNB	Czech National Bank
COSMC	Czech Office for Surveying, Mapping and Cadastre
CoVaR	Conditional Value-at-Risk
CRB	Commodity Research Bureau Index (Reuters commodity index)
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
CTU	Czech Technical University
CZ	Czech Republic
CZEONIA	Czech OverNight Index Average (reference O/N interest rate on the interbank market)
CZK	Czech koruna
CZSO	Czech Statistical Office
DAX	Deutscher Aktien IndeX
DB	Deutsche Bank
DD	distance to default
DJStoxx50	Dow Jones EURO STOXX 50, the main European stock index, comprising 50 corporations
DJ UBS	Dow Jones commodity index
D-SIBs	domestic SIBs
D-SIFIs	domestic SIFIs
EA	euro area
EAD	exposure at default
EBA	European Banking Authority
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortisation

EC	European Commission
ECB	European Central Bank
ECM	Error Correction Model
EDP	Excessive Deficit Procedure
EEA	European Economic Area
EFFAS	European Federation of Financial Analysts Societies
EFSF	European Financial Stabilisation Facility
EFSM	European Financial Stabilisation Mechanism
EIB	European Investment Bank
EIOPA	European Insurance and Occupational Pensions Authority
EMBI	Emerging Market Bond Index
EMU	European Monetary Union
EONIA	Euro OverNight Index Average (reference O/N interest rate on the interbank market)
ESA 95	European System of Accounts
ESCB	European System of Central Banks
ESM	European Stability Mechanism
ESMA	European Securities and Market Authority
ESRB	European Systemic Risk Board
EU	European Union
EU-12	euro area as of 2001–2006
EUR	euro
EURIBOR	Euro InterBank Offered Rate (reference interest rate on the interbank market)
EU-SILC	European Union Statistics on Income and Living Conditions
EWMA	exponentially weighted moving average
EWS	Early Warning Systems
FASB	Financial Accounting Standards Board
FDI	foreign direct investment
Fed	Federal Reserve System
FRA	forward rate agreement
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FSR	Financial Stability Report
FSSA	Financial Sector Stability Assessment
FTSE 100	Financial Times Stock Exchange Index
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GBP	pound sterling
GDI	gross disposable income
GDP	gross domestic product
GMM	generalised method of moments
GSCI	Goldman Sachs Commodity Index (S&P commodity index)
G-SIBs	global SIBs
G-SIFIs	global SIFIs
HP	Hodrick-Prescott filter
HUF	Hungarian forint
IASB	International Accounting Standards Board
IBEX	Iberia Index (benchmark stock market index – Spain)
IBRD	International Bank for Reconstruction and Development
IF	investment firm
IFRS	International Financial Reporting Standards
ILI	investment life insurance
IMF	International Monetary Fund
IMF IFS	IMF International Financial Statistics

IP	investment position
IRB	Internal Rating Based Approach, a Basel II bank capital adequacy approach
IRI	Institute for Regional Information
IRS	interest rate swap
JPY	Japanese yen
LB	liquidity buffer
LCR	liquidity coverage ratio
LFS	Labour Force Survey
LGD	loss given default
LI	life insurance
LIBOR	London InterBank Offered Rate (reference interest rate on the interbank market)
LOLR	lender of last resort
LTD	loan-to-deposit
LTI	loan-to-income
LTRO	Long-Term Refinancing Operation
LTV	loan-to-value
MA	monthly adjusted
MaRs	Macroprudential Research Network – a macroprudential research group within the ESCB
MCR	minimum capital requirement – the minimum required capital for calculation of the solvency of insurance companies and reinsurers
MF CR	Ministry of Finance of the Czech Republic
MFI	monetary financial institution
MiFID	Markets in Financial Instruments Directive
MLCX	Merrill Lynch Commodity Index
MLSA	Ministry of Labour and Social Affairs
MNB	Magyar Nemzeti Bank (the Hungarian central bank)
NACE	General Industrial Classification of Economic Activities
NFC	non-financial corporations
Nikkei	stock market index (Tokyo)
NLI	non-life insurance
NPL	non-performing loan
NSFR	net stable funding ratio
O/N	overnight
OECD	Organisation for Economic Cooperation and Development
OeNB	Österreichische Nationalbank
OFIs	other financial intermediaries
OIS	overnight indexed swap
OLS	ordinary least squares
OMF	open-end mutual fund
OMX	Stockholm Stock Exchange index
OOS	out-of-sample method
OR	operational risk
OTC	over-the-counter (outside regulated markets)
p.a.	per annum
PAYG	pay-as-you-go
pp	percentage point
PBTDA	Profit Before Taxes, Depreciation and Amortization
PD	probability of default
P/E	price-to-earnings ratio
PF	pension funds
PIIGS	Portugal, Italy, Ireland, Greece and Spain
PLN	Polish zloty

PMC	pension management company
PMG	Pooled Mean Group
PRIBOR	Prague InterBank Offered Rate (reference interest rate on the interbank market)
PX	Czech stock market index
QA	quick assets
QE	quantitative easing
QIS	quantitative impact study
RGDI	real gross domestic income
RMBS	residential mortgage-backed securities
RMSE	root mean square error
RoA	return on assets
RoE	return on equity
RoS	return on sales
ROW	Rest of the World
RTGS	real time gross settlement
RWA	risk weighted assets
SA	seasonally adjusted
S&P500	Standard & Poor's 500, a US stock index comprising 500 corporations
SCR	solvency capital requirement – the minimum solvency requirement for risks undertaken by insurance companies and reinsurers
SCS	systemic capital surcharges – additional capital requirements for systemic risk
SEK	Swedish krona
SIBs	systemically important banks
SIFIs	systemically important financial institutions
SKD	Short-Term Bond System
SKK	Slovak koruna
SMEs	small and medium-sized enterprises
SOLUS	association of legal entities – register of debtors
USA	United States of America
USD	US dollar
VA	value added
VaR	Value-at-Risk
VAT	value added tax

COUNTRY ABBREVIATIONS:

AT	Austria
AU	Australia
BE	Belgium
BG	Bulgaria
BR	Brazil
CA	Canada
CH	Switzerland
CN	China
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GR	Greece
HR	Croatia
HU	Hungary
IE	Ireland
IN	India
IS	Iceland
IT	Italy
JP	Japan
KO	Korea
LT	Lithuania
LU	Luxembourg
LV	Latvia
ME	Mexico
MT	Malta
NL	Netherlands
NO	Norway
NZ	New Zealand
PL	Poland
PT	Portugal
RO	Romania
RU	Russia
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom
US	United States

TABLE OF INDICATORS – PART 1

		2006	2007	2008	2009	2010	2011	2012			
								Jan.	Feb.	Mar.	Apr.
Macroeconomic environment											
ME.1	Real GDP growth (year on year, %)	7.2	5.7	2.9	-4.5	2.6	1.7				
ME.2	Consumer price inflation (end of period, %)	2.5	2.8	6.4	1.1	1.5	1.9	3.5	3.7	3.8	3.5
ME.3	Public finance deficit/surplus / GDP (%)	-2.4	-0.7	-2.2	-5.8	-4.8	-3.8				
ME.4	Public debt / GDP (%)	28.3	27.9	28.7	34.4	37.6	40.7				
ME.5	Trade balance / GDP (%)	1.8	1.3	0.7	2.3	1.4	2.5				
ME.6	External debt in % of banking sector external assets	122.3	129.0	134.4	135.4	137.7	146.1				
ME.7	Balance of payments current account / GDP (%)	-2.0	-4.3	-2.1	-2.4	-3.9	-2.9				
ME.8	Monetary policy 2W repo rate (end of period, %)	2.50	3.50	2.25	1.00	0.75	0.75	0.75	0.75	0.75	0.75
Non-financial corporations											
NC.1	Return on equity (%)	10.2	11.2	9.4	8.0	9.0	8.7				
NC.2	Debt (% of total liabilities)	45.9	45.7	47.3	47.5	47.6	49.2				
NC.3	Credit indebtedness (% of GDP)	38.2	37.8	40.7	39.3	38.8	38.5				
NC.4	– loans from Czech banks (% of GDP)	18.3	19.8	21.6	21.0	20.7	21.8				
NC.5	– loans from Czech non-bank financial corporations (% of GDP)	4.5	4.7	5.0	4.5	4.8	4.9				
NC.6	– other (including financing from abroad, % of GDP)	15.4	13.2	14.1	13.8	13.3	11.8				
NC.7	Interest coverage (pre-tax profit+interest paid/interest paid, %)	14.5	12.6	11.4	10.3	12.4	12.9				
NC.8	12M default rate (%)	1.8	1.5	2.9	4.0	4.3	3.1				
Households (including sole traders)											
H.1	Debt / gross disposable income (%)	37.1	45.9	50.0	52.4	54.2	56.8				
H.2	Debt / financial assets (%)	24.1	28.2	30.9	31.4	31.4	31.7				
H.3	Net financial assets (total financial assets – total liabilities, % of GDP)	58.9	57.8	55.7	59.9	61.7	63.3				
H.4	Debt / GDP (%)	19.6	23.7	26.3	28.9	29.8	31.0				
H.5	– loans from Czech banks to households (% of GDP)	14.8	18.3	21.0	24.0	25.4	26.5				
H.6	– loans from Czech non-bank financial corporations to households (% of GDP)	3.0	3.5	3.6	3.0	1.7	1.7				
H.7	– loans from Czech banks to sole traders (% of GDP)	1.1	1.1	1.1	1.1	1.1	1.0				
H.8	– loans from Czech non-bank financial corporations to sole traders (% of GDP)	0.8	1.0	0.8	0.7	0.7	0.6				
H.9	– other (including financing from abroad, % of GDP)	0.0	-0.2	-0.2	0.1	0.9	1.2				
H.10	Interest expenses / gross disposable income (%)	1.6	1.9	2.3	2.7	3.0	3.1				
H.11	12M default rate (%, excluding sole traders)	…	…	3.3	4.8	4.7	4.6				
Financial markets											
FM.1	3M PRIBOR (average for period, %)	2.3	3.0	4.0	2.2	1.3	1.2	1.2	1.2	1.2	1.2
FM.2	1Y PRIBOR (average for period, %)	2.7	3.4	4.2	2.6	1.9	1.8	1.7	1.8	1.8	1.8
FM.3	10Y government bond yield (average for period, %)	3.7	4.7	4.1	3.7	3.8	3.4	3.2	2.9	3.0	2.9
FM.4	CZK/EUR exchange rate (average for period)	28.3	27.8	25.0	26.4	25.3	24.6	25.5	25.0	24.7	24.8
FM.5	Change in PX stock index (% year on year, end of period)	7.7	14.2	-52.7	30.2	9.6	-25.6	-21.5	-18.7	-22.6	-25.6
Property market											
PM.1	Total change in residential property prices (transaction prices, % year on year)	10.5	18.5	9.2	-8.0	-0.1	0.7*				
PM.2	Change in apartment prices (asking prices according to CZSO, % year on year)	13.4	23.2	19.6	-8.8	-3.0	-5.2			-2.4	
PM.3	Number of property market transactions (houses and apartments, COSMC entries, % year on year)		1.8	11.9	-9.0	-3.8	-23.9				
PM.4	Apartment price / average annual wage	4.2	5.1	5.2	4.2	4.1	3.9				
PM.5	Apartment price / annual rent (according to IRI)	17.3	22.9	23.8	22.9	21.9	21.7			21.2	

* Estimate for 2011 H1; only for family houses and apartments (around 74.4% of index).
Note: Owing to data revisions, some historical values of the indicators may not be comparable to those published in previous FSRs.

TABLE OF INDICATORS – PART 2

	2006	2007	2008	2009	2010	2011	2012			
							Jan.	Feb.	Mar.	Apr.
Financial sector										
FS.1 Financial sector assets / GDP (%)		133.3	135.6	141.3	142.9	150.2				
FS.2 Shares of individual segments in financial sector assets (%)										
FS.3 banks		76.8	77.5	77.5	77.6	78.2				
FS.4 credit unions		0.2	0.2	0.3	0.4	0.5				
FS.5 insurance companies		7.1	7.1	7.5	7.9	7.6				
FS.6 pension funds		3.0	3.4	3.7	3.9	4.3				
FS.7 collective investment funds		3.9	2.8	2.8	3.1	2.9				
FS.8 non-bank financial corporations engaged in lending		8.4	8.6	7.6	6.5	6.0				
FS.9 investment firms		0.5	0.4	0.5	0.5	0.4				
Banking sector										
BS.1 Bank assets / GDP (%)	94.0	102.4	105.1	109.5	111.0	117.5				
BS.2 Assets structure (%, end of period)										
BS.3 loans to central bank	11.6	8.2	7.7	9.4	9.4	8.7				
BS.4 interbank loans	11.9	12.4	10.3	10.5	11.3	10.4				
BS.5 client loans	45.2	48.4	50.8	50.3	50.6	50.5				
BS.6 bond holdings	23.1	22.6	20.0	21.2	21.1	21.9				
BS.7 – government bonds	14.1	12.8	12.5	14.1	14.9	16.2				
BS.8 – Czech government bonds	12.3	11.0	11.0	12.8	13.8	15.1				
BS.9 other	8.3	8.4	11.2	8.7	7.5	8.5				
BS.10 Liabilities structure (%, end of period)										
BS.11 liabilities to central bank	0.0	0.0	0.9	0.1	0.0	0.1				
BS.12 interbank deposits	11.1	11.6	10.6	10.4	10.7	11.2				
BS.13 client deposits	66.7	65.6	64.2	66.6	67.3	65.9				
BS.14 bonds issued	8.5	9.4	9.0	8.8	8.4	8.4				
BS.15 other	13.8	13.4	15.2	14.1	13.5	14.4				
BS.16 Client loans / client deposits (%)	67.7	73.8	79.1	75.5	75.2	76.6				
BS.17 Sectoral breakdown of total loans (%)										
BS.18 – non-financial corporations	44.9	41.7	40.9	37.2	35.9	35.9	36.2	36.1	36.1	
BS.19 – households	35.0	37.5	38.9	42.7	44.2	43.8	43.9	43.8	43.9	
BS.20 – sole traders	2.5	2.2	2.1	2.0	1.9	1.7	1.6	1.6	1.6	
BS.21 – others (including non-residents)	17.5	18.7	18.1	18.0	18.1	18.6	18.3	18.5	18.3	
BS.22 Growth in loans (%, end of period, year on year):										
BS.23 total	19.9	26.4	16.4	1.3	3.5	6.0	6.0	6.3	5.7	
BS.24 non-financial corporations	20.8	17.2	14.1	-7.8	-0.3	6.1	5.8	5.6	5.1	
BS.25 – real estate activity (NACE L)	39.5	41.1	25.5	-5.9	6.0	11.5	10.9	10.4	10.3	
BS.26 households	30.4	35.1	20.9	11.1	7.0	5.0	5.0	5.0	4.8	
BS.27 – loans for house purchase	32.5	37.6	20.1	11.5	6.4	6.1	5.9	5.8	6.5	
BS.28 – consumer credit	26.5	26.1	22.8	9.8	7.3	-1.6	-1.5	-1.3	-1.7	
BS.29 sole traders	7.7	8.7	10.4	-1.4	-5.4	-5.5	-6.2	-6.2	-6.4	
BS.30 Non-performing loans / total loans (%):										
BS.31 total	3.6	2.7	3.2	5.2	6.2	5.9	5.9	5.9	5.9	
BS.32 non-financial corporations	4.4	3.1	4.2	7.9	8.9	8.2	8.1	8.1	8.1	
BS.33 households	2.9	2.7	2.7	3.8	5.0	4.9	5.0	5.0	5.0	
BS.34 – loans for house purchase	1.6	1.5	1.6	2.5	3.2	3.2	3.3	3.3	3.3	
BS.35 – consumer credit	7.2	7.4	6.7	8.4	11.7	11.3	11.5	11.6	11.7	
BS.36 sole traders	9.2	7.2	8.2	10.8	12.4	12.4	12.6	12.5	12.6	
BS.37 Coverage of non-performing loans by provisions (%)	53.6	60.0	58.1	50.1	46.8	48.9	49.4	49.4	49.5	
BS.38 Aggregate LTV for housing mortgages	42.6	44.7	43.3	56.4**	56.3	57.0			56.7	
BS.39 Capital adequacy (%)	11.4	11.5	12.3	14.1	15.5	15.3	15.0	15.1	15.2	
BS.40 Tier 1 capital adequacy (%)	10.0	10.3	11.7	12.7	14.1	14.2	14.2	14.3	14.5	
BS.41 Leverage (leverage ratio, assets as a multiple of equity)	12.4	13.5	12.0	11.4	10.9	11.1	10.8	10.7	10.7	
BS.42 Return on assets (%)	1.2	1.3	1.2	1.5	1.3	1.2	1.6	1.4	1.4	
BS.43 Return on Tier I (%)	22.5	24.4	21.7	25.8	21.9	19.4	25.7	22.2	22.5	
BS.44 Quick assets / total assets (%)	30.4	24.0	23.1	25.3	26.1	26.9	27.9	28.0	28.2	
BS.45 Quick assets / client deposits (%)	45.5	36.6	35.9	38.0	38.8	40.8	42.0	42.1	42.3	
BS.46 Net open position in foreign exchange / capital (%)	0.3	0.0	0.1	0.2	1.3	0.2	0.6	1.1	1.2	
BS.47 Net external position of banking sector (% of GDP)	9.4	9.2	6.6	6.2	5.7	5.0			5.5	
BS.48 Banking sector external debt / banking sector total assets (%)	12.5	15.1	15.2	12.0	12.2	12.3	11.4	11.5	11.9	

** The definition of mortgages was changed in 2009.

Note: Owing to data revisions, some historical values of the indicators may not be comparable to those published in previous FSRs.

TABLE OF INDICATORS – PART 3

		2006	2007	2008	2009	2010	2011	2012			
								Jan.	Feb.	Mar.	Apr.
Non-bank financial corporations											
NI.1	Share in financial sector assets (%)	26.7	23.2	22.5	22.5	22.4	21.8				
	Insurance companies										
NI.2	Premiums written / GDP (%)	3.8	3.8	3.8	4.0	4.3	3.8				
NI.3	Solvency of insurance companies: life insurance (%)	314	285	249	295	354					
NI.4	Solvency of insurance companies: non-life insurance (%)	368	394	460	449	355					
NI.5	Change in financial investment of insurance companies (%)	2.3	4.3	6.6	5.1	3.1	1.6				
NI.6	Return on equity of insurance companies (%)	25.9	21.8	14.8	20.8	26.0	12.1				
NI.7	Claim settlement costs / net technical provisions (life, %)	11.9	14.8	17.2	17.4	17.1	16.4				
NI.8	Claim settlement costs / net technical provisions (non-life, %)	71.1	61.3	60.4	63.9	70.0	61.4				
	Pension funds										
NI.9	Change in assets managed by pension funds (%)	18.2	14.6	14.7	12.6	7.7	6.5				
NI.10	Nominal change in value of assets of pension funds***	-0.6	-3.3	0.3	4.5	-0.8	-0.6				
	Collective investment funds										
NI.11	Growth in net assets (= equity; year on year, %)	...	...	...	-0.6	13.1	-2.4				
	Non-bank financial corporations engaged in lending										
NI.12	Growth in loans from non-bank financial corporations engaged in lending (%):										
NI.13	total	7.3	20.8	8.4	-17.1	-12.4	-1.7				
NI.14	households	9.3	29.8	3.5	-18.8	-36.8	-2.1				
NI.15	non-financial corporations	5.8	14.7	12.8	-15.5	6.8	-1.6				

*** Change in the assets of pension funds adjusted for contributions and benefits.
Note: Owing to data revisions, some historical values of the indicators may not be comparable to those published in previous FSRs.

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