FINANCIAL STABILITY REPORT

2010 / 2011

CNB CZECH
NATIONAL BANK

FINANCIAL STABILITY REPORT 2010/2011

CNB CZECH
NATIONAL BANK

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 regularly monitors and closely analyses developments in all areas relevant to financial stability. The members of the CNB Bank Board meet on a quarterly basis with experts from key sections to discuss the current risk outlook in so-called macro-financial panels. A wide range of information on developments in the domestic financial system and abroad is presented at these meetings. The discussions precede the Board's monetary-policy meeting debating the new CNB macroeconomic forecast and provide the participants with a comprehensive picture of the economic and monetary situation.

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.

LIST OF BOXES

OVERALL ASSESSMENT

This summer the global economy will enter its fifth year since the crisis broke out. Many countries remain exposed to the impacts of materialisation of the risks that built up before the crisis and face a danger of renewed or increased financial instability. Financial institutions, businesses, households and governments are again exposed to a very high degree of uncertainty. The balance of risks is little changed from the previous FSR 2009/2010. The intensity of those risks has generally increased, mainly as a result of adverse fiscal developments in the euro area and their potential impacts on the domestic economy. The Czech financial sector was affected indirectly by the crisis via weaker economic activity. Although its starting position is strong, developments in the global environment will be of key importance for maintaining financial stability over the next two years.

The global economic situation is very difficult to assess in terms of financial stability. It seems at first glance that the situation has almost normalised, but there are many underlying imbalances and signs of disequilibrium. An unusual degree of divergence across regions, countries, economic sectors and market segments is sending out warning signals. There is a strong imbalance in the geographical distribution of economic growth – emerging economies are seeing renewed growth, while advanced countries are tending to stagnate. As a result, commodity prices are surging and generating a strong negative supply shock for advanced, commodity-importing countries. The cross-country differences in the EU are widening further. Other major signs of imbalance include the fact that corporations in advanced countries are managing to improve their financial condition without this being reflecting proportionally in the income and balance sheets of households and financing banks. All this reduces the ability of advanced countries to deal with the consequences of their accumulated debts.

Given the situation described above, the main risk scenario for the Czech economy over the next two years remains a sharper slowdown in economic growth in Germany and other countries that are major trading partners of Czech corporations. A strained labour market and the need to implement further fiscal measures to reduce the structural public budget deficit will be an obstacle to a faster recovery in domestic demand in the near future. Income growth will thus remain very subdued. This will negatively affect the economic situation of households and their ability to repay loans.

In addition to the risks originating in the pre-crisis period, new risks relating to current economic policies and processes in financial systems are emerging in the global economy. The main such risk at the global level relates to the impacts of the long-term maintenance of interest rates at very low levels by key central banks. This is being reflected in low nominal returns on traditional assets. As a result, investors are searching for yield, which, in turn, is becoming a source of financial imbalances. Increased flows of capital are passing from advanced countries to emerging markets, where risks of excessive credit growth, economic

overheating and asset bubbles are emerging. Conversely, large volumes of investment in government debt are going from emerging economies to advanced countries, keeping long-term government bond yields low and driving private investors' search for yield. The search for yield is also apparent in growing investment in commodity derivatives, commodity funds and investment commodities such as gold. Although commodity prices are determined in the long run primarily by fundamental factors, temporary bubbles cannot be ruled out. Such bubbles could cause investors considerable losses, especially if they were to occur in smaller segments of the commodity market, which are prone to sharp price fluctuations when market sentiment changes.

On the other hand, doubts regarding the public finance sustainability of some small and medium-sized advanced countries are causing a "flight to quality" among investors. One consequence is that yields on the government bonds of some also relatively highly indebted, but large, countries are at very low levels. This fragile balance may become the subject of sharp non-linear fluctuations in the financial markets, with considerable impacts on the real economy.

International investors' flight to quality and search for yield may significantly affect the Czech economy, too. The Czech economy is regarded as advanced and stabilised from the macroeconomic viewpoint and its public finances can be seen as relatively sound in the light of the problems of some other European countries. In consequence, international investors' interest in koruna assets could generate strong pressures for a fundamentally unjustified appreciation of the koruna. The probability of this happening is increased by the fact that koruna assets are still classed by many international investors among the currently preferred assets of emerging economies and have historically offered high yields. A long period of overly fast appreciation might worsen the external balance of the Czech economy, which is already showing signs of a slight weakening.

In terms of the stability of the Czech financial system it is vital for domestic financial institutions to maintain the capital and liquidity buffers they created against increased risks during the crisis. Given the high degree of uncertainty about the speed of recovery of the domestic economy, overly optimistic expectations could lead to a build-up of new risks to the Czech banking sector, for example as a result of attempts by banks and their owners to boost profitability through significantly greater activity in the credit market. At the end of 2010, large domestic banks reduced their interest rates on house purchase loans and increased the volume of new loans of this type. This increase, however, is not currently being underpinned by any apparent improvement in clients' creditworthiness. Since the risks of movements in property prices are still on the downside, this trend may represent an increased risk to banks and their clients.

DEVELOPMENTS IN 2010 AND 2011 Q1

The global economy returned to unexpectedly fast growth in 2010. However, in the Czech Republic, as in other advanced countries except Germany and Sweden, the extent of recovery remained rather modest. This applies particularly to the euro area, where economic activity remained mostly subdued and even declined further in some countries.

The global and domestic economy recorded a recovery in 2010, but the recovery in the EU remains fragile

The CNB, like the major world central banks, kept its monetary policy rates at historically low levels. The international and national authorities' discussions about discontinuing their supportive economic policies and normalising their monetary policies became less intensive because of renewed risks in financial systems.

Monetary policies remained easy

The situation in the non-financial corporations sector improved considerably in 2010 compared to 2009, thanks mainly to increased demand from foreign trading partners and households. Exporting corporations recorded a noticeable improvement, but the economic condition of the property and transport sectors took a turn for the worse. The credit risk of corporations peaked in 2010 H2 and started to decline very gradually in 2011 Q1.

Domestic corporations improved their financial position but faced rising commodity and energy prices

The improvement in the corporate sector has not yet translated to the labour market situation and to the financial situation of Czech households. Persisting high unemployment and lower wage growth were reflected in an increase in non-performing consumer credit. The share of overindebted households increased not only in the lowest income bracket, but also among households with average income.

A worse situation of households adversely affected their ability to meet their obligations

Bank lending growth in the Czech Republic stayed positive in 2010 and rose gradually. The start of 2011 also saw renewed positive growth in loans to corporations. Annual credit growth also returned to positive values in other advanced countries in 2010, but remains strongly subdued overall.

Credit growth turned positive again but remains very subdued

The debt crisis in the euro area gradually escalated and became an ever-increasing source of uncertainty. In response to refinancing problems and sharp growth in demanded government bond yields, some highly indebted countries sought assistance from the EU and the IMF. The Czech Republic ranked among the advanced economies with lower public finance deficits, thanks in part to some budgetary measures. However, its estimated cyclically adjusted primary deficit was relatively high in 2010 and was near the EU average.

The debt crisis in the euro area escalated, while Czech public finances were partially consolidated

International financial markets were influenced by supportive economic policy measures, which helped maintain confidence in the equity markets and partly stabilise the bond markets. Nevertheless, the direct involvement of central banks in the markets weakens the functioning of these markets and can distort market signals in a way that increases the motivation of some financial institutions to take on bigger risks.

The situation in global financial markets is still strained...

…and the situation in Czech financial markets is currently stable

The financial market situation changed partially last year. In the first phase of the crisis the credit premium for Czech government debt had increased considerably, but during 2010 investors increasingly differentiated between countries and ranked the Czech Republic among the safe countries.

Falling property prices prompted a sizeable reduction in housing construction

Residential property prices continued to fall in 2010, albeit at a slower rate than a year earlier. The decline was linked mainly with low wage growth, persisting high unemployment and a deterioration of demographic price determinants. The number of property market transactions also declined and housing construction decreased significantly. On the other hand, property price sustainability indicators – in particular the price-to-income ratio – improved. The first signs of a slight market recovery emerged in early 2011, with mortgage loans and housing starts both picking up.

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

The Czech financial system is also showing favourable values of key macroprudential indicators at the start of 2011. Most institutions maintained relatively high profitability in 2010. The Czech banking sector's strong position is supported not only by sufficient profitability, but also by a high capital adequacy ratio, good balance-sheet liquidity and a high deposit-to-loan ratio. The Czech banking sector has a positive net external position and is thus independent of external funding. Analyses also suggest that banks in the Czech Republic should not now have any major problems with fulfilling the stricter Basel III capital and liquidity requirements.

Credit risk indicators are sending out mixed signals

The banking sector was hit by an increase in credit risks during the recession, although their impact was heavily dampened by good NPL recovery rates, continued prudent loan-classification behaviour by banks, and a change in portfolio structure towards less risky clients. However, some indicators – especially in 2010 H2 and 2011 Q1 – suggest a positive change in trend in the credit cycle. In particular, NPL growth has slowed and numerous NPL exposures have been reclassified to standard liabilities. However, the arguments against an optimistic assessment include a decline in the NPL coverage ratio to below 50%, persisting relatively high default rates in the segments of corporations, sole proprietors and households, an increase in the ratio of loss loans, a slight rise in concentration of corporate portfolios and a higher share of risky sectors in NPL portfolios.

The situation in the insurance company, pension fund and mutual fund sectors was relatively favourable

The banking sector is significantly interlinked with other financial institutions (insurance companies, pension funds, collective investment funds and financial corporations engaged in lending) through both assets and mutual exposures. These links did not increase its reputational risk, as the situation in the non-bank financial institutions sector was relatively favourable in 2010. Insurance companies remain profitable and sufficiently capitalised and should not be adversely affected by the implementation of the new Solvency II regulatory framework. The capitalisation of pension funds stabilised at around 5% after the crisis years 2008–2009, but this sector is not yet sufficiently prepared for the pension reform. The collective investment funds sector recorded growth in managed assets and the creation of new funds.

RISKS TO FINANCIAL STABILITY

The CNB's May forecast expects annual GDP growth to slow to 1.5% this year a result of a slowdown in domestic demand and external economic growth. GDP growth will increase to 2.8% in 2012, thanks mostly to household consumption and an investment recovery. However, the probability of materialisation of the scenarios on which these forecasts are based is subject to numerous risks stemming mainly from abroad.

The Czech economy will start to recover in 2012

The developments in 2010 and especially in the first few months of 2011 strengthened concerns that the weak economic growth in advanced economies could be a long-term phenomenon due to the sharp increase in debt in the previous decade. The attempts of corporations and households to reduce their debts are being reflected in a decline in demand for loans and subsequently in consumption and investment demand. This is adversely affecting income growth, which, as expressed by nominal GDP, has declined from an average year-on-year rate of 5–10% to negative or near-zero values in many countries. Although loan interest rates are generally falling moderately, real debt servicing costs remain elevated.

A combination of high private sector indebtedness and low income growth poses a threat to long-term economic growth in advanced economies

Czech households' main problem over the coming two years will be the labour market situation and the evolution of their income. According to the CNB's May forecast, the general unemployment rate will remain at around 7% in 2011 H1 and still slightly exceed 6% at the end of 2012. Average nominal wage growth will slowly rise from the historical low of less than 1% observed in 2010 Q4, but in the non-business sector it will fall in 2011 and remain flat in 2012. Although debt levels remain relatively low in all sectors in the Czech Republic, nominal income growth indicators show that households are particularly exposed to significantly adverse income developments in 2009–2011. This will continue to negatively affect their economic situation and their ability to repay loans.

The labour market situation is keeping the credit risk of Czech households elevated

Growing tensions can be observed in countries with high government debt levels. Critically indebted euro area countries are finding it more and more difficult and expensive to refinance themselves. Should the public debt and yields required by investors rise further, net interest payments in these countries could, within a few years, exceed the threshold consistent with gradual fiscal stabilisation through the generation of primary surpluses. These countries would then have to choose between transferring funds from creditors to debtors via increased inflation, or restructuring their debts. Since government bonds account for a large share of the assets of European financial institutions, the write-off of part of the liabilities as part of a debt restructuring process in some countries would cause many of these institutions to incur losses and some of them to run into critical difficulties. Czech financial institutions also hold a large part of their balance sheets in government bonds, but they focus primarily on domestic debt.

The overindebtedness of some governments is a source of strong financial tensions…

…and is creating a risk of negative feedback between government and financial sector balance sheets

From the medium-term perspective, one of the strongest risks to the group of critically indebted countries is negative feedback between government and bank balance sheets whereby increased sovereign risk transforms back into bank liquidity and credit risk. A substantial increase in yields demanded on government debt in response to sovereign debt rating downgrades could lead to higher market financing costs for banks in these countries owing to a subsequent decline in bank debt ratings. The probability of this scenario is increased by the threat of insufficient balance-sheet liquidity in numerous large European banks.

Stabilisation of Czech public finance requires decisive measures

The debt crisis in the euro area and the economic situation in the countries affected has clearly showed that rapid fiscal stabilisation is needed. It has confirmed that financial markets are asymmetrically much less tolerant to small countries showing signs of fiscal imbalances than of large countries. As a result of this asymmetry, small countries like the Czech Republic may be exposed to highly non-linear and discontinuous reactions of the financial markets to changes in the outlooks for fiscal deficits and public debt. Although Czech public finance seems to be relatively sound from the short-term perspective by international comparison among the advanced countries, and although deficit-reducing measures have been taken on both the expenditure and revenue sides of public budgets, long-term fiscal stabilisation will require further decisive measures in the years ahead to reduce the structural primary deficit. Such measures are also important because Czech public debt servicing costs will increase gradually in the years ahead and might become significant in the relatively short term given increasing risk aversion to economies with adverse fiscal outlooks.

Government fiscal measures may increase the risks to the private sector in the short term

The above fiscal measures are undoubtedly necessary and beneficial. In the short term, however, they may increase the risks to corporations and households. For corporations, these risks may materialise mainly in the construction and real estate sector via the impacts of tax changes relating to the commercial construction of residential projects, cuts in transport infrastructure construction and so on. Households will be affected by lower real income growth and continuing deregulation of rents. In the long term, however, the impacts of these risks are smaller than those of a loss of confidence in the country's fiscal sustainability.

The high degree of uncertainty necessitates continued central bank supportive policies

The high degree of uncertainty and none-too-optimistic expectations regarding revenues in the years ahead have significant economic policy implications. Although the current behaviour of financial institutions and their clients in the Czech Republic and other advanced countries is not generating significant risks of financial instability in the future, the impacts of the materialisation of systemic risk accumulated in the global financial system in the previous period are still strong enough to necessitate continued supportive economic policies. A premature exit from such policies might put the fragile financial market at risk. Given the high indebtedness of governments, the public is increasingly reliant on central banks' policies. However, the very low nominal interest rates are also exposing monetary policy makers in some countries to a conflict between the objectives of price stability and financial stability.

High dividend payments from retained earnings could be a risk to the banking sector in the near future. Such a reduction of the capital buffer could be motivated by signs of the end of the crisis and by excessive growth in optimistic expectations about the future. It is important to warn against over-optimistic expectations, as developments abroad, where the problems of some indebted euro area countries are coming to a head, and the evolution of risks in the domestic economy do not yet provide sufficient support for claiming that the crisis is over.

Payments of extraordinary dividends might endanger the adequacy of banks' capital buffer

Developments in the credit union sector can be regarded as a potential risk. The volume of client deposits in credit unions has almost tripled over the last three years, but the ratio of non-performing client loans in this segment is also double that in the banking sector. It also has a low NPL coverage ratio, relatively concentrated portfolios and low profitability. There is a question as to whether this sector can operate in the long term without major problems with such a significantly higher level of risk than banks. Credit unions are thus more vulnerable to risks if the economy takes a turn for the worse.

The credit unions segment is a potential risk

Some risks also persist in the building societies sector. It has a weaker liquidity position than the banking sector as a whole, mainly because of how the building savings system is configured. In the event of significant changes in the macroeconomic environment or market conditions, liquidity risks could emerge primarily in the form of an outflow of deposits after the binding period. The stable interest rate environment, which should be maintained over the next two years, creates suitable conditions for making changes to the building savings system that would significantly mitigate the current sources of risks in this segment.

There are also some risks in the building society sector

Despite the slower decline in property prices, a further downward movement in these prices, linked, for example, with the foreclosure of properties used as collateral for loans to households and developers, cannot be ruled out. At the same time, the ongoing rent deregulation may foster a decline in market rents and hence a deterioration in the apartment rental return and a related decline in apartment prices. A risk for the property development sector is a further slowdown in sales of apartments in residential projects with knock-on effect on developers' ability to repay loans. As regards commercial property, the situation in the industrial property sector is relatively favourable (rising demand and a falling vacancy rate), while the risks in the other market segments (office and retail) remain significantly elevated.

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

With regard to the risks identified above, the resilience of the domestic financial system was assessed by means of stress tests on banks, insurance companies and pension funds using three future economic scenarios entitled *Baseline Scenario*, *Asymmetric Developments* and *Renewed Recession*. Banks' balance-sheet liquidity was again stress-tested, now as an integral part of both stress scenarios. The *Baseline Scenario* is considered by the CNB to be the most probable. The other two alternative scenarios are characterised by a sizeable contraction in economic activity and adverse financial market developments.

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

ASSESSMENT OF THE FINANCIAL SECTOR'S RESILIENCE

The future risk scenarios consider the possibility of a renewed recession and an increase in volatility in the financial markets

Different adverse macroeconomic developments stemming from analyses of trends and weak spots abroad, in the domestic economy and in the financial sector were incorporated into scenarios used to test the financial sector's resilience. These scenarios mainly consider the possibility of a renewed recession in the domestic economy linked with a fall in external demand and potential strong volatility in the financial markets. Adverse developments in some segments of the domestic economy and specific shocks stemming from abroad are also the subject of tests.

According to the stress test, banks and insurance companies seem to be resilient to a wide range of risks, but pension funds have only limited capital

According to the stress test results, banks and insurance companies are resilient to relevant risks despite the significantly conservative settings of the two stress scenarios. This is due not only to a high initial capital buffer, but also to the ability to generate income even in an adverse scenario. However, if the economy were to develop in line with the alternative scenarios, some institutions would suffer losses which might require capital injections from shareholders. The pension fund sector has limited capital and in the event of financial market turmoil shareholders would have to supply new capital under the prudential mechanism introduced jointly by the CNB and the Association of Pension Funds in 2009.

Payments of extraordinary dividends or the collapse of the three largest debtors of each bank with subsequent materialisation of the *Renewed Recession* stress scenario might endanger the banking sector

Sensitivity analyses conducted as part of the banking sector tests revealed that if banks reduced their capital buffers in 2011 to the pre-crisis level by means of increased dividend payments and the economy subsequently developed in line with the *Renewed Recession* stress scenario, the entire sector would find itself in a situation of insufficient capital adequacy. The synchronised collapse of the three largest debtors of each bank would have a similar impact in the same stress scenario. By contrast, the banking sector's capital adequacy ratio would remain above the regulatory minimum if its exposures to developers, photovoltaic projects and indebted countries worsened simultaneously and the *Asymmetric Developments* scenario were to materialise.

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

The banking sector liquidity stress test was integrated into both stress scenarios *Asymmetric Developments* and *Renewed Recession*. The test as usual involved a first round of shocks, consisting mainly in a bank run, increased drawdown of credit facilities and a reduction in the value of market assets, and a second round of shocks capturing an additional reduction in the liquidity buffer stemming from a rise in reputational and systemic risk caused by banks' efforts to close the liquidity gap. Although no bank found itself in a situation of insufficient liquidity in the tests, several banks would have to raise extra funds by selling assets with maturities of over one month, albeit at a considerable loss. Overall, however, this stress test confirmed that the banking sector is also highly resilient to liquidity risk.

PART I

1 INTRODUCTION

The Czech National Bank is pleased to present its seventh Financial Stability Report (FSR) to the public. As usual, the aim is to identify and analyse the risks to the financial stability of the Czech Republic. This year the Report focuses on uncertainty at a time of fading financial crisis associated with excessive indebtedness of households, corporations and governments in many countries. It also deals with selected regulatory initiatives.

The Report profits from an advanced analytical and modelling framework and again contains stress tests of the main segments of the financial sector, i.e. banks, insurance companies and pension funds. The testing methodology was further refined for all sectors. For example, the tests of the banking sector include a refined estimate of the credit risk of the corporate sector by industry and the integration of aggregate tests of credit and market risks with the liquidity test. The quality of the tests was also enhanced by joint stress tests of banks and insurance companies.

The financial sector's resilience is tested by means of alternative macroeconomic scenarios. The *Asymmetric Developments* scenario captures the risk of increased volatility in both the economy and the financial markets and assumes further pronounced growth in commodity prices. The risk of W-shaped economic activity, i.e. the return of recession characterised by a further sharp decline in GDP particularly in 2012, is considered in the *Renewed Recession* stress scenario. The two alternative stress scenarios are compared with a *Baseline Scenario* that corresponds with the CNB's official May forecast. The impacts of the scenarios are assessed not only from the perspective of the financial sector, but also with regard to the property market and the corporate and household sectors.

The report is divided into three main sections. *The real economy* section discusses developments in the external and domestic macroeconomic environment and in the key domestic sectors, i.e. households and corporations. The section entitled *Asset markets* analyses risks in the financial markets, the financial infrastructure and the property market. The last section, *The financial sector*, sums up developments in the financial sector and assesses the Czech financial system's resilience to shocks under the alternative economic scenarios.

The final part of the FSR is devoted to thematic articles that discuss in more detail some topical issues relating to financial stability. *Financial Stability, Systemic Risk and Macroprudential Policy* presents macroprudential policy instruments and defines their position within the policies focused on achieving the objective of financial stability. The article also aims to open a debate about how the concept of macroprudential policy should be developed in the Czech Republic in the coming years. The article entitled *Excessive Credit Growth as an Indicator of Financial (In)Stability*

and its Use in Macroprudential Policy addresses excessive credit growth as one of the most reliable indicators of future problems in the financial sector and discusses its use in the calibration of a new macroprudential indicator laid down in Basel III – the "countercyclical capital buffer". The third article, *An Analysis of Progress with the Sale of Residential Developments,* is devoted to a microanalysis of the progress with the sale of selected residential projects in Prague. The last thematic article, *Retail Credit Premiums and Macroeconomic Developments*, studies the evolution of retail credit premiums in the Czech economy.

This Financial Stability Report was approved by the Bank Board of the Czech National Bank on 12 May 2011 and published on 14 June 2011. It is available in electronic form at http://www.cnb.cz/.

CHART II.1

**Economic growth worldwide and in
the advanced economies**
(year-on-year growth in %; outturns and October 2009 and April 2011 forecasts)

2008	2010f09	2011f
2009	2010	2012f
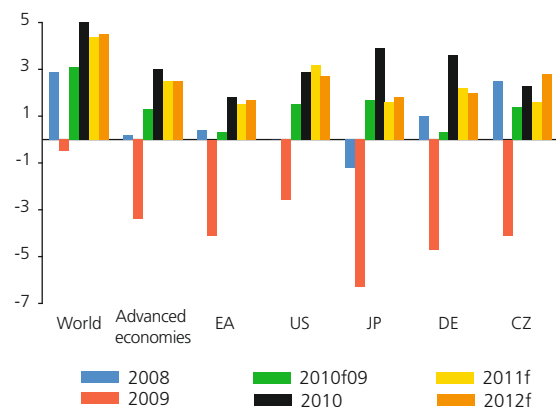
Source: IMF (World Economic Outlook, April 2011) and CNB (May 2011 macroeconomic forcast)
Note: 2010f09 is the October/November 2009 forecast for 2010.

CHART II.2

Economic growth in emerging and developing countries
(year-on-year growth in %; outturns and October 2009 and April 2011 forecasts)

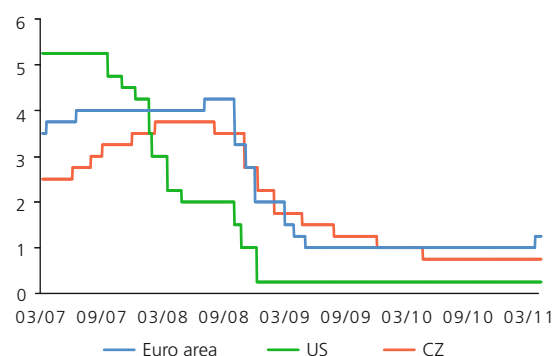|		
2008	2010f09	2011f
2009	2010	2012f
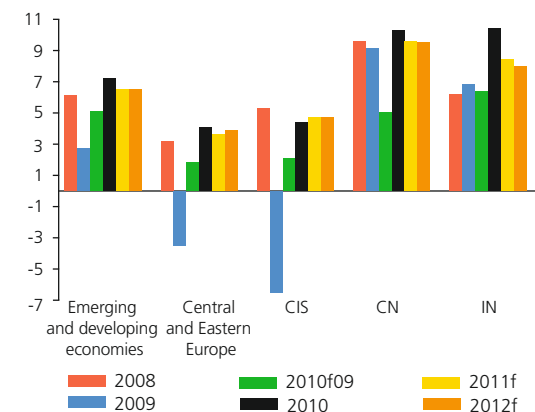
Source: IMF (World Economic Outlook, April 2011)
Note: 2010f09 is the October 2009 forecast for 2010.

CHART II.3

Monetary policy rates since the start of the financial turbulence
(%)

Euro area	US	CZ

Source: Thomson Datastream

2 THE REAL ECONOMY

2.1 THE MACROECONOMIC ENVIRONMENT

The global economy returned to unexpectedly fast growth in 2010. In the Czech Republic, as in other advanced countries except Germany and Sweden, the extent of the recovery can be labelled as modest. However, growth in economic activity in the euro area and the EU as a whole is likely to slow this year owing to a high level of uncertainty, the impacts of the private sector debt burden in an environment of very slow income growth, and to the consequences of continuing fiscal consolidation. The main sources of uncertainty and financial tension for the EU as a whole are concerns about the euro area debt crisis escalating and doubts about the capital adequacy of many European banks and their ability to secure sufficient funding. Although lending conditions in advanced countries have almost normalised and risk indicators have returned to their long-term levels, the high uncertainty means that central banks must continue their supportive policies. From the perspective of the Czech economy, the major external risks include a potentially more marked economic slowdown in Germany and other countries that are major trading partners of Czech corporations. Given the nature of the Czech economy, the sharp rise in commodity prices represents a strongly adverse supply shock.

The global economy showed an unexpectedly strong recovery

Whereas in 2009 the world economy had undergone a strong recession, in 2010 it returned to relatively fast growth. The size and speed of the recovery can be described as unexpected, as evidenced by the differences between the end-2009 forecasts and the actual situation the following year (see the third and fourth columns in Charts II.1 and II.2). A comparison of the two charts shows, however, that the recovery was very uneven from the global perspective. Developing and emerging countries enjoyed a robust recovery, while economic growth in advanced Western economies, which include the Czech Republic,[1] can be described – with the exception of Germany and Sweden – as modest. This applies particularly to the euro area, where economic activity remained mostly subdued and even declined further in some countries (Ireland, Greece and Spain). According to the current forecasts,[2] global economic activity this year and the next will grow at a slightly lower rate than in 2010. This is chiefly due to expectations that economic growth in the euro area as a whole will slow gradually, owing to a high level of uncertainty, the impacts of the private sector debt burden and continuing fiscal consolidation.

---

1 The breakdown of countries into groups is given in the statistical appendix of the World Economic Outlook (April 2011). The Czech Republic is classed as an advanced country.
2 The April IMF forecast and the April Consensus Forecasts (a publication containing the average estimates of a broad representative sample of analysts and forecasters, whose forecasts for the external environment are used by the CNB) expect the advanced countries (including the Czech Republic) to follow a similar path over the next two years. Charts II.1 and II.2 use IMF estimates, as they, unlike the Consensus Forecasts, cover the whole global economy.

At the same time, growth in Germany will moderate and the already large differences between the individual member countries will widen. A slight slowdown is also expected in some emerging economies in connection with the tightening of their monetary policies.

The domestic economy is experiencing a volatile recovery…
Domestic economic growth picked up pace during 2010 and Czech GDP rose by 2.3% for 2010 as a whole. The current CNB forecast of May 2011 expects annual GDP growth to fall to 1.5% this year owing to a slowdown in all domestic demand components and slower economic growth abroad. In 2012, GDP growth will rise to 2.8%, aided mainly by household consumption thanks to faster wage growth and by gross capital formation owing to a recovery in fixed investment. The CNB also expects both headline inflation and monetary-policy relevant inflation, i.e. inflation adjusted for the first-round effects of changes to indirect taxes, to be close to the inflation target over the entire forecast horizon.

…and unemployment remains high
The labour market situation remains very strained. Unemployment peaked at the start of 2010, when the general and registered unemployment rates reached 7.3% and 9.9% respectively. The decline in the unemployment rate is very slow. The general and registered unemployment rates, respectively, will be around 7% and just above 9% in 2011 H1 and 6.2% and 8.1% at the end of 2012. A highly subdued rate of growth of wage and non-wage income (or negative growth in real terms) adversely affected consumer demand in 2010 and resulted in an increase in the default rate on loans provided to the household sector, including house purchase loans (see section 2.3). According to the CNB's May forecast, this situation will start to reverse in 2012. From the point of view of competitiveness of domestic industry it is important, however, that the wage cost-output ratio decreased and nominal unit wage costs declined by almost 2% year on year in Q4.

Monetary policies remain easy
The key central banks kept their monetary policy rates at historically low levels in 2010. This also affected short-term money market rates (see Chart II.4), although not proportionally in all countries (see section 3.1). The international and national authorities' discussions about discontinuing their supportive economic policies and normalising their monetary policies became less intensive last year because of renewed risks in financial systems. Owing to a rise in supply-side inflation pressures, however, some central banks started to communicate a need to raise monetary policy rates and the ECB returned its key monetary policy rate to 1.25% after almost two years. The CNB has held its two-week repo rate at 0.75% since May last year.

The easy monetary policies are helping to maintain interest rates on loans and bonds in most advanced countries at relatively low levels, thereby helping financial institutions, corporations and households to cope with low income growth. However, the very low nominal interest rates are simultaneously exposing monetary policy-makers in some countries to

CHART II.4

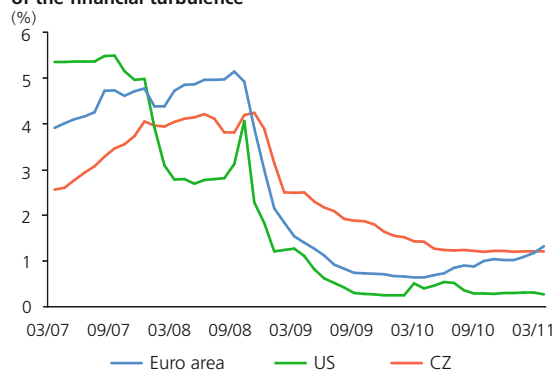**Three-month market rates since the start of the financial turbulence**
(%)

Source: Thomson Datastream

CHART II.5

Rates of growth of loans to the private sector in selected countries
(% of total loan stock)

Source: Thomson Datastream
Note: CE4 – average for Hungary, Poland, Austria and Slovakia
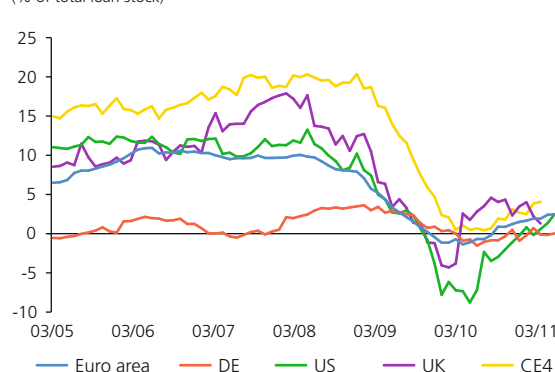
CHART II.6

Year-on-year growth rates and stocks of bank loans in the Czech Republic
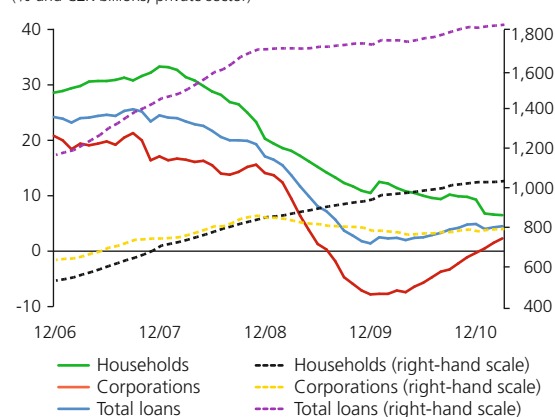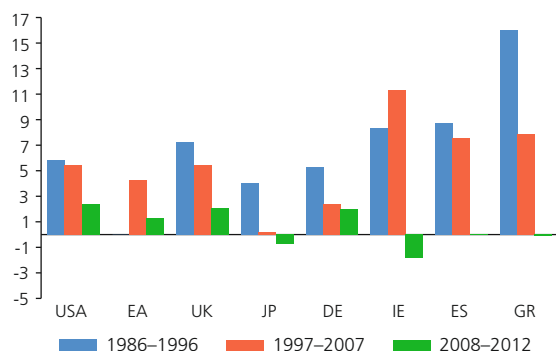(% and CZK billions; private sector)

Source: CNB

CHART II.7

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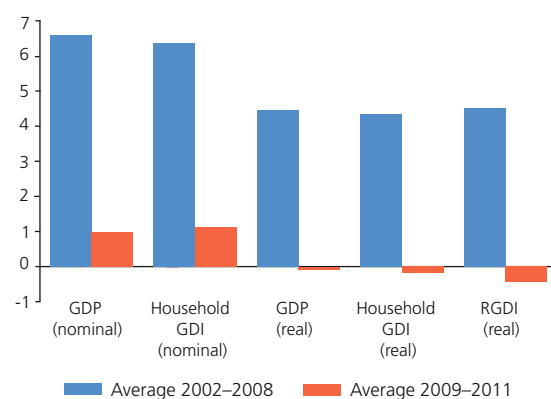

■ 1986–1996   ■ 1997–2007   ■ 2008–2012

Source: OECD (Economic Outlook, April 2011)
Note: EA excluding 1986–1996 period.

CHART II.8

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

■ Average 2002–2008   ■ Average 2009–2011
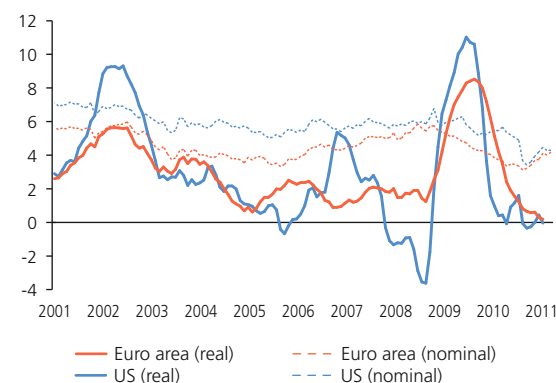
Source: CZSO and CNB forecast
Note: GDP – gross domestic product, GDI – gross disposable income, RGDI – real
          gross domestic income (GDP adjusted for change in terms of trade).

CHART II.9

**Nominal and real ex post interest rates on corporate debt
in the euro area and the USA**
(%)

—— Euro area (real)   – – – Euro area (nominal)
—— US (real)   – – – US (nominal)

Source: Merrill Lynch Corporate Indices, Thomson Datastream
Note: Corporate bond yields in the euro area and the USA (adjusted for current
          producer price inflation in the case of real rates).

a conflict between the objectives of price stability and financial stability, i.e. whether to increase interest rates in response to rising inflation and inflation expectations, or to keep them at low levels and thereby help stabilise the balance-sheets of banks and their clients and mitigate the side effects of deleveraging.

Growth in lending so far indicates continued deleveraging
Although annual credit growth returned to positive values in 2010, it remained very subdued (see Chart II.5). In many countries the ratio of private sector credit to GDP is falling. Bank lending growth in the Czech Republic stayed positive in 2010 and rose gradually (see Chart II.6). Thanks to house purchase loans, loans to households – as in previous years – rose faster (although at a much slower rate than before the crisis). The start of 2011 also saw renewed positive growth in loans to corporations (see sections 2.2 and 2.3).

High debt ratios are a barrier to growth in advanced economies
Developments in 2010 and the first few months of this year increased concerns that the weak economic growth in advanced economies may – despite easy macroeconomic policies – be a long-term phenomenon. Countries in which households and corporations are highly indebted experienced a sharp fall in credit demand and subsequently also in consumer and investment demand. These countries also saw a continuing process of revision of expectations about future corporate and household income. This process is linked not only with lower growth in sales of goods and services, but also with pressures on employees' wages and corporations' selling prices. If we proxy income growth with nominal GDP growth, the pre-crisis annual nominal income growth of 5–10% has been replaced by slightly negative or very low growth in many countries (see Chart II.7). Although the debt ratio remains relatively low in all sectors in the Czech Republic, indicators of nominal income growth (see Chart II.8) suggest that households are exposed to significantly adverse income developments in 2009–2011.

Rising real debt servicing costs are a risk to private sectors in other countries
In an environment of slow income growth there is a higher probability of emergence of a relatively long period of deleveraging with low credit demand and a high saving rate. Significantly lower growth rates of nominal income coupled with only slightly lower interest rates on debt mean that real debt servicing costs may be very high for indebted entities in the period ahead. This will adversely affect their ability to repay debts and cause the credit risk of banks to increase. Even a small change in the parameters affecting the debt burden can have a relatively large impact on the ability of highly indebted sectors to service their debts. In 2010 and so far in 2011, the situation in this respect has developed more favourably for corporations than for households. In

both the euro area and the USA nominal interest rates on corporate debt decreased slightly, but real rates fell significantly owing to faster growth in industrial producer prices (see Chart II.9).[3]

Real debt servicing costs are developing more favourably for corporations than for households

The overall debt level of economic sectors in the Czech economy remains relatively low (see sections 2.2 and 2.3), but domestic economic growth is being hampered by links with the euro area, where not only households and corporations, but also governments are highly indebted. The evolution of real debt servicing costs will also be an important factor for the stability of the Czech financial sector. In the Czech Republic in 2010 average interest rates on loans to corporations decreased further, while those on loans to households remained unchanged on average (see Chart II.10). Accordingly, the evolution of real debt servicing costs[4] in the Czech Republic, as in the euro area and the USA, was more favourable for corporations than for households (see Chart II.11). The approximation of real interest rates on corporate loans returned to the long-term average in 2010. The same will happen for households in 2012 given the relatively optimistic assumption regarding their nominal disposable income. The fact that the view of corporate sector risks has virtually normalised is confirmed by the return of interest rate spreads on corporate bonds to their usual long-term levels (see Chart II.12[5]).

Developments over the last few quarters have confirmed expectations that the private sector's reaction to the crisis and supportive economic policies will result in a "jobless recovery", i.e. a situation where the financial situation of corporations will stabilise relatively quickly, while the labour market situation will be very strained for quite some time. The renewed access of corporations to relatively cheap loans and the modest recovery in demand for their production are allowing them to improve their financial position and increase their stocks of cash. Thanks to capacity optimisation and personnel cost cuts, corporations can increase their profitability. If economic growth is slow, however,

---

3 Real interest rates calculated as the difference between current rates on loans to corporations (or corporate bond yields) and current producer price inflation are a very rough approximation of real corporate debt costs. In advanced economies importing energy-producing materials and commodities (and thus also in the Czech Republic), an increase in the prices of these commodities can significantly positively distort the actual growth in producers' selling prices. High growth in import prices 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 output prices.

4 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 gross disposable income of households. Interest rates on loans to corporations are adjusted for industrial producer price inflation. The average is calculated for 2002–2010 and the outlook for 2011–2012 is created by using baseline scenario data and by keeping interest rates constant at the December 2010 level.

5 Chart II.12 shows that corporate interest rate spreads rose above their long-term average level during the 2001–2002 recession, but in the pre-crisis years they had stayed at unusually low levels in both the euro area and the USA, probably because of over-optimistic expectations. Following a sharp increase in 2008 they started to fall very quickly in 2009. In the euro area, however, they are still somewhat elevated. Spreads for the Czech Republic are calculated from loans to corporations and their path is naturally different. Here too, however, we can see unusually low figures in the pre-crisis years and a slightly increased level at present

CHART II.10

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

— Households, total   — Non-financial corporations
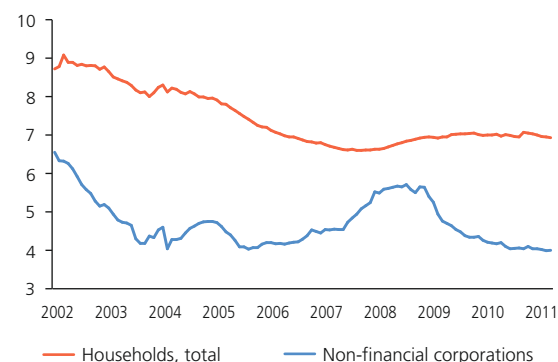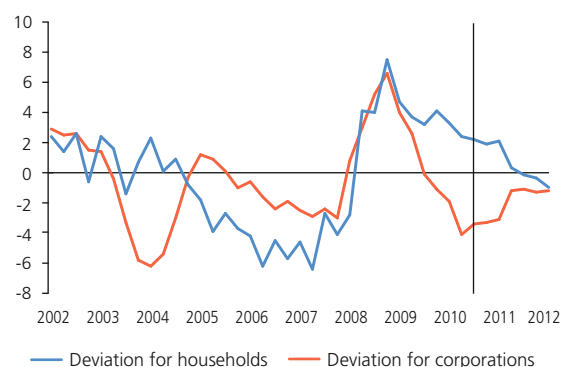
Source: CNB
Note: Interest rates on overdrafts are not included in the case of households.

CHART II.11

Approximation of deviation of real interest rates from the long-term average
(% p.a.)

— Deviation for households   — Deviation for corporations

Source: CNB

CHART II.12

Gaps of corporate debt interest rate spreads
(b.p.)

— Euro area   — US   — CZ
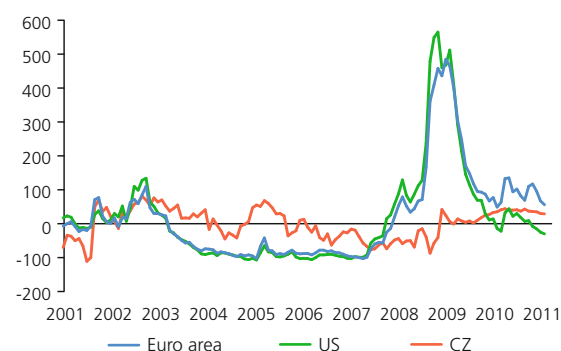
Source: Bloomberg, CNB
Note: Gaps between spreads and their long-term average (1998–2011 average for the euro area and the USA, and 2001–2011 average for the Czech Republic). Spreads – Merrill Lynch indices of BB-rated corporate bonds for the euro area and the USA, and spread between interest rates on new loans to corporations and one-year PRIBOR rates for the Czech Republic.

Estimated ratio of net interest payments to government revenue in 2011 and long-term government bond yields in April 2011
(%)

Source: OECD, Thomson Datastream
Note: Government revenue comprises tax and non-tax revenue of general government (including dividends for some countries).
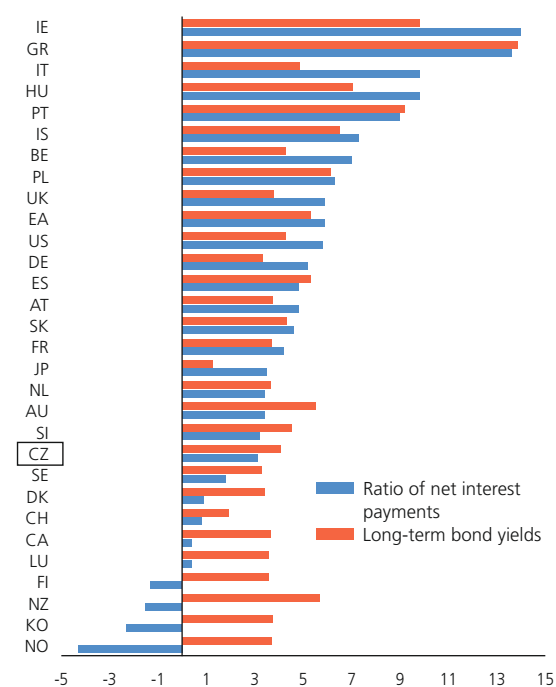
investment will be flat and new jobs will not be created. In a situation where high unemployment rates will persist virtually throughout Europe, employee wage growth will be unusually slow for quite some time. As a result, the credit risk of corporate loans will soon stabilise, while bank losses on loans to households will remain strongly elevated (see sections 2.2, 2.3 and 4.1). Should such trend be long-running, households in advanced economies could be exposed to some elements of debt deflation (as currently in Ireland), which would further worsen their growth outlooks.

Euro area banks are facing balance-sheet liquidity problems
One of the biggest risks to a renewal of stable economic growth in the EU is a potential shortage of funding in many European banks. This is indicated not only by low deposit-to-credit ratios in some countries (see Chart IV.20) and high shares of market-based sources in total liabilities, but also by banks' dependence on sources of liquidity from central banks in some countries.[6] The still high issuing activity of banks linked with the need to finance budget deficits is also still a source of concern about the ability of banks to replace maturing bonds by new issues under similar conditions. In the next two years, the acuteness of this threat will probably still be partially reduced by subdued growth in demand for loans from private entities and a modest global excess of savings over investment.

Balance-sheet liquidity problems are becoming acute for some euro area governments
The debt crisis in the euro area escalated in 2010 and the situation worsened sharply in April 2011 (see section 3.1). Some highly indebted countries are finding it more and more difficult and expensive to refinance themselves. Amid falling investor demand for government bonds of heavily indebted countries, the most vulnerable governments will be those with high near-term financing needs and high marginal financing costs. These governments will probably face rising interest costs. The interest expenditure of Ireland and Greece already exceeds 10% of government revenue (see Chart II.13). Should the public debt and yields required by investors rise further, net interest payments will exceed 20% of government revenue within a few years. This would put these countries in an unsustainable fiscal situation. Such a level of net interest payments in government revenue makes it virtually impossible to achieve gradual fiscal stabilisation through the generation of primary surpluses, and the only solutions available are to keep interest rates at low levels and transfer funds from creditors to debtors via increased inflation or to restructure and write off debts.

6 Concerns regarding the sufficiency of funds are also linked with other factors. One of these is that large international banks will have to refinance a large volume of maturing resources in the next few years. The IMF's *Global Financial Stability Report* (April 2011) estimates that debt securities worth almost USD 3,000 billion will mature in large European banks in the next two years.

Box 1:

**DO ADVANCED COUNTRIES FACE A PERIOD OF HIGH INFLATION?**

Owing to the very easy monetary policies of central banks in large advanced economies – be they in the form of standard instruments, i.e. the lowering of monetary policy interest rates (even to zero), or less standard tools such as quantitative easing (see the Glossary) – economists and the public have long been voicing concerns about whether such policies will result in a significant or even dramatic rise in inflation in the future. These concerns most often stem from the fact that the relevant central banks have kept their interest rates at very low levels since 2008 and have simultaneously greatly increased the size of their balance sheets and monetary bases (see Chart II.1 Box). Investor and public concerns about high inflation are evidenced by the sharp increase in the gold price in recent years (see Chart III.19).

Although the growth in the balance sheets of some central banks seems unprecedented (for example, the monetary base of the US Fed, which comprises currency in circulation and bank reserves, has risen from around USD 900 billion before the crisis to almost USD 2,400 billion at present), it alone is not an indicator of an inevitable rise in inflation in the future. This is because banks hold most newly issued liquidity as free reserves with the central bank, so the increased monetary bases are not causing credit and money supply growth. In other words, the rise in the monetary base is being offset by a fall in the money multiplier (see Chart II.2 Box). And it is the growth in the amount of money in circulation, not the change in the monetary base, that significantly affects inflation. In the USA, for example, M2 has increased by only 13% in the almost four years since the crisis started. This cannot be described as a strong monetary expansion. Economists warning of the consequences of supportive monetary policies claim, however, that once banks come to the conclusion that economies are returning to steady growth and credit risk is decreasing, rapid lending growth will resume and the money supply will really start to surge. The counter-argument is that central banks can re-absorb the liquidity quite quickly with no great difficulty in the event of major pressures.

There is, however, another potential channel that may significantly increase inflation in advanced countries in the future. This channel contains the mechanisms described by the fiscal theory of the price level. This theory says that inflation is not determined solely by money supply growth relative to economic output, but also by fiscal policies. In countries where the general government debt-to-GDP ratio reaches a high level and the fiscal situation becomes unsustainable, governments will have a greater

CHART II.1 BOX

Total assets of key central banks
(basic indices; January 2008 = 100)
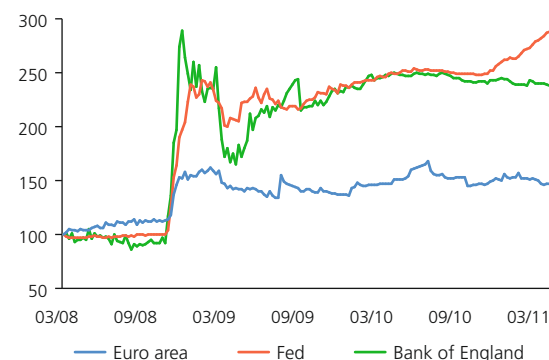
Source: ECB, Fed, Bank of England

CHART II.2 BOX

Money multipliers
(ratio of M2 to monetary base)
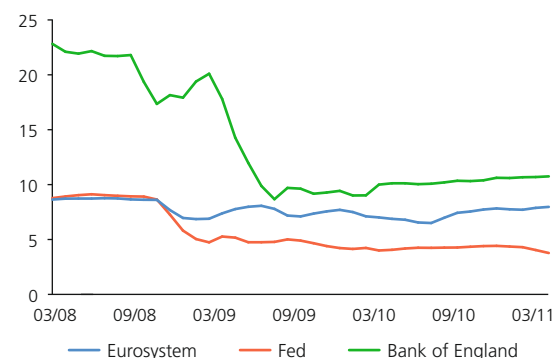
Source: ECB, Fed, Bank of England, IMF

CHART II.3 BOX

Correlation between long-term government bond yields and inflation in the USA and the UK
(%; 1951–2010)

$y = 0.8447x + 3.59237$
$R^2 = 0.5298$

$y = 0.5716x + 4.3777$
$R^2 = 0.5571$
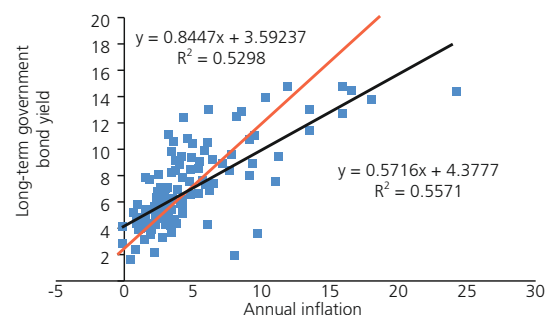
Source: IMF, Thomson Datastream, CNB calculation
Note: The red regression line excludes outliers and points with inflation exceeding 10%; the other line shows that when they are taken into account the nominal yield can rise substantially less than inflation.

incentive to liquidate the debt gradually by inflation rather than fiscal austerity. History offers numerous supportive arguments in this sense. Empirical evidence from Anglo-Saxon countries shows, for example, that long-term government bond yields have not reacted in full to inflation since the 1950s (see Chart II.3 Box).

The British economic historian Niall Ferguson (2010) says that the Western world is facing a level of government debt that has previously been seen only in times of world war. Historically, advanced countries have got out of post-war debt not through fiscal restriction, but through a combination of growth and inflation, which ensured very low or even negative real interest rates on government bonds.[7] US economists Carmen Reinhart and Maria Sbrancia (2011) confirm in their historical analysis[8] that the hidden liquidation of government debt through inflation was a frequent phenomenon in the last century. During 1945–1980, for example, real interest rates on government debt were negative for one-quarter of the time in the USA and almost one-half of the time in the UK. Government debt was liquidated not only through inflation, but also through other methods of financial repression, such as explicit or implicit caps on interest rates, directed mass investment by institutional investors (such as pension funds) in domestic government bonds, and tighter connection between government and commercial banks. They also point out that these government debt liquidation methods do not need high inflation; slightly increased inflation for a long enough time is sufficient. However, Niall Ferguson counters by warning that institutional investors, who have much more information nowadays, will quickly incorporate increased inflation into their inflation expectations and demand higher nominal government bond yields. Governments' efforts to resolve their excessive debt by means of inflation could therefore be counterproductive. If Niall Ferguson is right, it is bad news for current investors in gold, as without significantly higher inflation in the future it is probably considerably overpriced.

A rise in long-term interest rates as a result of sovereign risk could have a strong destabilising effect

From the medium-term perspective, negative feedback between government and bank balance sheets can be identified as one of the strongest risks to the euro area and certain other advanced countries. In the first stages of the crisis, risk was transferred from bank balances to government balances, but in subsequent stages some governments have become overindebted and now the significantly higher sovereign

---

7   Ferguson, N. (2010): *Fiscal Crises and Imperial Collapses: Historical Perspective on Current Predicaments*, lecture for the Peterson Institute for International Economics, 13 May 2010.
8   Reinhart, C., Sbrancia, M. (2011): *The Liquidation of Government Debt*, NBER Working Paper No. 16893, March 2011.

risk is starting to transform into bank liquidity and credit risk. In recent months the risk of this loop developing has increased in countries where government bond yield spreads have risen markedly (see section 3.1). Subsequently, banks in these countries have also started to face higher market financing costs, as government debt rating downgrades have been followed by bank debt rating downgrades. In the period ahead, this effect may be exacerbated by governments' efforts to finance deficits more from domestic sources in response to the lower willingness of foreign investors to buy their debt. A rapid exit of central banks from easy policies or a sharp increase in concerns of higher inflation in the future could have a similar adverse effect. Banks are responding to the funding stress and rising costs of market financing by increasing deposit rates (see Chart II.14) in an effort to obtain more stable funds. However, this inevitably leads to a rise in loan costs or a decline in interest margins.

A rise in long-term interest rates could therefore jeopardise the stability of banks, and possibly other financial institutions, for at least two reasons. If banks lost the ability to obtain funds relatively cheaply, they would also lose the ability to achieve a yield level enabling them to cope with loan impairment losses and a fall in the value of securities holdings.[9] Higher debt servicing costs of corporations and households would be reflected in rising credit risk and loan losses. All this would eventually have an adverse impact on banks' capital. Overall, a vicious circle would be created in the euro area and some other EU countries (although not the Czech Republic so much). Banks could break this primarily by significantly increasing their capital adequacy. Not only would that create a sufficient buffer to cover potential losses, but the higher credibility would also lead to lower liability financing costs.[10]

Insufficient capital and the effects of new regulations are medium-term risks

Although it is generally agreed that capital buffers need to be strengthened in many national banking sectors, in reality there is a high degree of uncertainty surrounding the capital of banks in the EU. There are concerns that many banks may not currently have sufficient capital to cover unexpected loan impairment losses, let alone a reduction in the value of government bond holdings. A European stress test prepared by the European Banking Authority (EBA), whose results will be published in mid-2011, should determine whether these concerns are justified. The new Basel III regulatory requirements and the plans of some regulators to implement the agreed capital adequacy ratios earlier than expected or to allow national authorities to set higher requirements (see Box 7 in section 4.1) are a source of nervousness for many banks. In addition, there are strong doubts

CHART II.14

Deposit interest rates in indebted countries
(%)
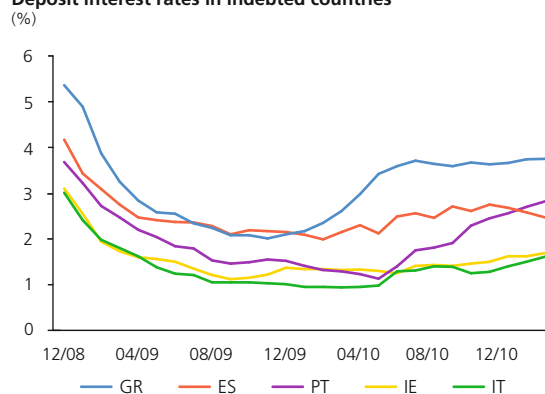
Source: Eurostat, Central Bank of Ireland
Note: Interest rates on new household deposits with a maturity of up to one
          year (up to two years for Ireland).

CHART II.15

The koruna exchange rate and its volatility
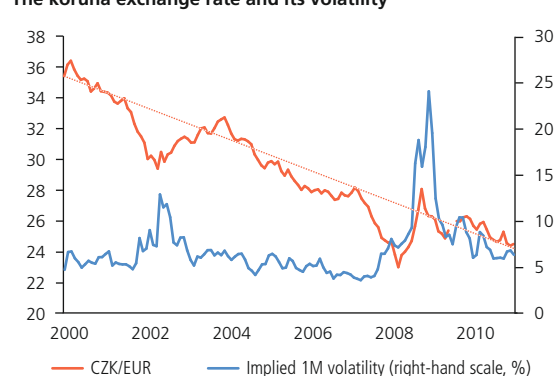
Source: CNB calculation based on CNB data
Note: The dotted line shows the long-term trend.

---

9 Profits of European banks generally improved in 2010, although mainly as a result of a decrease in provisioning. In many countries, however, no increase in operating profit (before provisions) can be expected in the next few years owing to weak demand for loans by corporations and households.

10 However, if capital adequacy is to be improved in some other way than by substantial deleveraging, many European banks will have to undergo restructuring. This process, however, will be very difficult.

Nominal currency yields for foreign investors
(%; 2001–2010 average)
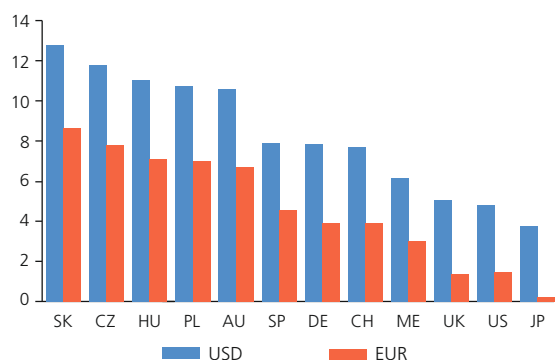
Source: Thomson Datastream, CNB calculation
Note: Approximation of the yield of foreign investors investing in government bonds in the relevant currency. The average yield is given by the the sum of the average interest rate on government bonds and the average annual appreciation of the nominal exchange rate of the domestic currency against EUR and USD.

The investment position of the Czech Republic
(CZK billions)

Source: CNB

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

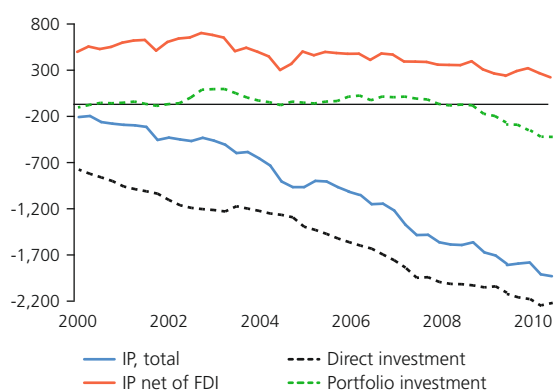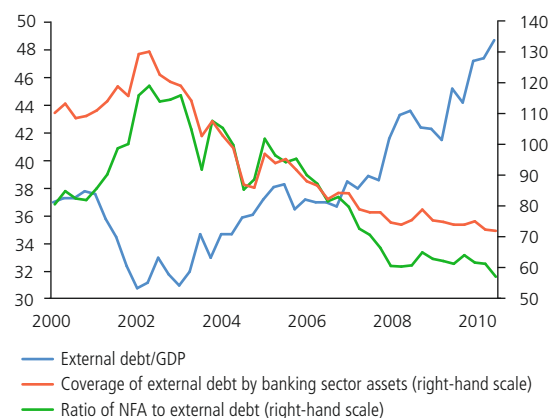about the ability of a large number of European banks or national banking sectors to comply in time with the new Basel III requirements regarding the extent, quality and structure of balance-sheet liquidity. Moreover, banks and other financial institutions are still facing high regulatory uncertainty connected with further proposals to introduce new regulations and restrictions or new types of taxation targeted at the financial sector. These factors may be detrimental to the private sector's access to loans or increase the cost of loans, which may have negative short-term and long-term effects on the supply side of the economy.

The rise in commodity prices is a strong negative supply shock

Concerns about the response of prices of commodities (energy and agricultural commodities and metals) to the renewed increase in economic activity in Western economies and the continued dynamic growth in emerging economies started to be confirmed in 2010 (see section 3.1). Growing interest in commodity derivatives among foreign investors may be one of the drivers of the commodity price growth (see Box 6). For advanced economies with weakened demand, including the Czech Republic, this growth represents a strong negative supply shock, dampening economic activity[11] and leading to cost-push inflation pressures (albeit partly moderated by the koruna's appreciation vis-à-vis the dollar). VAT rate increases, which many countries including the Czech Republic have used to cover public budget shortfalls, are having a similar effect. As in 2006–2007, monetary authorities are thus getting into a difficult situation. If they are forced to react to cost-push inflation by tightening monetary policy, this will represent an additional negative demand shock which could affect above all those countries which are facing problems with public finance sustainability and are having to make significant public expenditure cuts.

A fundamentally unjustified appreciation of the koruna is still a significant risk...

The Czech economy is regarded as stabilised from the macroeconomic viewpoint and its public finance can be seen as relatively sound in the light of the problems of some other European countries, so the search for yield by international investors could in certain circumstances generate strong pressures for a fundamentally unjustified appreciation of the koruna. Since spring 2009, the koruna has remained relatively stable at levels that can be seen as consistent with the long-term trend (see Chart II.15). According to prevailing market expectations, the koruna will appreciate very slowly in the period ahead. A survey of forecasts of world analysts and forecasters published in *Foreign Exchange Consensus Forecasts* in April 2011 revealed that the koruna-euro exchange rate is expected to be 24.31 at the end of July 2011

---

11 Import price inflation related to growth in world prices of commodities has a marked negative effect on domestic industry. According to CNB calculations, for example, sales and output in the segment of non-financial corporations with 50 employees or more saw continuing relatively fast annual growth in 2010 Q4. However, the growth rate of book value added slowed due to the high material cost-output ratio, influenced mainly by rapidly growing prices of imported inputs.
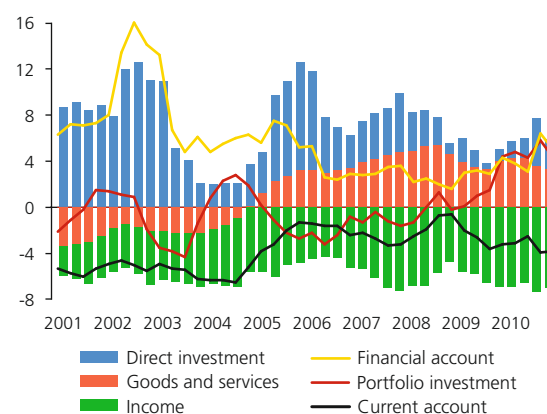
and 23.93 at the end of April 2012 (and the koruna-dollar exchange rate 17.60 and 17.44 respectively). The fact that koruna assets are classed by many international investors as emerging economy assets and have historically offered high yields to foreign investors is one of the sources of risk of unjustified appreciation of the koruna (see Chart II.16). Owing to the low yields on assets denominated in the currencies of large advanced economies, international investors are trying to place liquidity in at least slightly more profitable assets and are focusing mainly on emerging economies. The inflow of capital into these economies is generating risks of excessive loan growth, overheating of the economy and creation of bubbles in asset markets (especially property markets). In recent months, these risks have become one of the main economic policy topics at the global level. The very easy monetary policies of most advanced economies have also led to a resurgence of "carry trade" strategies (see FSR 2007, p. 20), which limit the ability of monetary authorities in emerging countries to react to an overheating economy by raising interest rates. Carry trades and other forms of search for yield are basically an effort for monetary policy arbitrage on the part of investors. Conversely, in some countries debtors are attempting to achieve monetary policy arbitrage by accepting foreign currency loans with lower interest rates.

…especially given the slight weakening of the Czech economy's external balance

Data on the international investment position and the balance of payments are sending out slight warning signals. The negative net international investment position increased further in 2010. Although the position adjusted for the net FDI inflow remains positive, its gradual decline cannot be overlooked (see Chart II.17). The situation is similar for the rising gross external debt, which was 72% covered by banking sector assets and 57% covered by net external assets at the end of 2010 (see Chart II.18). With regard to the external balance, the domestic economy thus remains clearly stable, but its strong position is gradually deteriorating. The CZK 300 billion increase in the negative net investment position between the start of the crisis in 2008 Q3 and the end of 2010 was due largely to a rise in net government debt to non-residents (from CZK 319 billion to CZK 463 billion).[12] The balance of payments also seems less favourable under the new methodology (see Chart II.19). As a result of a falling goods and services surplus and a rising income deficit, the current account deficit is widening gradually (from 3.8% of GDP in 2010 to 4.3% in 2012 according to the CNB's May forecast). This trend, like the stagnation of FDI at low levels, can be regarded as unfavourable (although reinvested earnings do not generate any external refinancing need).

The balance of payments
(% of GDP)

Legend:
- Direct investment
- Goods and services
- Income
- Financial account
- Portfolio investment
- Current account

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

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

Legend:
- Debt-to-GDP (%)
- Government borrowing needs (CZK bn, right-hand scale)
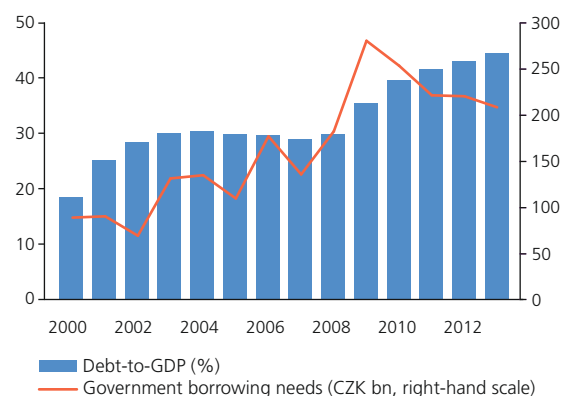
Source: CZSO, CNB, MF CR
Note: CNB estimates used for debt-to-GDP ratio for 2011–2013 and MF CR estimates used for central government borrowing needs.

---

12 The increase in the negative net investment position was due to increases in the negative balances of direct investment (of CZK 331 billion), the government (of CZK 144 billion) and other sectors (of CZK 48 billion), and a decline in the positive balance of banks (of CZK 108 billion). This was offset by an increase of CZK 171 billion in the positive balance of the CNB.

Public finance deficits of advanced countries in 2010
(% of GDP)
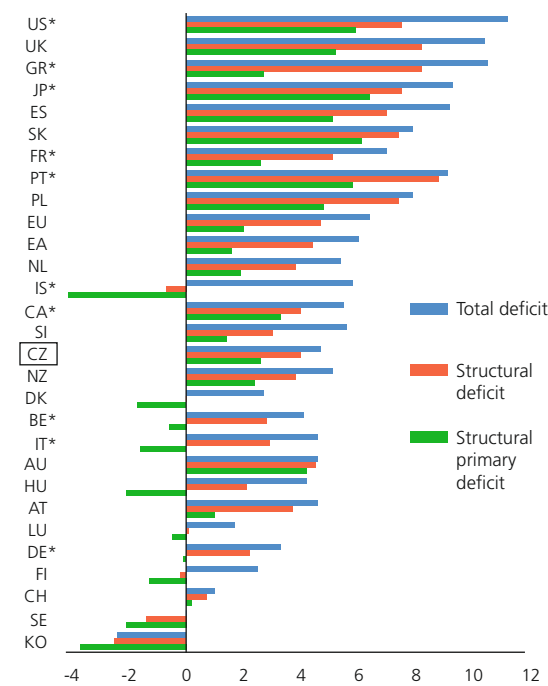
Source: EC, IMF
Note: Excludes Norway, which reported a high total deficit (11%) and structural
           deficits (5.1% and 7.5%) and Ireland with a total deficit of 32.4%
           and structural deficits of 30.3% and 27%; * public debt-to-GDP ratio
           exceeds 80%.

The risks related to Czech public finance are still rising
Owing to the growth in domestic economic activity and some budgetary measures, the Czech public finance deficit fell from 5.8% of GDP in 2009 to 5.1% in 2010. Owing to fiscal restriction, the deficit should shrink further to 4.3% of GDP in 2011 and 4.2% of GDP in 2012 by the CNB's estimation. Given these deficits and the expected nominal GDP growth, government debt is expected to be 44% of GDP at the end of 2012 (see Chart II.20). Thanks to the lower deficit and government debt management measures, the total gross government borrowing requirement should fall from CZK 280 billion in 2009 to CZK 220 billion in 2012 (see Chart II.20).[13] In the years ahead, the Czech government debt should be financed without significant problems, not least because the Czech Republic has low share of short-term debt (16% in 2010 with a limit of 20% in the following years). It cannot be ruled out, however, that the issuing conditions will deteriorate unexpectedly and required yields will rise if the euro area debt crisis deepens further, the expected Czech public finance outlook worsens or domestic financial institutions decide to diversify their government debt holdings internationally.

As regards the size of the deficit, the Czech Republic had one of the smallest deficits among the advanced economies in 2010 (see Chart II.21), and 2011 will be similar.[14] Nonetheless, the domestic fiscal situation is sending out warning signals with regard to the medium and long term. First, the Czech general government debt is rising apace. At the end of 2013 the ratio of government debt to GDP will be 15 percentage points higher than at the start of the crisis in 2008 (see Chart II.20). The tight fiscal situation is also indicated by the estimated cyclically adjusted primary balance, which remained near the EU average in 2010. Debt servicing costs are also expected to rise from 1% of GDP to 2% of GDP over the next few years.[15]

The euro area debt crisis and the economic situation in the countries affected have clearly showed that rapid fiscal stabilisation is needed. It has been confirmed that financial markets are asymmetrically much less tolerant of small countries showing signs of fiscal imbalances than of large countries (see also section 3.1). In 2010 and the first months of this year, marginal interest rates on newly issued debt in small euro area countries were above the average interest rate on total debt, while the opposite tended to be true in large countries. As a result of this asymmetry, small countries like the Czech Republic may be exposed to highly non-linear and discontinuous reactions

---

13 For details see the Czech Ministry of Finance document *Funding and Debt Management Strategy for 2011.*
14 Similar or more favourable figures for the Czech Republic by comparison with relevant groups of countries can be found for other fiscal indicators as well. At the end of last year the share of debt held by foreign creditors was 32.7% (euro area average 52%), the share of short-term debt with maturity of up to one year was 16.1% (euro area average 26.1%) and debt servicing costs were 1.4% of GDP (euro area average 2.8%) and 3% of government revenues (euro area average 6%; see Chart II.13).
15 The net interest costs of servicing the Czech national debt calculated on a cash basis were CZK 36 billion last year, compared to CZK 47 billion in 2009. The decrease in costs was due to a decline in the Czech yield curve, which reduced the net interest costs of servicing the floating-rate component of the national debt.

of the financial markets to changes in the outlook for fiscal deficits and public debt. If the Czech Republic were to face such reactions in the future, it would not have access to the kind of assistance that some euro area countries are using now.

Although Czech public finance seems relatively sound from the short-term perspective by international comparison among the advanced countries, and although deficit-reducing measures have been taken on both the expenditure and revenue sides of public budgets, long-term fiscal stabilisation will require further decisive measures in the years ahead to reduce the structural primary deficit (i.e. the cyclically adjusted deficit excluding debt servicing costs). This will necessitate further substantial changes to public budgets on the revenue side and above all on the expenditure side. In the first phase they may generate a negative demand shock and a fall in economic activity. However, at a certain debt level the situation could become very difficult to cope with and the economy could find itself in the vicious circle described above. If fiscal consolidation is delayed, the Czech Republic will probably not avoid a negative demand shock. The shock will merely occur through a different channel, i.e. via growth in interest rates on government debt and on bank loans to the private sector, as in Greece, Ireland and Portugal.

Alternative economic scenarios

Potential alternative future macroeconomic paths together with the risks identified became the basis for the alternative economic scenarios used mainly in section 4.2 to test the resilience of the Czech financial sector. The paths of key variables in each scenario are shown in Charts II.22a–d. 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[16] and property prices) will be presented for each scenario in the following sections of this Report.

The **Baseline Scenario** corresponds to the CNB's official May macroeconomic forecast published in Inflation Report II/2010. It assumes a temporary interruption of the gradual recovery of the Czech economy, which will resume in 2012. The unemployment rate will be flat in 2011 and fall gradually as from the start of 2012. This scenario also assumes that headline and monetary-policy relevant inflation will both be close to the inflation target over the next two years. Gradually mounting inflation pressures from the domestic economy linked with an acceleration of the currently low wage growth will be partly offset by gradual exchange rate appreciation. Short-term interest rates will be broadly stable initially and rise gradually from 2011 Q4 onwards.

---

16 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.
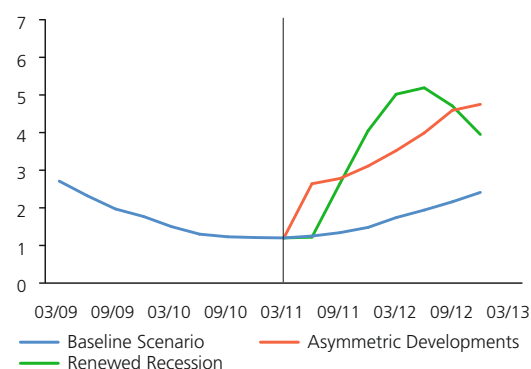
CHART II.22A

Alternative scenarios: real GDP growth
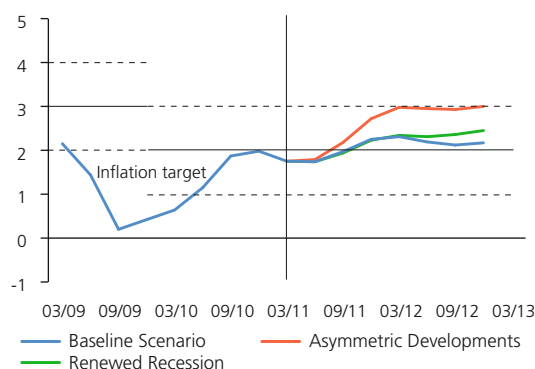(%)
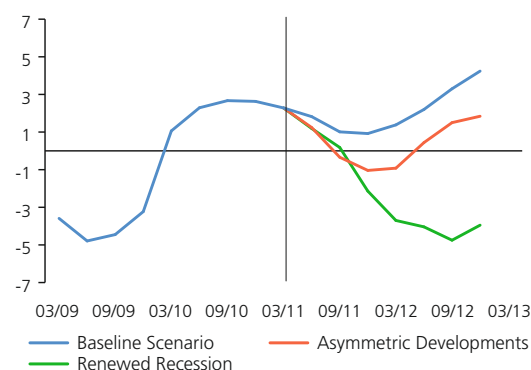
Source: CNB

CHART II.22B

Alternative scenarios: 3M PRIBOR
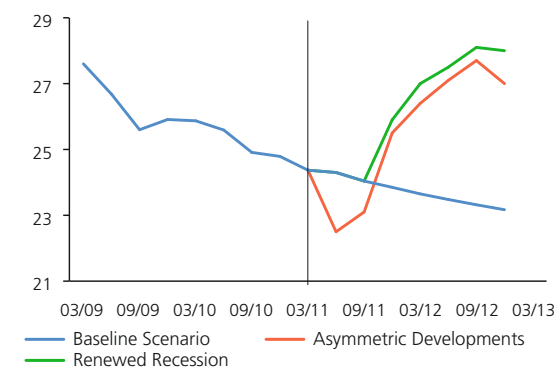(%)

Source: CNB

CHART II.22C

Alternative scenarios: inflation
(%)

Source: CNB

Alternative scenarios: exchange rate
(CZK/EUR)

Source: CNB

The ***Asymmetric Developments*** stress scenario simulates the potential combination of weak economic growth (relative to the *Baseline Scenario*), due to negative demand and to supply shocks, and adverse developments in the financial markets and subsequently also in the financial sector. The Czech Republic will slide back into recession temporarily as a result of weak consumer and investment demand abroad. By contrast, robust economic growth will continue in emerging economies, leading to further growth in prices of commodities and energy. Inflation pressures will thus rise despite the recession. Central banks will respond to a certain extent by increasing short-term interest rates. Coupled with higher interest rates, rising consumer prices will then lead to a further slowdown in demand. In the generally adverse situation, fiscal problems will start to worsen and long-term interest rates will also start to rise. All this will unfold amid high exchange rate volatility, with the koruna initially appreciating in 2011 due to investors' search for yield but later depreciating rapidly as a result of a reassessment of the sustainability of domestic public finance, causing a further increase in interest rates. Together with an adverse income situation and unemployment growth, this will be reflected in a rise in defaults among corporations and households. During 2012, the economy will start to recover and the financial market situation will calm very gradually.

The ***Renewed Recession*** stress scenario captures the risk of a renewed slide of the domestic economy into strong recession, with the initial optimistic expectations in 2010 H2 being replaced by a combination of a marked decline in GDP in 2011 and 2012 and adverse financial market developments. The decline in domestic GDP will be caused chiefly by a sizeable weakening of external demand (e.g. as a result of an escalation of the euro area debt crisis) and the financial markets will be adversely affected by a loss of investor confidence in the domestic economy. Concerns regarding public finance sustainability will result in a rise in government bonds yield and the koruna will depreciate rapidly. This depreciation will lead to a rise in potential inflation pressures, to which monetary policy-makers will react by raising short-term interest rates. Client interest rates will also increase. Together with falling income and rising unemployment, this will result in a rise in defaults among corporations and households. The property market situation will also start to deteriorate significantly.

2.2 NON-FINANCIAL CORPORATIONS

The situation in the non-financial corporations sector improved significantly in 2010 compared to the previous year, but the pre-crisis situation has not been restored yet. One of the main future risks for non-financial corporations is a potential economic slowdown in EU countries (Germany in particular), where a large part of Czech industrial production is exported. At the same time, the availability of loans may worsen again and their price may rise owing to a potential increase in public budget borrowing requirements. If the fiscal problems in some peripheral EU countries escalate, this would generate problems with financing the production and investment needed to meet the growing demand for consumer and export goods.

**Corporations' financial results improved in 2010**

Czech companies recorded increased demand in 2010 from foreign trading partners and households, and also from the government in the first half of the year, thanks to renewed economic growth in advanced economies. This allowed them to slightly increase their profitability, which, however, is still below its pre-crisis levels (see Chart II.23). Corporations managed to significantly reduce their personnel costs by cutting employee numbers. Turnover ratios also suggest a positive trend. Total debt ratio almost did not change from 2008 and 2009 despite a decline in the number of bank loans received, with some operating loans not being renewed. The fall in bank loans was thus probably offset by a rise in total intercompany debt. Within this debt, the inflow of FDI in the form of loans from foreign parent companies surged and trade liabilities rose because of deferred invoice payments. Although this helped some corporations overcome liquidity problems in the short term, a continuation of this trend would create a source of risk for the entire non-financial corporations sector in the long term. Corporations also tended to obtain funding more by means of bond issues, in line with the general trend in the EU. As in 2009, the current liquidity of corporations remained low (as did the acid-test). The decline in this indicator was driven mainly by a fall in prices of securities priced at fair value, especially between 2008 and 2009. By contrast, the cash ratio continued to grow sharply, driven mainly by partial substitution of short-term debt financing with long-term debt financing. Holdings of currency and deposits on accounts increased slightly (possibly because of cautious policy of corporations and reining-in of new investment). The average of all the liquidity indicators of non-financial corporations was slightly higher than in 2009.

The differences in profitability across sectors are large

The evolution of return on equity (RoE) in the main sector of the Czech economy – manufacturing – corresponds to the annual increase in this indicator for all non-financial corporations. The automotive industry recorded its main wave of RoE growth in 2010 H1 despite a downturn in this sector abroad. The electricity, gas, heat and water supply industry is showing a very good and stable RoE, thanks in part to its oligopolistic structure. The transport sector, which had recorded near-zero RoE in previous years but showed some improvement last year despite an
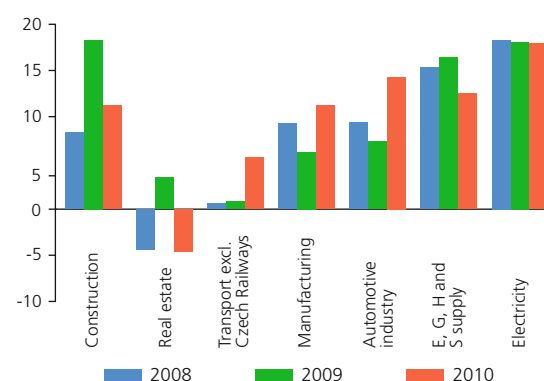
CHART II.23

Key financial indicators for non-financial corporations
(2008 = 100; increase in index means improvement)
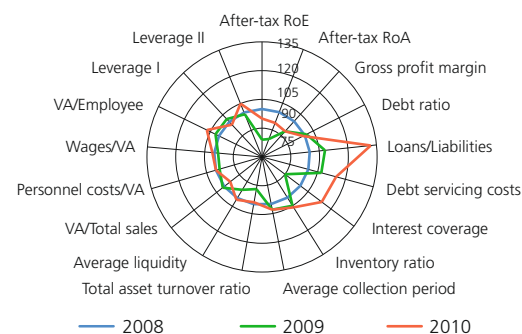
Source: CZSO, CNB

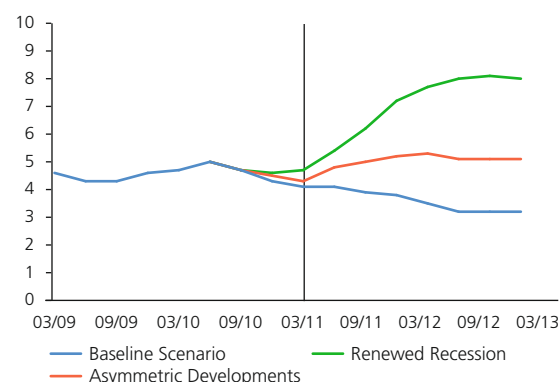**CHART II.24**

After-tax RoE in selected sectors
(%)

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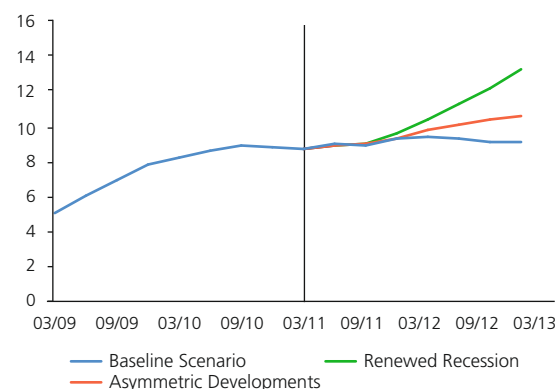Note: E, G, H and S are electricity, gas, heat and sewerage.

CHART II.25

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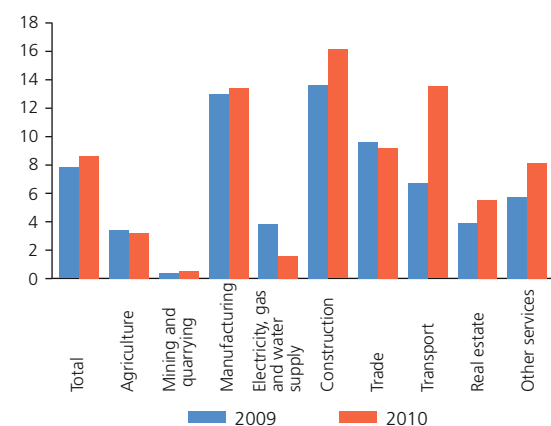(%)

Source: CNB

CHART II.26

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

— Baseline Scenario — Renewed Recession
— Asymmetric Developments

Source: CNB

CHART II.27

NPL ratios in selected sectors
(%)

■ 2009 ■ 2010

Source: CNB

CHART II.28

Number of insolvency petitions and actually declared insolvencies

— Number of insolvency petitions filed
--- Number of insolvency petitions estimated
— Number of insolvencies declared
--- Number of insolvencies estimated
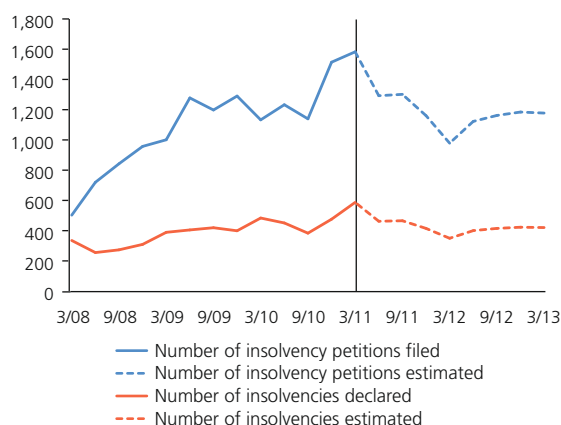
Source: Czech Credit Bureau, CNB calculation

increase in fuel prices, may become problematic. If its RoE was calculated solely on the basis of operating profit excluding subsidies, this sector would record negative profitability. The planned fiscal consolidation may lead to a reduction in subsidies, which could have a negative impact on the sector's RoE and its ability to meet its obligations. However, transporters have a very low share of loans in liabilities, so the potential impact of a cut in subsidies on banks' loan portfolio quality would be limited. Moreover, the sector has very good short-term liquidity. Besides being very weak over the previous three years, the economic condition of the property sector was clearly countercyclical (see Chart II.24 and also section 3.2). The renewed decline in its RoE into negative figures is due to a decrease in the number of properties sold and to a fall in property prices, which in the residential sector responded with a lag to the financial crisis owing to the delayed response of household income to the decline in economic activity.[17] Although total debt ratio of developers is at normal levels, the ratio of loans to assets seems high compared to other sectors and increased further in 2010. It should also be noted that the asset turnover ratio is high. Construction, which, unlike industry, saw no positive turnaround in 2010 and which is linked to the developer sector and public budgets, has also been showing considerable anticyclicality in terms of RoE recently, but it stayed in the black in all three previous years. It is also worth mentioning that the cash ratio of this sector was very good at the end of the previous year.

The credit risk of corporations increased further but is no longer rising
The 12-month default rate in the non-financial corporations sector rose further to 4.7% in 2010, but the rise was not dramatic. The latest estimates show that corporations are close to the peak of their credit risk, which is likely to start declining in 2011 (see Chart II.25). Similarly, the NPL ratio has stabilised (see Chart II.26). Small corporations[18] have higher and still increasing credit risk, while larger ones are starting to show a gradual decline in their NPL ratio. Sectors for which potential problems can be expected going forward (see the previous paragraph) also recorded a sharper increase in their NPL ratio. This applies in particular to the transport sector. By contrast, the NPL ratio in the energy, gas and water supply industry dropped by about one-half to very low levels (see Chart II.27). Photovoltaics is now a closely followed sector. Having boomed, it is now having to cope with a worse position after the introduction of higher taxation. Based on an estimate from the CNB's Central Credit Register, the banking sector's credit exposure to companies engaged in the construction and operation of photovoltaic power stations is around CZK 55 billion. The NPL ratio in this sector is currently very low (it recorded a quarter-on-quarter increase from 0.2% to 0.4% at the start of the year, relating exclusively to small and medium-sized photovoltaic companies with a total installed capacity of less than 3 MWp). Solar companies went to great lengths to connect to the distribution network before the end of 2010 in order to avoid a fall in electricity purchase

17 See also the thematic article *An Analysis of Progress with the Sale of Residential Developments* in this Report.
18 I.e. corporations with less than 50 employees and less than CZK 200 million in total turnover.

prices. This is also evidenced by the fact that more than half of the current photovoltaic power stations obtained their operating licence in the second half of 2010 (loans to power stations connected in 2010 H2 accounted for 54.6% of the total volume of loans to photovoltaic power stations as of the end of 2010). Medium-sized photovoltaic power stations (with output between 30 kWp and 3 MWp) and those which did not manage to connect to the network before the end of 2010 can be expected to get into loan repayment problems.

Despite a visible stabilisation of the credit risk of non-financial corporations, a deterioration of some less closely followed variables can be observed, such as an increase in the ratio of loss loans to NPLs (section 4.1) and the collapses of several major property development projects. This is linked with the number of insolvency petitions and declared insolvencies (e.g. of developer ECM). The latest data show a particularly sizeable increase in the former (see Chart II.28).

The level of corporate debt seems sustainable and its structure seems sound
Even taking into account the economic level of the Czech Republic, the debt of Czech non-financial corporations is relatively low by international comparison (see Chart II.29), having fallen further (from 48% to 46% of GDP) as a result of the financial crisis. Most loans to non-financial corporations come from the domestic banking sector (see Chart II.30). Loans from non-residents account for around 20% of all loans to non-financial corporations and are used mostly by exporters. There is thus no danger of problems similar to those which have emerged in countries with a high share of foreign currency loans (e.g. Hungary). The time structure of corporate debt is changing over time, shifting from short-term to long-term loans. This trend can be considered positive, as long-term financing is more stable.

Corporations are taking out more – and cheaper – loans
Modest year-on-year growth in new loans to non-financial corporations can be observed. This should continue in 2011 and gradually strengthen (see Chart II.31). The debt financing costs of corporations are also starting to fall. This, combined with the recovery in their revenues, constitutes a positive stimulus for their profitability.

Box 2:

EXPORT SECTOR DEVELOPMENTS

The global financial crisis has so far affected the Czech economy mainly through the export sector. The fall in the balance of goods trade in 2008 and early 2009 (see Chart II.4 Box) can thus be put into direct relation to the lagged effects of the excessive exchange rate appreciation observed in 2007–2008[19] and to the decline in

19 However, the fast appreciation in this period was partly due to an improving foreign trade situation in the early phase of the financial crisis. The Czech economy was thus perceived as a "safe haven". The fact that the appreciation did not lead to a worse foreign trade balance represented an impulse for further appreciation.

CHART II.29

International comparison of ratios of debt of non-financial corporations to GDP
(% of GDP; 2009 data)
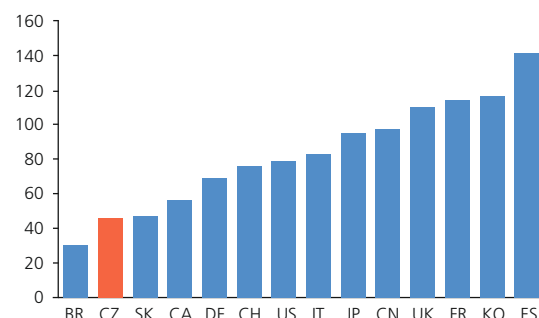
Source: CNB, McKinsey Global Institute
Note: Debt comprises loans accepted, bonds issued and other securities representing liabilities of corporations.

CHART II.30

Loans accepted by non-financial corporations by creditor
(stock as of 31 December 2010)

- MFIs
- Non-residents
- Non-financial corporations
- Financial intermediaries
- Government
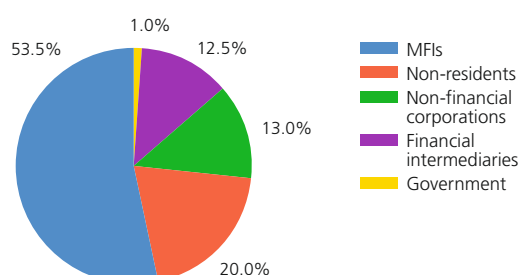
Source: CNB

CHART II.31

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

Baseline Scenario   Renewed Recession
Asymmetric Developments

Source: CNB

Foreign goods trade and its determinants
(foreign trade balance annual moving totals in CZK bn; others y-o-y growth in %)
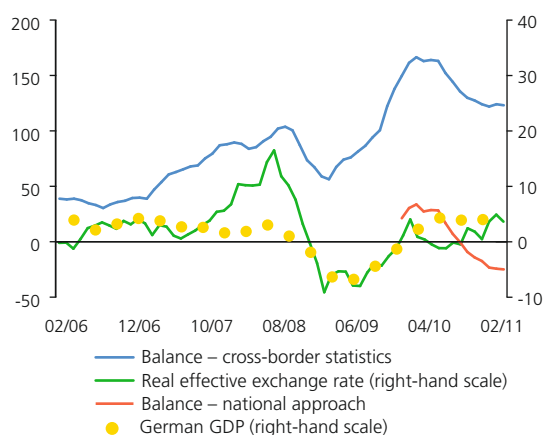
- Balance – cross-border statistics
- Real effective exchange rate (right-hand scale)
- Balance – national approach
- German GDP (right-hand scale)

Source: CZSO, CNB calculation

Non-performing bank loans ratio
(%)

- Non-financial corporations, total
- 700 largest exporters

Source: CNB

Natural hedging indicators for the 700 largest exporters
(%)

- Foreign currency loan ratio
- Coverage of exports by imports (right-hand scale)
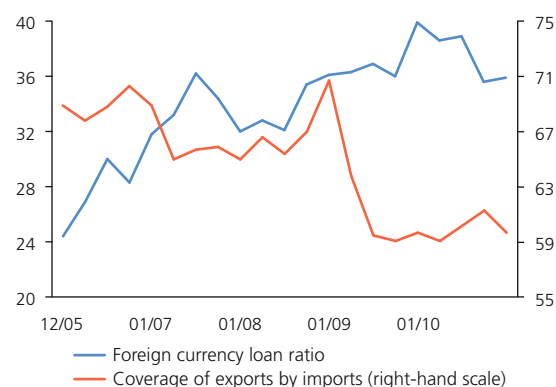
Source: CZSO, CNB

GDP growth seen in Germany, which is the Czech Republic's largest trading partner. However, the subsequent evolution of net goods exports was rather surprising. The trade balance improved in 2009 and 2010 Q1 despite persisting low external demand. This can be explained at least partly by the depreciating exchange rate in 2009, which helped to absorb the fall in external demand. Similarly surprising, however, is the deterioration in the trade balance since the end of 2010 Q1, when the real exchange rate was roughly at its equilibrium level and when external demand was starting to recover; in this period, however, the terms of trade have deteriorated owing to rising prices of imported commodities (for details see section 3.1 and Box 6). The surprisingly high goods trade surpluses in the past can be explained by deficiencies in the cross-border statistics methodology. These statistics, which were previously the sole source of information, do not distinguish – with regard to exports and imports – between domestic companies and foreign companies that are merely VAT registered in the Czech Republic and generate no value added for Czech GDP.[20] When foreign trade was converted to the so-called national approach,[21] which involves adjusting the values of goods transactions by non-residents for their value added, foreign goods trade started to show a deficit in the past year.
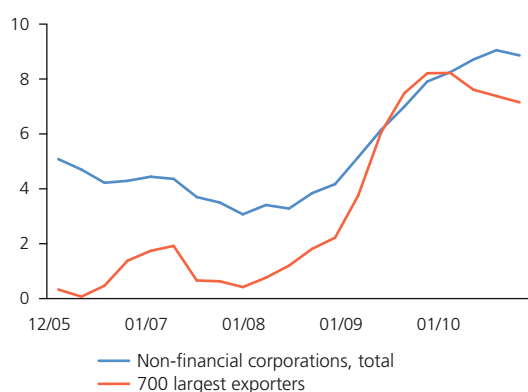
The worse situation of exporters in 2009 was reflected in a surge in non-performing bank loans provided to exporting companies to above the ratio recorded for the non-financial corporations sector as a whole (see Chart II.5 Box). However, the improved external economic growth outlook in 2010 led to a year-on-year fall in the NPL ratio of 1.1 p.p., while the NPL ratio for non-financial corporations as a whole rose by 1 p.p. The sensitivity of the domestic economy to external developments thus remains high. Moreover, the question is whether the safe haven scenario observed in 2008 will recur and whether the koruna will appreciate excessively (see section 2.1). However, natural hedging indicators for the largest export corporations (see Chart II.6 Box) suggest that exporters probably responded to the increased foreign exchange risk by increasing their foreign currency loan ratio, which is roughly twice as high as the same ratio for all non-financial corporations (35.9% as against 18.4%). On the other hand, the coverage of exports by imports decreased for these corporations.

---

20 These companies mostly only carry on "branding" in the Czech Republic. This involves packaging imported goods in the Czech Republic and re-exporting them.

21 The national approach to foreign trade statistics is based on the adjustment of cross-border statistics for data on the value added of exporting/importing non-residents obtained from their VAT returns in the Czech Republic (their value added is deducted). These data are closer to the value added actually generated in the Czech Republic. The CZSO has been publishing foreign trade data under the national approach since the start of 2011. Only data for 2009–2011 are available so far. Earlier data will be published from mid-2011 onwards and reflected in the national accounts statistics in December 2011.

2.3 HOUSEHOLDS

The slight recovery recorded by the Czech economy in 2010 has not had much effect on the economic situation of Czech households so far. Adverse developments in the labour market and simultaneous growth in essential household expenditure are pushing up the NPL ratio and causing faster growth in personal bankruptcies. Despite slower debt growth, problems with covering debt repayment costs can be expected among low- and medium-income households.

High unemployment and historically low nominal wage growth persist in the labour market
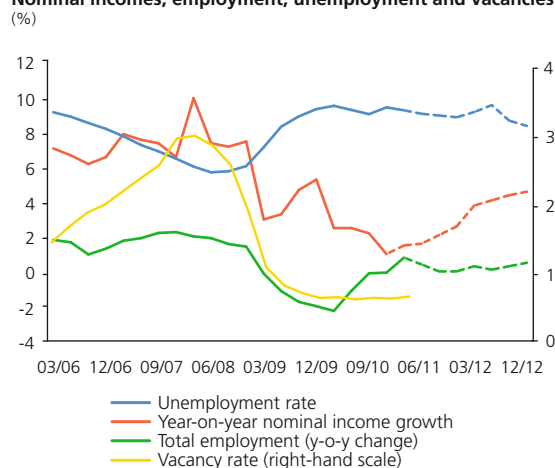
The registered unemployment rate remained high in 2010 (see Chart II.32). This adverse situation was largely due to a persisting downturn in construction, where employment declined by 11.7% year on year,[22] and a small number of new jobs. The gradual moderation in the decline in employment halted in 2010 Q4 owing to the recovery in economic activity. Total employment was therefore broadly flat. Buoyant commodity price growth is also having an indirect negative impact on the labour market (see sections 2.1 and 3.1). Amid a rising cost-to-output ratio related to growth in import prices of energy and non-energy commodities and metal-based semi-finished products, corporations are trying to reduce the wage cost-to-output ratio by exerting pressure on wages or by optimising jobs. After a short-term acceleration in late 2009 and early 2010 caused by dismissals of low-income employees, average nominal wage growth thus fell to a historical low (below 1%) in 2010 Q4.[23] The average wage grew by 1.9% in nominal terms (and by 0.4% in real terms) overall last year. The nominal growth in the business sector was 2.6%, while the non-business sector recorded a decline of 0.6%. According to the CNB's May forecast, similar developments can be expected this year, too; growth of 2.7% is expected in the business sector (as much as 5% in 2012), while a further decline of up to 1.7% is expected in the non-business sector (a slight rise of 0.5% in 2012). Not only will this impact negatively on the economic situation of the households affected, it may also complicate credit risk management of banking institutions, whose models may be historically calibrated to traditionally stable wage growth in the non-business sector.

The pace of growth of Czech household debt slowed

Growth in the ratio of aggregate household debt to GDP slowed again and thus remained low compared to the euro area economies (30.8%; see Chart II.33).[24] The ratio of debt to gross disposable income increased to 56%, thus recording a more moderate slowdown than the debt-to-GDP ratio. This reflects the fact that household income does not grow

---

CHART II.32

Nominal incomes, employment, unemployment and vacancies
(%)

- Unemployment rate
- Year-on-year nominal income growth
- Total employment (y-o-y change)
- Vacancy rate (right-hand scale)

Source: MLSA, CNB, CZSO
Note: The vacancy rate expresses the ratio of vacancies to the total number of jobs.

CHART II.33

Ratios of household debt to gross disposable income, financial assets and GDP, ratio of net interest payments to gross disposable income of households
(%)

- Debt/Gross disposable income
- Net financial assets/GDP
- Net interest/Gross disposable income (right-hand scale)
- Debt/Financial assets
- Debt/GDP
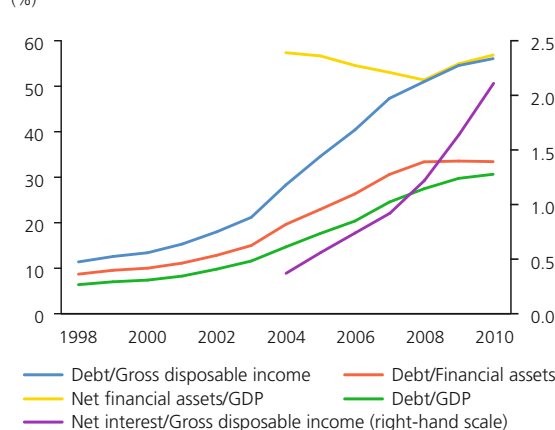
Source: CNB, CZSO
Note: The net interest payments data do not cover non-bank financial intermediaries.

---

22 However, this decline was relatively small compared to the falls in employment in the construction sector recorded in some economies in which property prices decreased (falls of 53.5% from the peak in Ireland, 42.5% in Spain and 41.7% in Estonia). Construction accounts for 9% of total employment in the Czech Republic.

23 The short-term increase in the average nominal wage was described in detail in FSR 2009/2010.

24 Debt-to-GDP ratios in 2009 in selected economies according to the OECD: Denmark 145%, the UK 103%, Portugal 80%, Germany 63%, Austria 56%, Hungary 37%.

CHART II.34

Bank and non-bank loans to households
(CZK billions)
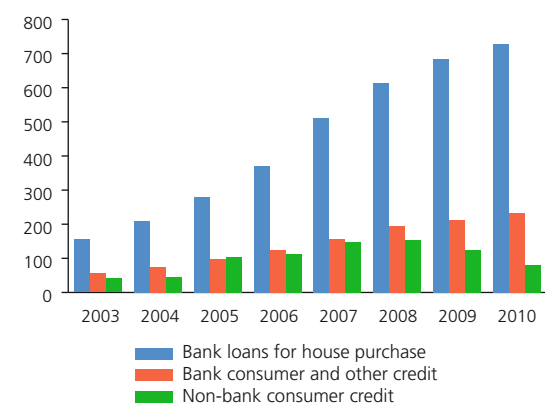
Source: CNB

CHART II.35

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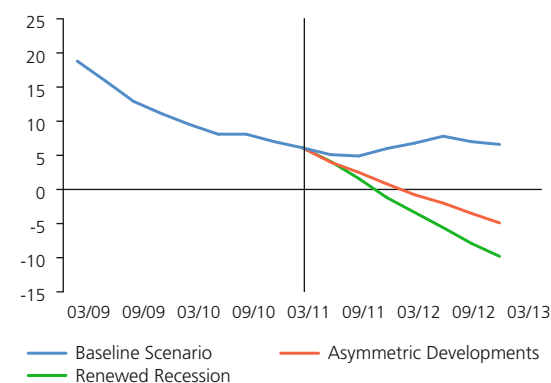
Source: CNB

CHART II.36

Financial assets of households: change between June 2008 and December 2010
(p.p.)
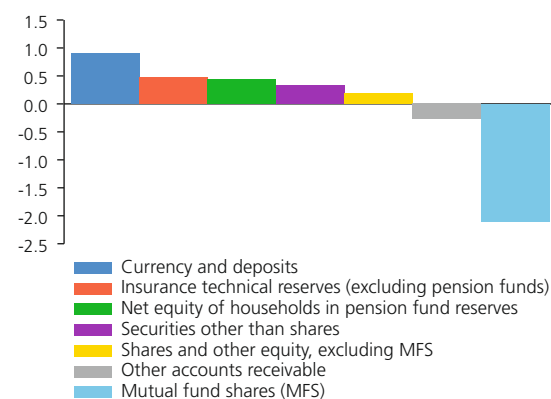
Source: CNB

at the same rate as the economy as a whole (see Chart II.8). As a result, households' liabilities totalled CZK 1.28 trillion, remaining at 33.6% of financial assets. The slower growth in debt is due mainly to falling interest in the services of non-bank financial intermediaries, whose products are dominated by consumer credit (see Chart II.34). The stock of such loans was 35% lower at the end of 2010 than at the end of 2009, while the total volume of consumer credit (bank and non-bank) declined by 7.4%. The *Baseline Scenario* forecast expects growth in the debt of the Czech population to increase in 2012. If the economy follows either of the stress scenarios, debt growth will continue to slow in the long term (see Chart II.35).

Czech households are cautious investors

The financial assets held by households at the aggregate level continue to significantly exceed households' liabilities. Households' assets increased by 4.7% in 2010, to CZK 3.36 trillion, which is 2.6 times more than the total volume of liabilities. Chart II.36, which depicts the change in the portfolio from the start of the crisis to the present, shows that the share of deposits held in investment funds declined in favour of currency and deposits (with a stable share of 60.5%), insurance technical reserves held in insurance companies (8.9%) and accounts receivable from pension funds (6.4%). The shares of shares and other equity (16.2%) and securities (0.9%) almost did not change.

Renewed growth in mortgage loans may generate new risks

The decline in the volume of new loans for house purchase in 2008–2010 was largely due to a more cautious approach of banks and therefore a high risk premium on these loans. Interest rates on house purchase loans fell to 4.6% at the end of 2010, thanks mainly to the activities of large banks, and so new mortgage loans again recorded an annual pick-up in growth (see Chart II.37). However, this increase has not so far been underpinned by any noticeable increase in clients' creditworthiness, and if the forecast of either of the adverse scenarios materialises (see Charts II.39 and II.40) this trend may pose an increased risk for both households and the financial sector.[25] Loans with rate fixations of three and five years dominate new loans. There is increased interest in loan agreements with a variable interest rate, which may be riskier for households in the future and which account for 16% of the volume of new agreements.[26] On the other hand, there is a long-term decline in loans with a fixation of one year. As interest rates fall, however, the debt servicing costs of households that borrowed in previous years are going down gradually.

---

25 The issue of excessive debt is also discussed in the thematic article *Excessive Credit Growth as an Indicator of Financial (In) Stability and its Use in Macroprudential Policy* in this Report.
26 This figure includes loans with a fixation of up to three months and also changes to existing agreements between loan providers and clients, i.e. including changes in the method of charging interest on of previously provided loans. This figure thus differs from the one provided by Fincentrum Hypoindex (4.2%), which, moreover, does not include all relevant banks.

The non-performing consumer loans ratio is still rising

The consumer credit segment has been characterised since 2009 by low growth and simultaneously rising interest rates (see Chart II.38). This is linked with the historically high non-performing consumer credit ratio, which is still rising. Banks have a non-performing consumer credit ratio of 12.3%, while non-bank financial intermediaries have a ratio of 19.4%.[27] The ratio of non-performing mortgage loans also rose to a historical high of 3.3%. Should the economy grow in line with the *Baseline Scenario*, the default rate of households will peak at 5.3% and will drop below 5% at the start of 2012 provided that the labour market recovers gradually (see Chart II.40). However, in the case of the *Renewed Recession scenario*, a further increase in the default rate can be expected, mainly in connection with a decline in real household income. The default rate for loans to sole proprietors follows a similar path, but at values that are 1 percentage point higher.

Heads of households with a mortgage are typically aged between 20 and 40

Table II.1 shows the characteristic features of households with a house purchase loan.[28] The higher the income and the level of education, the higher the number of households with a mortgage. Households headed by an active person aged between 20 and 40 dominate the category of house purchase loan owners. However, these loans also have a high occurrence among households of divorced individuals and households partly or fully unemployed, where loss of employment means a high risk of insolvency.

The probability of insolvency is high among low-income and low-education families

Table II.1 also presents the characteristic features of households unable to meet their obligations in 2009. Intuitive results can be observed in the third column: the probability of insolvency is high among low-income and low-education families, among single and divorced individuals, but also among households partly or fully unemployed. Of the households having difficulties meeting their obligations, 15.7% had a house purchase loan and 47% had consumer credit.[29] The last column shows the changes since 2008, i.e. the impact of the recession on the solvency of specific categories of households. In particular, low- and medium-income families, which were affected most by dismissals, ran into difficulties. A significant increase in difficulties meeting obligations was recorded by households living in apartments with regulated rent. A large rise in insolvency was also recorded among families with market rents and high education.

---

27 Figure based on calculations using data from a register created by the SOLUS Association.
28 The data come from the *Statistics of Income and Living Conditions survey* (EU-SILC) conducted in 2009 H1 and published in 2010 by the CZSO.
29 The remaining households without loans had difficulties meeting obligations relating to payments of rent, payments for energy and payments for similar services.

CHART II.37

New CZK house purchase loans
(%)

— Year-on-year growth in volumes
— Retail rates (right-hand side)
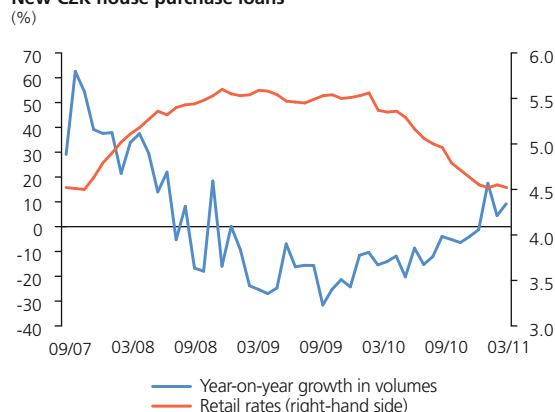
Source: CNB

CHART II.38

New CZK consumer credit
(excluding overdrafts; in %)

— Year-on-year growth in volumes
— Retail rates (right-hand scale)
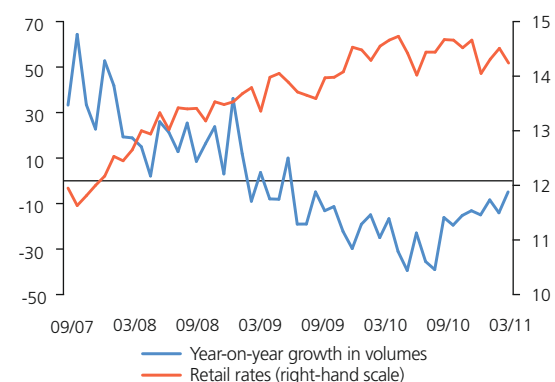
Source: CNB

CHART II.39

NPL ratio for bank loans in the household segment
(%)

— Baseline Scenario   — Asymmetric Developments
— Renewed Recession
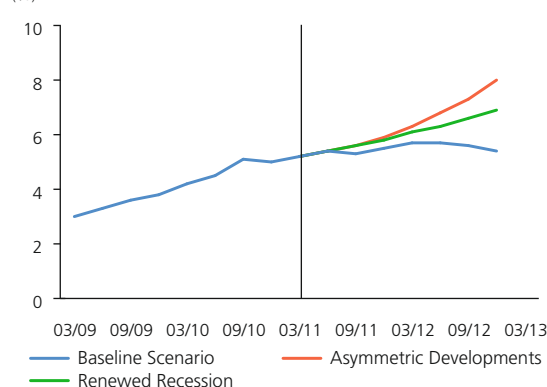
Source: CNB

12M default rate on bank loans to households
(%)
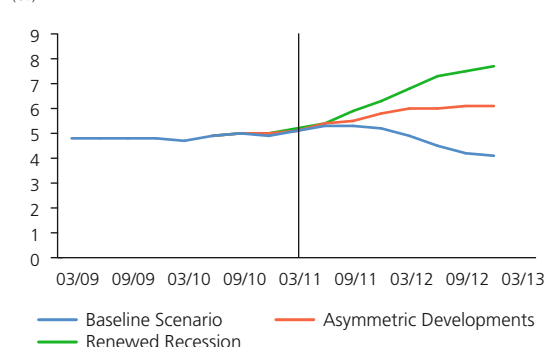
Source: CNB

Relative frequency of mortgage (left) and inability to meet obligations (right) among households

Categories	Household has mortgage (%)	Household has difficulties meeting obligations (%)	Household has difficulties meeting obligations – change from 2008 (p.p.)
Income category			
1st quintile	2.6	7.2	1.3
2nd quintile	5.9	6.2	0.4
3rd quintile	10.7	6.1	2.9
4th quintile	18.3	3.9	0.1
5th quintile	21.1	3.0	0.9
Age of head of household			
19 or below	x	6.6	1.0
20–39	25.5	7.6	1.2
40–59	13.4	6.3	1.7
60 or above	2.1	1.8	0.3
Education attained by household			
Primary	3.2	10.5	1.1
Secondary	12.2	4.7	0.8
Tertiary	20.1	3.6	2.5
Housing type			
Owner-occupier	16.3	3.2	0.5
Open-market rent	x	14.4	2.4
Regulated rent	x	10.5	3.4
Marital status of head of household			
Single	15.1	7.6	0.1
Married	15.2	3.9	1.1
Divorced	9.4	9.3	1.6
Widowed	2.5	2.3	1.0
Overall economic activity of household			
Employed full time	17.7	4.3	1.0
Unemployed	3.1	10.5	2.0
Partially employed	17.8	7.6	1.6
Retired	0.9	0.9	0.5
Total	11.7	5.3	1.1

Source: CZSO (EU-SILC 2008 and 2009), CNB calculation
Note: The figures express the relative frequency of the phenomenon in the given category of households.

Low- and medium-income households face an increased risk
The fiscal austerity measures (wage cuts, a reduction in the number of public sector employees, the abolition of the reduced VAT rate, reduced unemployment benefits and reduced tax rebates for taxpayers)[30] may have a major impact on the solvency of some households. At the same time, below-average-income households are also being adversely affected by growth in essential expenditure related not only with increases in prices of energy (gas and electricity in particular), fuel and water, but also with deregulation of rents and the planned VAT rise. These separate measures will have a negative impact on real household income for a time and may not only affect households' solvency, but also feed back to aggregate consumption and therefore to the economy as a whole.

Results of the stress test of households
Chart II.41 presents the results of a stress test of households based on 2007–2009 data. The observed indicator is the number of households whose debt repayment costs exceed a critical threshold of 50% of net income after deduction of essential expenditure on food, housing, transport and health. This value is then compared with the number of all households with liabilities arising from house purchase loans, consumer credit and rental agreements. The statistics for 2010 and 2011 are a result of a microeconomic simulation that assumes adverse developments in the labour market (an unemployment rate unchanged from 2009 and low nominal wage growth), a fall in wages of public sector employees and an increase in essential expenditure as indicated above. The simulation did not include changes in interest rates or changes in household debt in the survey sample.[31]

Some indebted households will not be able to cover essential expenditure
According to the adverse scenario described above, some indebted households will not be able to maintain their minimum living standard, as their income will not cover their repayments and essential expenditure simultaneously, or will not even cover their essential expenditure alone. The results of the tests based on both historical and simulated data also indicate an increasing variance in the distribution of the debt burden. Some households are minimising their debt, while others are getting deeper into debt. According to the historical data, most of the risk pertains to low-income families, where a large proportion of liabilities stem from low-volume consumer credit. However, the risk in 2011 may also relate to medium-income households, which are repaying mortgage loans to a greater extent.

30 Government Decree No. 44/2011 Coll. and No. 45/2011 Coll.; the amendment of Act No. 96/1993 by Act No. 348/2010 Coll.
31 A smaller impact can be expected on the economic situation of households in reality, as neither the price nor the income elasticity of demand was included in the calculation. However, types of expenditure which show very low income elasticity were selected. The calculations were based on data from the CZSO's household budget surveys conducted in 2007–2009.

The number of discharge petitions is surging

The deterioration in the credit situation of households is associated with sharp growth in the use of "personal bankruptcy", which can no longer be explained by the increased availability of this option. This growth testifies to the negative impact of developments in the labour market, as well as to an increased ability of overindebted persons to resolve their situation voluntarily by means of legislation. According to the Czech Credit Bureau, 8,796 discharge petitions were filed in 2010, of which 6,197 were approved. However, a thousand petitions a month were being filed on average in the latter part of the year.

Shares of insolvent households in total number of indebted households broken down by income category – simulation results
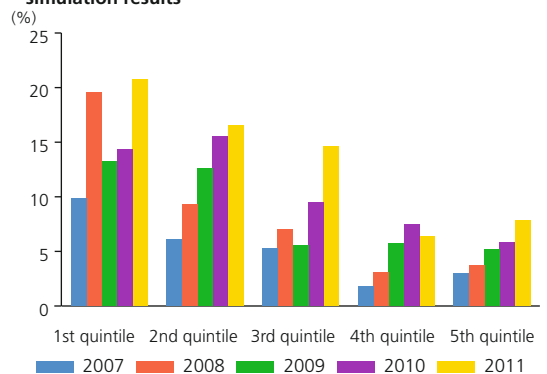
Source: CZSO Household Budget Survey, CNB calculation
Note: The figures for 2010 and 2011 are based on estimates.

Volatility, liquidity and yield in the Czech financial market

Source: Bloomberg LP, CNB, Thomson Reuters, CNB calculation
Note: The volatility index is the sum of the historical volatility of the PX index, the CZK/EUR rate, the 10Y government bond and the 3M PRIBOR. See FSR 2007, Box 4 for the calculation of the liquidity indicator. The yield index is calculated as the arithmetic mean of the yields from the EFFAS index for 3- to 5-year government bonds and the PX index. The indices are normalised over the entire period.

Market liquidity indicators for individual Czech markets
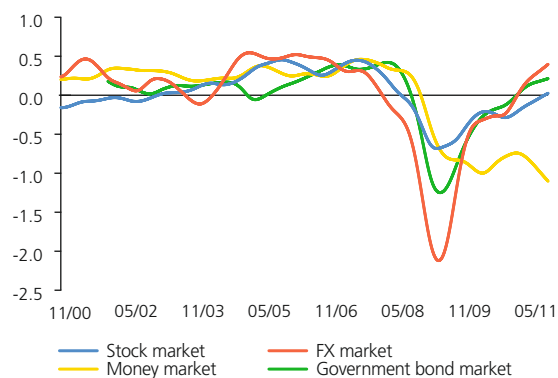
Source: Bloomberg LP, CNB, CNB calculation
Note: See FSR 2007, Box 4 for the calculation of the indicators.

Monetary policy rate and market rates in the Czech Republic
(% p.a.)
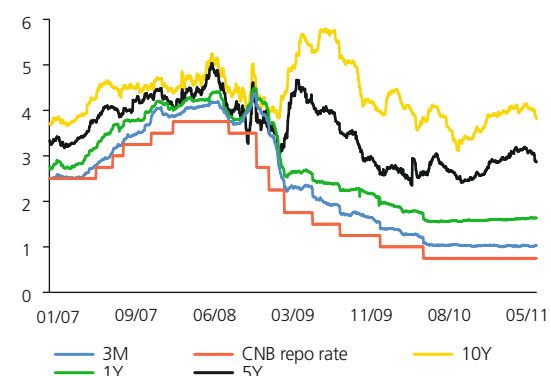
Source: Thomson Reuters
Note: 3M and 1Y = 3-month and 1-year PRIBOR; 5Y and 10Y = 5-year and 10-year Czech benchmark government bond yield.

3 ASSET MARKETS

3.1 THE FINANCIAL MARKETS

International financial markets remain strongly affected by supportive economic policies and extraordinary measures. The global economic recovery and relaxed monetary policies in advanced countries have led to rising equity and commodity prices. Market volatility has decreased and corporate bond spreads have flattened out. Long-term yields are rising again owing to positive expectations regarding economic growth, inflation, and a deteriorating fiscal situation in some countries. The risk of substantial growth in financing costs for the real economy is thus becoming relevant, and the danger of fiscal risk transforming into liquidity and credit risk in the financial sector is also rising owing to the interconnectedness between fiscal developments and the situation of the banking sector. The Czech financial market is being affected by the external situation to a limited extent. The main risk to it remains an escalation of the debt crisis in the euro area and subsequent growth in risk premiums.

The scenario that played out in the Czech financial markets in 2010 and in the first few months of 2011 was similar to that in foreign markets. Market volatility decreased, while liquidity and yields increased slightly (see Chart III.1). Although these aggregate financial market indicators suggest an improvement compared to the highly negative situation observed in late 2008/early 2009, individual market indicators suggest persisting increased nervousness in the markets. An improvement is apparent in the equity and commodity markets, but the indicators for the credit (interbank and bond) markets remain in positions suggesting caution, uncertainty and a lack of confidence in counterparties.

The foreign interbank market is under the influence of adopted measures...

Ever-present concerns about sovereign risk and counterparty risk are significantly hindering any improvement in the redistribution of liquidity through the money markets, especially European ones.[32] The overall turnover of the euro money market decreased for the third consecutive year, amid a continuing partial redirection of liquidity from the unsecured to the secured market, especially at longer maturities. The difference between lending rates on these two money markets remains high, and the share of transactions backed by collateral issued in the same country of origin as the counterparty providing the collateral is declining. This suggests a high level of caution, a persisting lack of confidence in counterparties, and segmentation of countries by sovereign risk level. The ability of some euro area banks to finance themselves in the term money market is very limited, which means they are more or less dependent on the ECB's supportive liquidity

---

32 ECB, *Financial Stability Review*, Box 6, December 2010.

measures.[33] Consequently, a return to the natural situation in the euro money market with no negative impact on the stability of the financial system is still not entirely possible.

…and the domestic market situation is little changed

The situation in the Czech money market was little changed from the previous year, which had been characterised by high volatility and lower liquidity (see Chart III.2). The bid-offer spread remains at around 30 b.p. at all maturities, while the spreads between the monetary policy rate and individual market rates are not narrowing and at longer maturities are even widening (see Chart III.3). Total trading turnover currently remains low compared to 2008 and before, especially at longer maturities (see Chart III.4). Since mid-2010 it has increased slightly but only at the shortest maturities (overnight and one-week). Overnight transactions traditionally strongly dominate the unsecured Czech money market, and at the moment there is clearly no incentive for change and for a shift in activity to longer maturities. In the case of the secured koruna money market, transactions with maturities of one week to three months dominate (see Chart III.5). The increased activity in the secured koruna market relative to the pre-crisis period is eye-catching. Before the crisis this type of market was hardly used at all. The shift towards longer-maturity operations in the secured market and the stagnation of such operations in the unsecured market is probably due to the aforementioned credit risk (see Chart III.6), which, as in other countries, is being driven by growing counterparty credit risk caused by increased banking portfolio credit risk (see Box 3).

Box 3:

PRIBOR QUOTATIONS AND THE INTERBANK MARKET RISK PREMIUM

The financial crisis had a negative effect on interbank markets in many countries and led to growth in the risk premium contained in interbank rates on unsecured deposits (see Chart III.6).[34] As a result, identification of the components of this premium and of how they changed during the crisis has been the subject of numerous research projects.[35] The risk premium is usually explained by two factors, namely counterparty risk (a counterparty may not be able to pay its debts in the future)

---

33 For these reasons the ECB is continuing to conduct certain extraordinary operations, such as three-month longer-term refinancing operations with a fixed rate tender procedure with full allotment. The ECB also discontinued its longer-maturity (6M and 1Y) operations, which led to a fall in the use of the deposit facility.

34 There was also parallel growth in other risk premiums, for example in client rates, including in the Czech Republic (see the thematic article *Retail Credit Premiums and Macroeconomic Developments* in this Report).

35 Acharya, V., Merrouche, O. (2010): *Precautionary Hoarding of Liquidity and Inter-Bank Markets: Evidence from the Sub-prime Crisis,* NBER WP No. 16395; Nobili, S. (2009): *Liquidity Risk in Money Market Spreads,* ECB Workshop on "Challenges to Monetary Policy Implementation Beyond the Financial Market Turbulence", November 2009; Taylor, J. B., Williams, J. C. (2008): *A Black Swan in the Money Market?* NBER WP No. 13943; Michaud, F. L., Upper, C. (2008): *What Drives Interbank Rates? Evidence from the Libor Panel*, BIS Quarterly Review, March 2008.

CHART III.4

Koruna deposit transactions in the interbank market
(CZK billions; average daily turnovers)
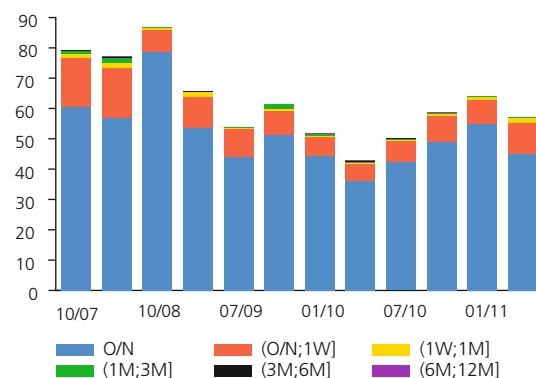
Source: CNB
Note: O/N = overnight, 1W = 1-week, 1M = 1-month, 3M = 3-month, 6M = 6-month, 12M = 12-month.

CHART III.5

Koruna repo operations in the interbank market
(CZK billions; average daily turnovers)
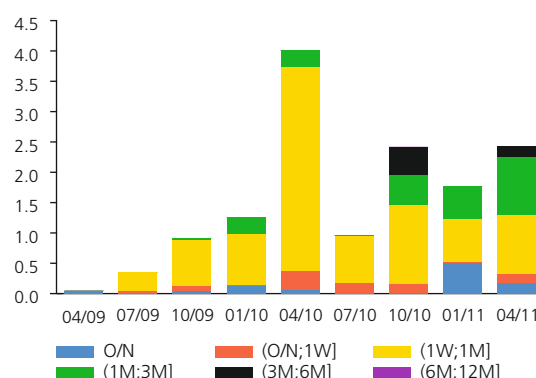
Source: CNB
Note: O/N = overnight, 1W = 1-week, 1M = 1-month, 3M = 3-month, 6M = 6-month, 12M = 12-month.

CHART III.6

Risk premiums in the interbank market
(%)
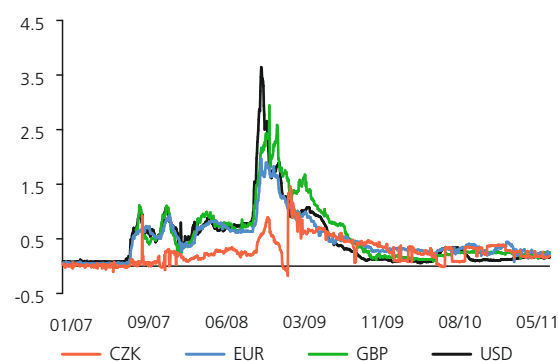
Source: Thomson Reuters, CNB calculation
Note: Difference between the 3M interbank rate and the 3M OIS of the relevant currency.

CHART III.1 BOX

Coefficient of variation of the 3M PRIBOR quotes
(%; standard deviation of quotations weighted by mean)
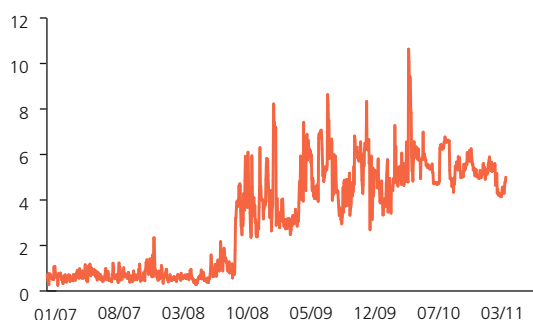
Source: Thomson Reuters, CNB calculation

CHART III.2 BOX

Relationship between banking liquidity and the risk premium in the interbank market
(%; x-axis: difference between 3M PRIBOR quotations and CNB 2W repo rate; y-axis: loans/deposits)

Crisis period (Sep 2008–Feb 2010)
Pre-crisis period (Jan 2005–Sep 2008)
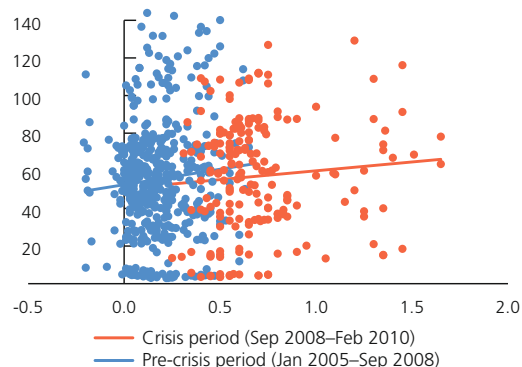
Source: CNB, Thomson Reuters, CNB calculation

and the balance-sheet liquidity of banks acting as creditors in the interbank market (liquidity hoarding in a situation of increased uncertainty). The balance-sheet liquidity of banks is additionally influenced by market liquidity in relevant financial markets.[36] Numerous empirical studies have shown that while counterparty risk was relevant at the start of the crisis in the US, the problems in the interbank market in Europe manifested themselves more as liquidity problems linked with liquidity hoarding in banks' balance sheets.

As the PRIBOR is a reference rate calculated from the quotations of 11 reference banks,[37] a microeconomic analysis drawing on the quotations of the individual banks can help to explain movements in the risk premium in those rates. The PRIBOR represents the rate of interest at which banks, "on average", are willing to lend to their counterparties, i.e. to other reference banks. The evolution of the coefficient of variation of the individual quotations reveals the different behaviour of reference banks before and after the collapse of Lehman Brothers (see Chart III.1 Box). Until mid-September 2008, the banks behaved more or less the same and the quoted rates did not differ significantly from each other. The collapse of Lehman Brothers represents a milestone for change in banks' behaviour. Not only did PRIBOR quotations by reference banks increase as a result of the crisis, they also started to show greater dispersion across the reference banks.

Preliminary analyses making use of the unique links between the reference banks' individual quotations and their individual balance-sheet indicators (NPL ratios, ratios of quick assets in balance sheets, loan-to-deposit ratios, etc.) and other variables describing developments abroad (including in parent companies) and in relevant financial markets (the evolution of market liquidity and long-term bond yields) reveal that liquidity factors played a role in the Czech Republic as well, especially at the start of the crisis. As a result of the increased uncertainty and fall in liquidity in the financial markets, with the "real" liquidity of assets in banks' balance sheets falling, there was an increase in domestic banks' unwillingness to lend to the unsecured interbank market (see Chart III.4). This was reflected in higher interest

---

36 The bilateral effect between balance-sheet and market liquidity in the Czech financial system is analysed, for example, by Geršl, A., Komárková, Z. (2009): *Liquidity Risk and Banks' Bidding Behavior: Evidence from the Global Financial Crisis*, Czech Journal of Economics and Finance, Vol. 59, No. 6, pp. 577–592.

37 The list of quoting banks is public and contains the following institutions: all four large banks (Česká spořitelna, Československá obchodní banka, Komerční banka and UniCredit Bank ČR), representatives of medium-sized and small banks (Raiffeisenbank and LBBW Bank CZ) and significant branches of foreign banks (Crédit Agricole, Citibank Europe, Deutsche Bank, ING Bank and The Royal Bank of Scotland). These banks account for around 70% of the assets of the banking sector as a whole.

rate quotations (see Chart III.2 Box).[38] Since the liquid assets of domestic banks consist mostly of domestic bonds, the fall in liquidity in the bond market at the end of 2008 (see Chart III.2) may have been related to a large extent to the increase in the risk premium in the unsecured interbank deposit market. During 2009 and 2010, when the risk premium in the unsecured interbank market fell sharply but remained high (see Chart III.6), counterparty risk was more prevalent than liquidity factors in a context of rising credit risk in banks' balance sheets (see section 4.1).

The generally low activity in the Czech money market is probably due to the still low incentive for Czech banks to finance this market. By international comparison, the banking sector remains sufficiently liquid with the use of conservative sources of financing (see section 4.1) and makes hardly any use of the CNB's temporary liquidity-providing repo operations despite the increased tension in this market (see Chart III.7).[39] On the other hand, the behaviour of banks in liquidity-absorbing operations has remained unchanged since the start of the crisis. In the pre-crisis period, banks often bid in the repo tenders to deposit liquidity with the CNB at rates below the repo rate,[40] whereas since the start of 2009 virtually all banks have been bidding only at the highest possible rate (i.e. the repo rate). This may signal expectations of growth in the relatively low nominal short-term rates.

The money market will be significantly affected by the currently planned and much debated introduction of two new liquidity standards for the financial sector (the LCR and the NSFR; more details in Box 7 in section 4.1). In simple terms, these liquidity standards are targeted on the one hand at encouraging the holding of risk-free deposits with the central bank or government bonds (the LCR) and on the other hand at promoting stable sources of financing (NSFR). Both standards could to some extent affect market liquidity and activity in the unsecured money market and probably shift both of them to secured markets. Although the standards are not planned to be introduced in several years, they could have an impact on the markets much earlier.

38 The spread between the 3M PRIBOR and the CNB's 2W monetary policy repo rate was used as the proxy for the risk premium for the analysis in this box. There were two reasons for this choice: (1) the same spread is used in the monetary policy modelling framework (see CNB *Inflation Report II/2011*), and (2) the premium is easier to communicate, even though in this case and with regard to various maturities it also contains expectations about changes in the CNB's monetary policy rates and a general term premium. However, the effects of the last-mentioned factors were taken into consideration in the analysis.
39 In January 2011 the CNB modified the extraordinary liquidity-providing monetary measures it had introduced in October 2008 to support the domestic financial market during the global financial crisis. The changes, introduced to reflect current market conditions, involved the discontinuation of the 3M liquidity-providing repo operations at the end of 2010 and the extension of the 2W liquidity-providing repo operations at least until the end of 2011.
40 Geršl, A., Komárková, Z. (2009): *Liquidity Risk and Banks' Bidding Behavior: Evidence from the Global Financial Crisis,* Finance a úvěr – Czech Journal of Economics and Finance, Vol. 59, No. 6.

CHART III.7

Open market operations and volume of currency in circulation
(CZK billions)

Sterilisation — Currency in circulation — Liquidity-providing operations (right-hand scale)
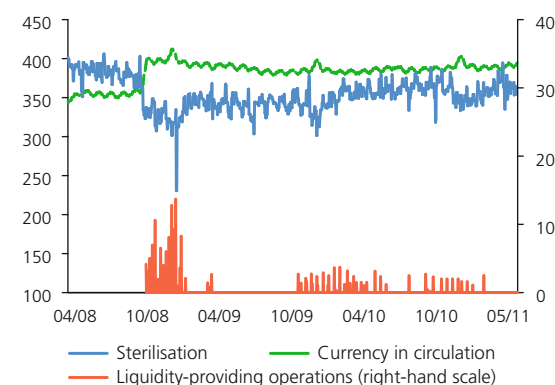
Source: CNB

CHART III.8

Term spreads for selected economies
(%)

CZ — EMU_AAA — GR — SE — US
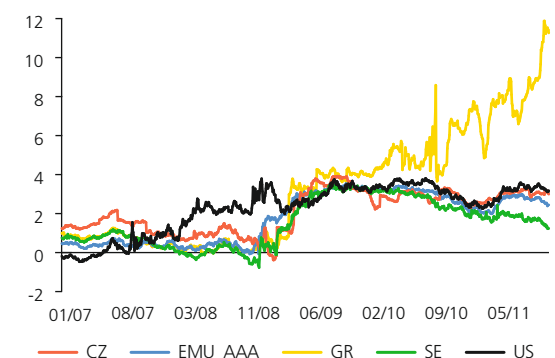
Source: Thomson Reuters, CNB calculation
Note: The term spread is the difference between the 10Y government bond yield and the 3M T-bill yield. AAA = rating of relevant debt instrument.

CHART III.9

Sovereign ratings of selected countries
(long-term foreign currency rating; Standard&Poor's)
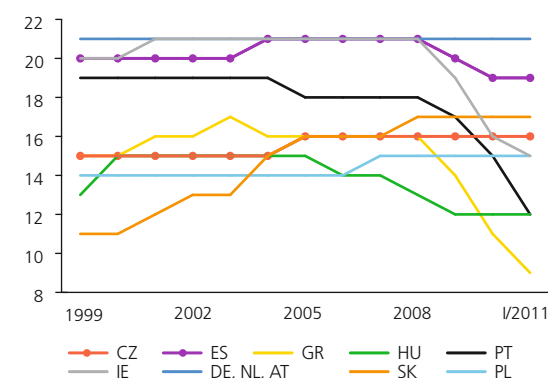
Source: Standard & Poor's
Note: Long-term S&P rating conversion scale: 21 = AAA, 16 = A, 11 = BB+, 6 = B-, 0 = D.

CHART III.10

Ten-year government bond yields of selected countries
(1 January 2010 = 100)
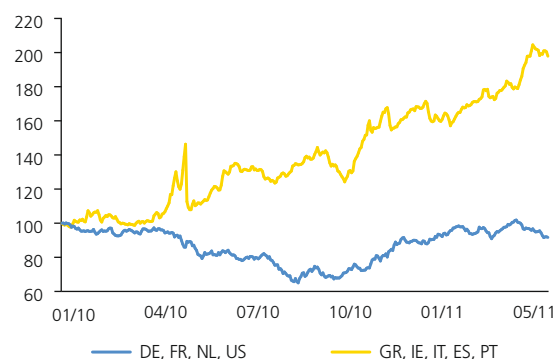
Source: Thomson Reuters, CNB calculation
Note: Arithmetic means for country groups.

Yield curves remain upward sloping and relatively steep…

Yield curves on the interbank market and also on the government bond market are still rather steep (see Chart III.8). A flattening of these curves is currently being prevented by deferral of the monetary policy tightening cycle by central banks and by concerns regarding the future evolution of sovereign risk, accompanied by several sovereign rating downgrades (see Chart III.9) and consequent growth in long-term rates since the middle of last year (see Chart III.12). The rise in long-term rates was due to a more positive outlook for economic growth, which started to push long-term real interest rates upwards (especially in the US), as well as to increased inflation expectations (especially in the euro area). The exception is Sweden, where the bond yield curve is flattening out slightly (see Chart III.8), mainly because of a rise in short-term rates. The monetary policy rate also increased in the euro area in April this year, although the transmission almost halted at the one-month maturity level. At longer maturities there was almost no effect and the euro area government bond yield curves remain steeper.

…because of the continuing sovereign debt crisis

The return to rising long-term rates was triggered by the events of last spring regarding the threat of default on the Greek government debt. These events spilled over to other countries in public finance difficulties, even though the euro area member states together with the IMF provided Greece with a conditional loan of EUR 110 billion. Owing to the "flight to security" effect, decoupling of government bond yields started to occur (see Chart III.10). While government bond yields in fiscally more stable countries (such as France, Germany, the Netherlands and the US) fell, yields in more risky countries (such as Ireland, Portugal and Greece) rose sharply, and their upward trend – driven primarily by a rising credit premium (see Chart III.11) – was not reversed even by the EU's rescue mechanisms (see Box 4).

Box 4:

EURO AREA RESCUE PROGRAMMES

In a situation of rising volatility in the euro market and the euro area government bond market, EU representatives in May 2010 unveiled a plan to create a potential financial assistance mechanism for euro area governments unable to refinance themselves on the market under satisfactory conditions. This support mechanism is based on the potential provision of credit to the countries concerned from three sources.

First, an European Financial Stabilisation Mechanism (EFSM) was set up for this purpose. The EFSM enables the European Commission to borrow up to EUR 60 billion in the financial markets and to use this money to lend to EU Member States. The EFSM was put in place for as long as it will be needed. On 5 January 2011, an inaugural EUR 5 billion issue of bonds took place successfully as part of the financial support package

agreed for Ireland. Bonds issued under the EFSM are guaranteed by the Commission, which uses the EU budget as collateral. The second source is the European Financial Stabilisation Facility (EFSF), whose founding members and potential users are euro area countries and whose effective capacity is EUR 440 billion.[41] The EFSF was officially established on 7 June 2010 and successfully placed its inaugural bonds for an amount of EUR 5 billion on 25 January 2011. As the EFSF was established for a limited tenure only, the European Council this year approved the establishment of a European Stability Mechanism (ESM) as its permanent successor. The ESM is due to become operational in July 2013 with total subscribed capital of EUR 700 billion (EUR 80 billion, of which will be paid up gradually and the remaining EUR 620 billion will be callable capital and guarantees of the euro area member countries). The effective lending capacity will be EUR 500 billion and the rates on loans provided will be 200–300 basis points above the financing costs. The third source is IMF loans totalling up to EUR 250 billion.

The May 2010 crisis package also included a Securities Market Programme launched by the ECB. This allows the ECB to buy government bonds of euro area countries for a limited period of time. Government bonds totalling EUR 77 billion have so far been purchased under this programme.

The only country to have obtained credit from the EFSM and EFSF so far is Ireland,[42] which has borrowed a total of EUR 85 billion (EUR 22.5 billion from the EFSM and EUR 17.7 billion from the EFSF). Portugal has also requested financial assistance. The Czech Republic will provide guarantees only to the EFSM. Its contribution equals its share in the EU budget, which is around 1.23%, i.e. approximately EUR 738 million in the event of full use of the EFSM's capacity. However, financial payment would only be made if a state defaulted on its loan from the EFSM. In specific cases of default, the Czech Republic would have to contribute CZK 6.7 billion to the EU budget under the financial assistance package approved for Ireland in November 2010 and CZK 7.7 billion under the financial assistance package approved for Portugal in May 2011. The Czech Republic could also potentially incur a financial obligation due to defaults on loans provided by the IMF (the quota for the Czech Republic is 0.42%).

CHART III.11

Five-year sovereign CDS spreads of European governments
(b.p.)
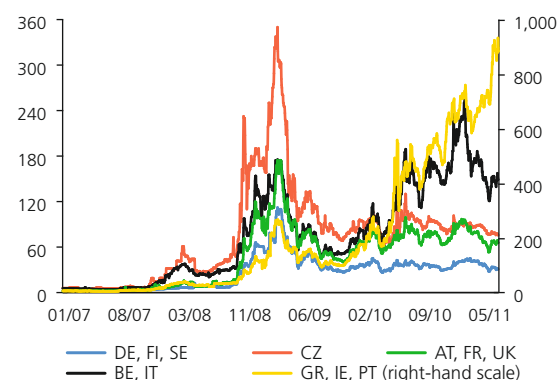
Source: Bloomberg LP, CNB calculation
Note: Arithmetic means for country groups.

CHART III.3 BOX

Exchange rates of the koruna and the euro against the dollar
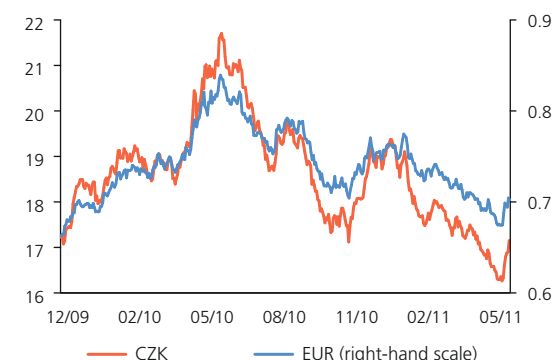
Source: Thomson Reuters

41 The original effective capacity was considerably lower owing to the creation of cash reserves, cash buffers and a 120% guarantee on each loan, and was therefore increased in March of this year.
42 Greece's total borrowing of EUR 110 billion was provided by the euro area member states (EUR 80 billion) and the IMF (EUR 30 billion) before the establishment of the EFSM and the EFSF and so is not a part thereof.

CHART III.12

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

Source: Thomson Reuters, CNB calculation
Note: Arithmetic means for country groups.
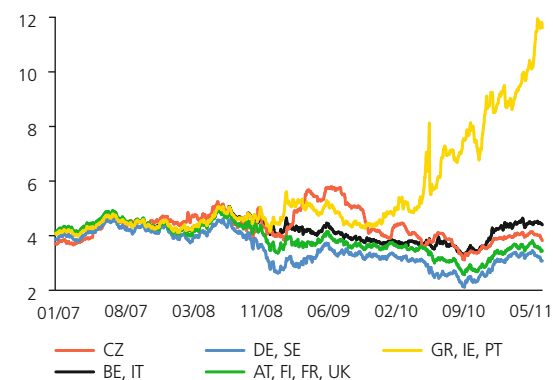
CHART III.13

Comparison of the ratio of gross government debt to GDP and the yield for selected countries
(%)

Government debt/GDP (2010, right-hand scale)
Yield in April 2010

Source: IMF, Thomson Reuters, CNB calculation
Note: The yield is the arithmetic mean of the yield on the 5Y government bond of the relevant country for April.
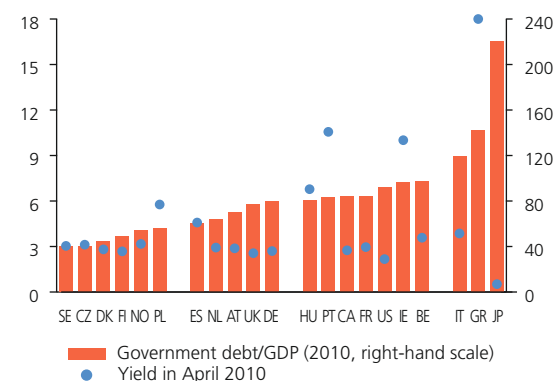
The plans to introduce, and the actual introduction of, the aforementioned institutions and mechanisms helped to reduce the tensions in bond markets last spring (see Chart III.10 and Chart III.3 Box). In an attempt to help reduce the risk of a further escalation of the sovereign debt crisis, the EFSF and the ESM have this year been allowed to buy government bonds in the primary market in exceptional cases, and the capacity of the EFSF has been increased.

However, the introduction of these rescue systems has not led to a significant reduction in credit premiums for European sovereign debt (see Chart III.11). Uncertainty persists in the markets in the sense of spillover of the government crises to other euro area countries with strained public finance situations, such as Spain and Italy, and also to fiscally more stable countries with high exposures to the problem countries. Concerns are therefore arising mainly because the capacity of the rescue systems may not be sufficient in the event of such spillover. It is also necessary to take into account the fact that the assistance from rescue systems has to be supported by euro area member states. Consequently, the growing unwillingness of some stable and fiscally responsible countries to contribute constantly to the bailout of partners who have been fiscally less responsible in the past cannot be ignored.

In the course of the sovereign debt crisis, investors have gradually ranked Czech bonds in the safe country category…
The developments in the Czech government bond market suggest that investor perceptions have changed since the start of the crisis (see Chart III.11). At the onset of the sovereign debt crisis, investors added Czech bonds to the category of risky countries and the risk premium as measured by CDS spreads therefore increased significantly. As the crisis progressed, however, investors started to differentiate between countries in more detail, and given that the current situation and outlook for Czech public finance were among the more moderate in the European context (see section 2.1), they ranked the Czech Republic among the countries with stable outlooks (see Box 5). The crises in Greece, Ireland and Portugal revealed something that had been identified as a risk for the Czech Republic in FSR 2009/2010, namely that the financial markets are asymmetrically far less tolerant of smaller countries showing public finance deficits than of larger ones doing the same (see Chart III.13), even though their structural primary deficits are not on the same scale as those of large states (see Chart II.21). This asymmetric phenomenon can be explained partly by the greater appeal of the much more liquid markets of large countries (the US, the UK) and by the effect whereby the sovereign debt refinancing need in large countries, which are regarded as too powerful to fail, crowds out demand for small countries' bonds. In small countries these effects may exert upward pressure on sovereign debt financing costs and therefore make their fiscal problems more difficult to solve (see Box 5).

Box 5:

QUANTILE ANALYSIS OF CROSS-COUNTRY CONTAGION EFFECTS BASED ON CDS SOVEREIGN SPREADS

The continuing debt crisis in the euro area reopened the debate about the role played by rating agencies during the crisis and the interdependencies between various financial markets as regards the transmission of shocks. During the crisis, the ratings of several states were downgraded repeatedly (see Chart III.9), yield and CDS sovereign spreads widened (see Charts III.11 and III.12) and stock markets came under increased pressure (see Chart III.15). Although only some sovereign ratings were downgraded, virtually all financial markets came under pressure. Owing mainly to psychological contagion, the correlation between European sovereign CDS premiums increased sharply after the collapse of Lehman Brothers,[43] when negative sovereign risk perceptions spread even to countries whose financial systems had been until then affected by the crisis either not at all, or – as in the case of the Czech Republic – only marginally.[44] Consequently, independence can be observed for a time between the market and economic fundamentals of certain – often structurally different – countries. The evolution of sovereign CDS spreads raises the question of to what extent the pricing of such spreads is affected by concerns about default of individual countries and to what extent it is governed by common time-varying factors. The high CDS premium seen in many countries during the financial crisis may indeed have been due to common factors (growing risk aversion on the part of investors, drying up of market liquidity, global recession and concerns about possible rating downgrades) rather than to actual default losses.[45]

In the integrated financial world there are several potential channels through which sovereign risk shocks can be transmitted from one country to another. These channels include the "mere" negative impact of changes in sovereign ratings.[46] The purpose of this box is to demonstrate how much the fiscal problems in peripheral parts of the euro area have transmitted to the Czech

Pre-crisis relationship of sovereign CDS spreads between selected country groups and the Czech Republic
(b.p.; x-axis: CZ; y-axis: selected country groups; May 2006–August 2007)

Source: Bloomberg LP, CNB calculation
Note: Arithmetic means for country groups. 5Y CDS spreads were used for the comparison.

Relationship of sovereign CDS spreads between selected country groups and the Czech Republic during the debt crisis
(b.p.; x-axis: CZ; y-axis: selected country groups; March 2010–May 2011)

Source: Bloomberg LP, CNB calculation
Note: Arithmetic means for country groups. 5Y CDS spreads were used for the comparison.

---

43   For more details see *Financial Stability Report 2009/2010*, Box 4, or Banque de France (2009): *Financial Stability Review*, Box 1, September.
44   Between 2008 and 2009 several advanced countries provided government guarantees for banks' liabilities. This resulted in a fall in bank CDS spreads, because the default risk was transferred from banks' balance sheets to fiscal balance sheets. The sovereign CDS spreads of the governments providing such financial guarantees therefore logically increased.
45   Fontana, A., Scheicher, M. (2010): *An Analysis of Euro Area Sovereign CDS and Their Relation with Government Bonds,* WP No. 1271, ECB.
46   Blundell-Wignall, A., Slovik, P. (2010): *The EU Stress Test and Sovereign Debt Exposures*, OECD WP on Finance, Insurance and Private Pensions, No. 4; Ehrmann, M., Fratzscher, M, Rigobon, R. (2009): *Stocks, Bonds, Money Markets and Exchange Rates: Measuring International Financial Transmission*, Journal of Applied Econometrics; Gande, A., Persey, D. C. (2005): *News Spillovers in the Sovereign Debt Market*, Journal of Financial Economics, Elsevier, Vol. 75(3), pp. 691–734, March.

Pre-crisis relationship of sovereign CDS spreads between selected country groups and the Czech Republic
(b.p.; x-axis: CZ; y-axis: selected country groups; May 2006–August 2007)

Source: Bloomberg LP, CNB calculation
Note: Arithmetic means for country groups. 5Y CDS spreads were used for the comparison.

Relationship of sovereign CDS spreads between selected country groups and the Czech Republic during the debt crisis
(b.p.; x-axis: CZ; y-axis: selected country groups; March 2010–May 2011)

Source: Bloomberg LP, CNB calculation
Note: Arithmetic means for country groups. 5Y CDS spreads were used for the comparison.
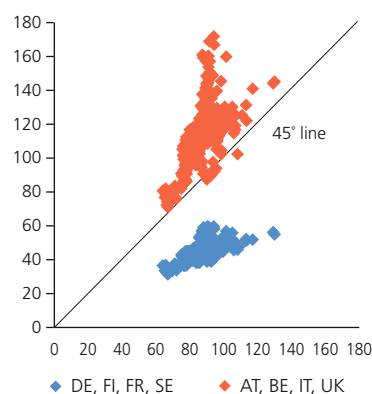
Co-movement of default risks of various country groups and the Czech Republic
$(\beta_{\tau,j})$

COUNTRY (j)	QUANTILE (τ)				
	5th	25th	50th	75th	95th
DE, FI, FR, SE	0.85	0.78	0.73	0.64	0.54
AT, BE, IT, UK	0.76	0.71	0.66	0.63	0.75
IE, PT	0.56	0.41	0.38	0.34	0.37
GR	0.51	0.39	0.34	0.31	0.37

Source: Bloomberg LP, CNB calculation
Note: The results are significant at the 1% level.

government bond market, or more precisely to what extent the default risk of Czech sovereign debt is affected by the default risk of other sovereigns (in our case also groups of sovereigns)[47] and to what extent by common market factors.

Following IMF (2009),[48] quantile analysis was used to investigate the contagion effect. This was because the relationship between the individual sovereign default risks is non-linear (see Charts III.4–7 Box)[49] and this method is a suitable technique that can explain apparent non-linearities in the data. Standard regression only provides 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 quantile, or in a greater deviation from the mean of the distribution function.

Daily data on the five-year CDS spreads of the countries under review for the period of May 2006 to April 2011 were used to express the sovereign credit risk premium, and, like IMF (2009, p. 16), we used market indicators of liquidity, volatility, default risk and the business cycle to express the common aggregate risk factor. The contagion effect was measured using the following equation:

$$CDS_{CZ} = \alpha_\tau + \sum_i^K \beta_{\tau,i} R_i + \beta_{\tau,j} CDS_j \ ,$$

where the credit premium for Czech sovereign debt (CDS_{CZ}) is expressed as a function of the credit premium for sovereign debt of the other country under analysis (CDS_j) after correcting for the effect of the common aggregate risk factor (R_k) for different quantiles (τ). In other words, the estimated parameter $\beta_{\tau,j}$ expresses how the sovereign debt default risk of sovereign j effects the Czech debt default risk (directly and indirectly) in different quantiles.

The analysis (see Table III.1 Box) revealed that in the period of calm (defined as the 5th quantile) the credit premium reacts to Czech sovereign debt in the same way as to the sovereign debt of Germany, Finland, France and Sweden, whereas in the period of

47 Three groups of European countries were created for the purposes of the analysis: (i) those with the lowest CDS spreads (DE, FI, FR, SE), (ii) those with similarly high CDS spreads as the Czech Republic (AT, BE, IT, UK), and (iii) those with high CDS spreads (IE and PT). The relationship between the Czech Republic and Greece was then analysed separately.
48 IMF (2009): *Global Financial Stability Report*, April.
49 It is clear from Charts III.4–III.7 Box that the co-movement of the risk premiums of the Czech Republic and the selected country (group of countries) is non-linear, because during the period of higher credit risk levels (see Charts III.5 and III.7, expertly characterised as a period of crisis) the credit premium of the Czech Republic reacts more or less than proportionately to movements in the credit premium of the other country (group of countries), unlike in the period when the credit risk level is lower (see Charts III.4 and III.6, expertly characterised as a period of calm).

market tension (defined as the 95th quantile) it reacts differently in relation to those countries. In other words the Czech premium shows different sensitivity to a negative market situation. The fact that the data sample covers "only" the present crisis makes the explanation considerably simpler. 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 were exposed to increased demand by comparison with other countries (see section 3.1). Another example is the co-movement of Czech and Greek sovereign risk, which also decreases with increasing quantile number. However, in the period of calm only around 50% of the effect transmits from Greece to the Czech Republic, and in the crisis period the figure is even lower (around 40%). The interpretation here differs from that of the relationship with the premium of stable countries. In the case of Greece, in contrast to the Czech Republic, there is a high probability of restructuring of sovereign debt. The most stable Czech CDS relationships can be seen with countries such as Belgium, Italy, Austria and the UK (almost identical values across quantiles). Although these countries are more indebted than the Czech Republic (see Chart III.13), their financial markets are larger, deeper and more liquid. These effects are also relevant to the determination of the risk premium. All this implies that the Czech sovereign credit premium is affected more by market conditions and effects than by concerns about potential debt restructuring.

A further escalation of the sovereign debt crisis in the euro area cannot be ruled out

Although the debt crisis in the euro area is spreading across economies differently and is currently very subdued thanks to accommodative policies, the risk of contagion is still relevant. The combination of rising deficits, high refinancing volumes (see section 2.1) and unremitting market concern about banks exposures to countries mired in fiscal crisis (see Table III.1) will probably continue to put primary government bond markets under pressure. Moreover, if any of the peripheral euro area countries with fiscal problems is actually forced to restructure its debt, the crisis could spill over via losses in bank balance sheets to other and larger, currently stable, countries (such as Germany, France or Spain). From there the turbulence could spread through the financial markets to the entire global financial system (e.g. the USA or Japan), giving rise to pressure for a renewed energetic response by central banks. In addition, it is evident that although the advanced economies are still able to finance themselves in the markets, demand for sovereign debt remains very volatile (see Chart III.14).

Stock markets recorded strong growth…

The continuing implementation of loose monetary policy and the introduction of rescue systems (see Box 4), accompanied by the improving macroeconomic outlook and consistently better-than-

TABLE **III.1**

Exposures of foreign banks to government debt of peripheral economies
(EUR billions; end of 2010 Q3)

	GR	GR, IE, PT
TOTAL EXPOSURE	54	109
of which:		
German banks	19.7	28.4
French banks	14.8	31.8
Spanish banks	0.4	7.3
Italian banks	1.9	3.2
UK banks	2.4	9.3
Japanese banks	0.4	2.5
US banks	1.3	3.7
Other banks	12.8	23.2

Source: BIS, DB

CHART **III.14**

Volatility in the financial markets
(%; moving monthly average)
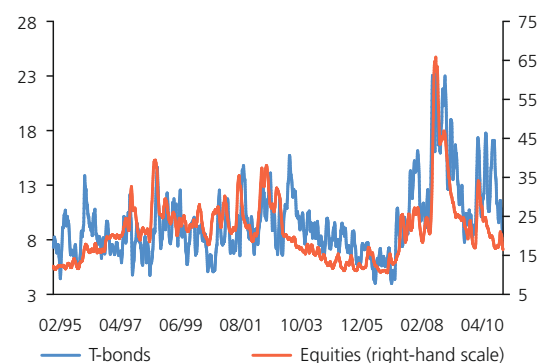
Source: Bloomberg LP, CNB calculation
Note: Equity volatility is measured by the VIX (Chicago Board Options Exchange Volatility Index), which reflects the market estimate of future volatility based on the weighted average of implied volatilities of pre-specified options. Bond volatility is calculated as the 10-day volatility of the index of prices of 10-or-more-year T-bonds in the USA.

Stock indices
(1 January 2010 = 100)
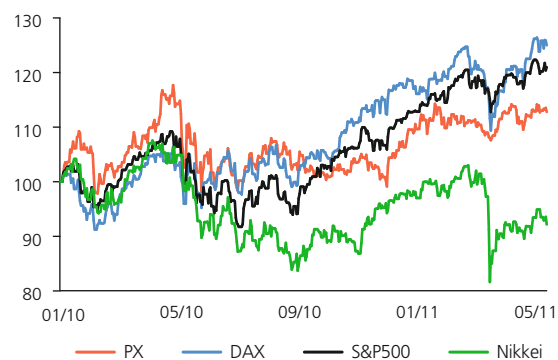
Source: Bloomberg LP, CNB calculation

Comparison of the S&P500 and PX stock indexes and their P/E ratios
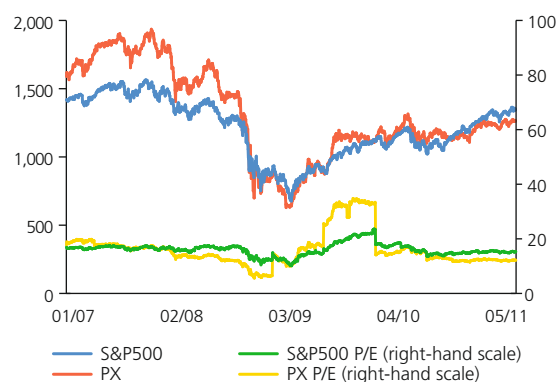
Source: Bloomberg LP, CNB calculation

Evolution of commodity indexes over the last ten years
(monthly data)
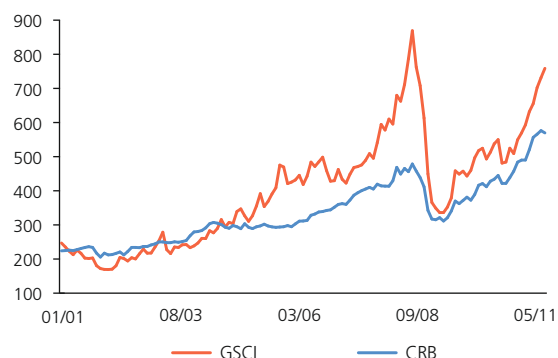
Source: Bloomberg LP, CNB calculation
Note: CRB and GSCI are commodity indexes (Reuters Commodity Research
          Bureau and S&P Goldman Sachs Commodity Index).

expected corporate profits, is increasing the incentive for investors to switch from fixed-yield assets to equities in their search for yield. A significant growth trend has been observed in the stock market since last May (see Chart III.15). This growth is being accompanied by a renewed reduction in volatility, which increased significantly above its long-term average during May and June 2010 (see Chart III.14). The relative values of stock indices are also close to their long-term averages (see Chart III.16). The Czech stock market does not stray significantly from the trends in foreign equity markets and can be expected to continue copying them.

The persisting uncertainty about how events will unfold in the countries of North Africa and the Arabian Peninsula is currently creating a risk of flat or falling stock markets. If the conflicts were to spill over into Saudi Arabia, which together with Russia is the largest oil producer in the world, stock markets could come under more significant pressure. Other potential risks to the stock markets include the possibility of a "hard landing" in some Asian emerging markets, especially in China, where the local authorities are trying to tackle rising inflation (currently driven primarily by rising food prices), and in particular high and constantly rising property prices.

...as did commodity prices
An upward trend has also been visible in the commodity markets since the start of 2009 (see Charts III.17 and III.18, and Box 6). The price of gold, for example, has been rising sharply last year and this year (see Chart III.19), as have the prices of certain other precious metals. As a result, gold ETFs,[50] for example, have recorded an enormous inflow of funds, and this, in turn, has become one of the factors driving up the gold price. Last spring, after investors and economists began to get concerned about a possible major downturn in global economic growth (due to a debt crisis, a risk of a double-dip recession in the US or a risk of a sharp slowdown of the Chinese economy), the previous strong growth in prices in the commodity markets was replaced by a temporary decline. During the summer these concerns began to ease and prices of most commodities started to rise again. This rise continued until March of this year (see Chart III.18).

Geopolitical tensions and the global recovery are driving up energy commodity prices
The global economic recovery, the unrest and tension in some countries of North Africa and the Middle East and the nuclear disaster at Fukushima in Japan caused the prices of energy commodities, especially oil, to escalate in the first quarter of this year (see Chart III.20). Prices of most industrial commodities (in particular basic metals and iron ore) stabilised at high values, but saw no further escalation in the first quarter of this year (see Chart III.20).

---

50 Commodity ETFs (exchange-traded funds) are exchange-traded investment funds that hold commodities or commodity derivatives in their portfolios. These funds are usually traded very close to their net asset value. The first commodity ETF was created in 2003 and was based on gold.

Prices also surged in food commodity markets as it became increasingly clear during the second half of last year that some major world regions (for example Russia) would record poor harvests due to bad weather (see Chart III.20).

Upside and downside risks for commodity prices

The main upside risk for further growth in energy commodity prices is the risk of unrest spreading from North Africa and the Arab Peninsular to other states. Whereas Libya accounts for 2% of global oil output, Iran and Saudi Arabia, for example, account for 5.3% and 12% respectively. A fall in production in either of these countries would therefore be difficult to replace with increased production in other countries and would have a huge impact on oil prices with potential knock-on effects on global (and Czech) economic growth. Commodity prices are also being pushed up by persisting growth in demand in emerging economies. However, the risks of the movements in commodity prices may be also on the downside. Some restrictive economic measures (e.g. the monetary policy measures introduced in China) could slow economic growth and thereby cause a sudden turnaround and fall in commodity prices. This, in turn, could be reflected in increased volatility and nervousness in other financial markets (see Box 6).

Box 6:

WHY HAVE COMMODITY PRICES SURGED OVER THE LAST DECADE AND WHY ARE THEY SO VOLATILE?

The debate about the sharp growth, and volatility, of commodity prices (see Chart III.17) has been going on for several years now. The fundamental and widely accepted explanation is the buoyant GDP growth in emerging economies.[51] The process of industrialisation and urbanisation in these countries is causing increased demand for commodities. Since per capita consumption of most commodities in these countries is still very low by comparison with the advanced nations, there is significant space for further structural growth in this demand. Empirical experience over at least the last decade has shown that mining companies cannot keep up with rising demand, as a result of which the balance between supply and demand in most commodity markets is a factor supporting further price growth. Expectations that new sources of supply can be found and exploited only at higher cost may be having a similar effect.

Another factor pushing up commodity prices is the low real interest rate environment[52] typical of the last decade. Hotelling's 1930s model predicted a negative correlation between real

---

CHART III.18

Evolution of commodity indexes since the collapse of Lehman Brothers
(monthly data)
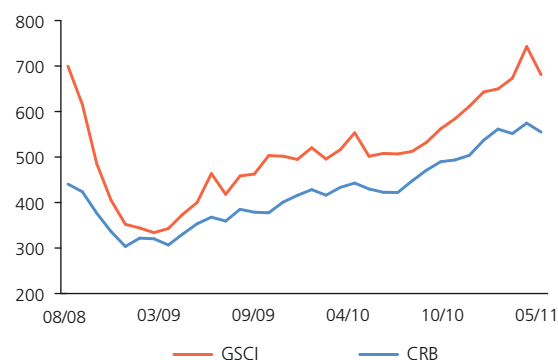
Source: Bloomberg LP, CNB calculation
Note: CRB and GSCI are commodity indexes (Reuters Commodity Research Bureau and S&P Goldman Sachs Commodity Index).

CHART III.19

Gold prices
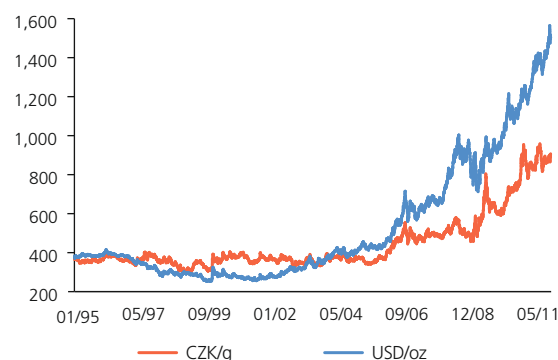
Source: Bloomberg LP, CNB calculation
Note: Gold prices are given in US dollars per troy ounce and in Czech korunas per gram.

CHART III.20

Prices of selected commodities over the past 13 months
(15 April 2010 = 100)
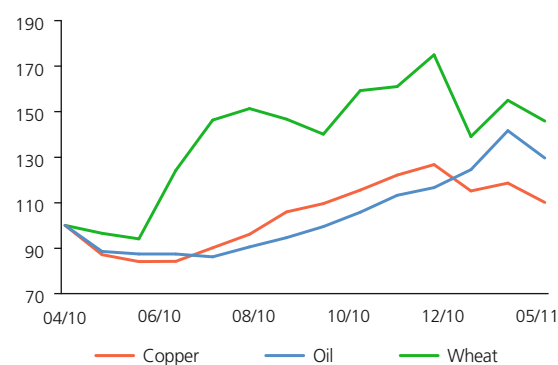
Source: Bloomberg LP, CNB calculation
Note: Commodity prices are obtained from the following exchanges: ICE (Brent crude oil), LME (London copper), CBT (Chicago wheat).

---

51 According to the IMF database (World Economic Outlook Database, April 2001), for example, the share of the BRIC countries in global GDP (in purchasing power parity terms) rose from 16% to 25% between 2000 and 2010.
52 See, for example, Hošek, J., Komárek, L., Motl, M. (2011): *Měnová politika a cena ropy*, Politická ekonomie, No. 1.

CHART III.8 BOX

The real price of oil and real interest rates in industrially advanced countries
(left-hand scale in %; right-hand scale in USD/barrel)

Source: IMF, Thomson Reuters, CNB calculation
Note: The real price of oil is the nominal price of oil (IMF) deflated by the CPI
         of advanced countries (1969 = 100); real interest rates are the 3-year
         moving average of long-term government bond yields (average for DE,
         UK, US, JP and CH) minus the 3-year moving average of CPI inflation in
         those countries; the figures for 2011 are as of the end of Q1.

CHART III.9 BOX

Commodity derivative turnover in OTC markets
(USD billions; half-yearly data)

Source: BIS, CNB calculation
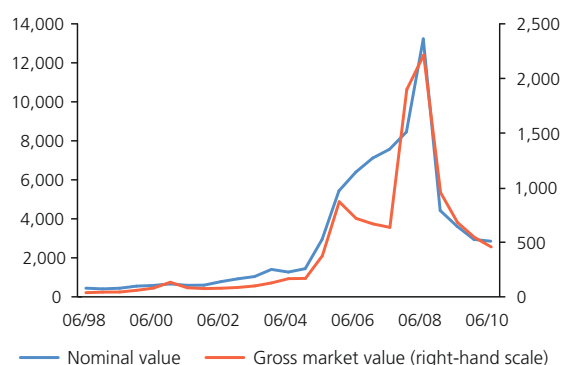
interest rates and the oil price. It argues that if the current real interest rate is low (and so the money earned from selling the oil has a low rate of return), producers have little incentive to produce the oil now and prefer to leave it in the ground in the form of reserves for production in the future. At the same time, firms' interest in holding reserves (for example oil in tanks) can increase, since this strategy is cheap to finance when interest rates are low. Such constriction of supply will then push the current oil price upwards, but simultaneously increases future supply and thereby reduces the future price. The data over the last 40 years suggest that there is some truth in this hypothesis (see Chart III.8 Box).

Besides the ongoing process of industrialisation and urbanisation in emerging economies over the last decade, certain segments of the commodity markets have also been affected by a change in the behaviour of portfolio managers in the financial markets. In addition to traditional investment in equities and bonds, they have been shifting part of their investments towards derivatives, whose value is derived from the value of underlying assets such as property or commodities. There are various motives for the growing allocation of assets into commodity derivatives.[53] The first argument is the observed negative correlation between commodity prices and yields on other investment assets, thanks to which investment in commodity derivatives, in line with portfolio theory, provides a tool for reducing overall portfolio risk, a tool which, moreover, provides a hedge against inflation. Another factor is the search for yield associated with the low nominal yields on traditional assets. After the recession at the start of the millennium, investors faced a long period of low interest rates in the advanced economies. A similar situation arose after the crisis of 2008 and 2009. In an environment of low nominal rates (and in some cases even negative real rates) the incentive for individual and institutional investors to demand riskier and potentially higher-yielding assets increases at the expense of safe but low-yielding assets. Owing to the strong growth trend in commodity prices, this process has created increased demand for commodity derivatives over the past decade. Commodity derivatives also offer an easy way of indirectly acquiring exposure to the dynamically developing economies of China, India and other countries. The aforementioned factors have fostered exponential growth in the volume of assets managed in commodity funds. Logically enough, this has been accompanied by enormous growth in trades in commodity derivative markets (see Chart III.9 Box). Given this fact, it is possible that under certain circumstances growth in prices of commodity derivatives can contribute to growth in prices of

53 See, for example, Basu, P., Gavin, W: *What Explains the Growth in Commodity Derivatives?*
    Federal Reserve Bank of St. Louis Review (January/February 2011).

commodities themselves, i.e. their spot prices. For example, rising prices in the commodity futures market can motivate commodity producers and traders to hoard their reserves for future sale, which would strengthen the aforementioned Hotelling effect.[54] However, the overall effect of this channel will be short-lived and quantitatively limited. The following relationship holds between the spot price of a physical commodity and the futures contract for that commodity: $F(t) = (S(t)+U)*e^{r(T-t)}$, where $F(t)$ is the price of futures for the commodity at time t, $S(t)$ is the price of the commodity at time t, $(T-t)$ is the time to maturity of the futures contract, U is the present value of the costs of storing the commodity for time $(T-t)$ and r is the risk-free interest rate. For consumer commodities, another determinant of the price of futures contracts is the so-called "convenience yield", C, or the benefit of holding a physical commodity. Such benefits include the ability to keep a production process running in the event of a shortage of a physical commodity used in that process, and the ability to profit from shortages in some other way. In such case, we can rewrite the previous equation as: $F(t) = (S(t)+U - C)*e^{r(T-t)}$. The existence of a convenience yield explains why some futures markets can be in a situation of backwardation, where prices of futures contracts are lower than spot prices.

It is clear from the previous two relationships that there is a direct link between the spot and derivatives markets, and it is therefore evident that the spot market affects the derivatives market. When the derivatives market becomes sufficiently large (for example because trading in commodity derivatives is much less capital-intensive than trading in physical commodities) the opposite can of course hold, i.e. the derivatives markets can affect the spot market. The causality from the derivatives market to the spot market can be amplified by the frequent practice whereby purchases or sales of a physical commodity are based directly on the value of various futures contracts at a given moment in time. Futures contracts can therefore also act as a benchmark for determining the spot price of a commodity.

Is the potential interaction between the spot and derivatives markets a reason for increased regulation? The surge in commodity prices has become a political issue in recent years. We often hear the fashionable explanation that the high commodity prices and their high volatility are due to the enormous boom

---

54 The mechanism of transmission of price movements from the futures market to the spot market may work as follows. Financial investors will drive up the price of near (and later also more distant) contracts, so that the futures curve switches from backwardation (where the spot price is the highest and the price decreases with increasing maturity) to contango (where the price of futures contracts is higher than the spot price up to a certain horizon). If a real oil processor sees this situation (and believes that the future price really will be higher), it will tend to hedge its future needs by buying more oil now. This will increase current real demand and therefore also the spot price.

CHART III.10 BOX

Comparison of commodity prices and global GDP growth
(%)

Global GDP growth
Annual commodity growth (right-hand scale)
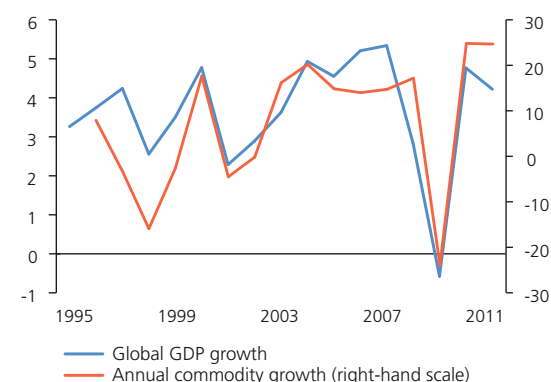
Source: IMF, Bloomberg LP, CNB calculation
Note: Annual commodity growth is calculated as the percentage change in
         the average value of the commodity indexes in the current year relative to
         the average value in the preceding year. The commodity index is the arithmetic
         mean of the CRB and GSCI indexes.

CHART III.11 BOX

**Comparison of the volatility of commodity prices
and the GDP of OECD countries**
(%; quarterly data)

Commodity volatility
GDP volatility (right-hand scale)
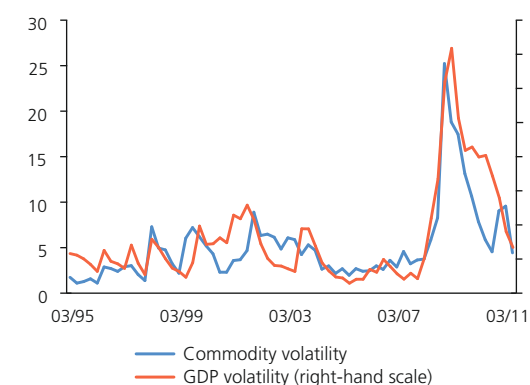
Source: IMF, OECD, Eurostat, FED, Bloomberg LP, CNB calculation
Note: Volatility is calculated as the rolling exponentially weighted volatility
         for the previous ten quarters from the quarter-on-quarter changes in
         the average prices of commodity indexes (CRB and GSCI) and from
         the quarter-on-quarter seasonally adjusted changes in GDP in OECD
         countries.

in derivatives markets and that instead of being used by commodity producers and users to manage risk, derivatives are being used by speculators and aggressive investors in the search for quick profits. This argument gives rise to the opinion that we need to start regulating these markets much more and try to reduce the undesirable volatility (and potentially also the high prices) in the commodity markets. Further to the conclusions of the most recent G20 summits in Pittsburgh and Seoul,[55] there has been series of initiatives in the EU to regulate derivatives markets. They include the European Commission's proposals to regulate OTC derivatives trading, a revision of the Market Abuse Directive to cover commodity markets, a proposal for a Directive on Alternative Investment Fund Managers and a revision of the Markets in Financial Instruments Directive. The US administration is also issuing legislative proposals to make OTC trading more transparent (e.g. the Dodd–Frank Wall Street Reform and Consumer Protection Act).

The fundamental problem with these proposals, however, is the mistaken idea that derivatives markets are one of the main factors underlying the growth in spot prices, or that the growth in spot prices over the last decade has been due to speculative rather than fundamental factors. Chart III.10 Box, however, reveals a very close link between global economic growth and (spot) prices of commodities. This supports not only the fundamental explanation of the surge in prices, but also the significant volatility of those prices over the last few years (see Chart III.11 Box). As global economic growth accelerated in the pre-crisis years, growth in commodity prices also increased rapidly. The onset of the financial crisis saw a considerable rise in concerns about the future evolution of the world economy, to which commodity prices responded by falling sharply. It soon turned out, however, that many emerging economies would not be hit as hard by the crisis as initially expected. In reality, the global economic recovery has been V-shaped, albeit strongly asymmetric in emerging and developed economies. The commodity markets have shown the same pattern. As economies have recovered, demand for oil has surged and many producers have gradually reached full capacity. The opinion that derivatives do not rank among the major sources of growth in spot prices is supported by other arguments as well. Although commodity derivatives trading turnover has increased by many orders of magnitude over recent decade (see Chart III.9 Box), the amounts being invested in commodity funds are still small relative to the total annual turnover in the spot commodity markets. Financial investors

55 The Pittsburgh summit conclusions contained a declaration to try to improve the regulation, functioning and transparency of financial markets to address excessive commodity price volatility. This commitment was bolstered by the Seoul G20 summit declaration, in which the parties undertook to address food market volatility and excessive fossil fuel price volatility.

operate almost exclusively in derivatives markets and rarely influence market supply by trying to obtain physical supplies of a commodity. And as far as volatility is concerned, various types of commodities are historically price volatile regardless of whether or not they are traded in the derivatives markets.

In this context, it is logical for investors allocating part of their assets in commodity derivatives to make their decisions on the basis of the expected evolution of commodity prices based on the expected path of relevant economic fundamentals. When global economic growth slows significantly they will tend to sell their commodity assets, and when global economic growth accelerates they will buy commodity assets. This investment element may be fostering greater and faster movements in the commodity markets. Regardless of this, however, it is clear from Chart III.10 Box that the commodity market situation is governed primarily by economic fundamentals and that prices of commodity derivatives therefore tend to react to expected growth in spot prices (financial investors are trend-followers rather than trend-setters). In this situation, the introduction of restrictive and broad regulation of commodity derivatives markets does not seem justified. These arguments do not mean, however, that speculative purchases cannot drive a price significantly away from its fundamental level. On the contrary, trend-following and a lack of interest in fundamentals on the part of financial investors is what leads to large speculative bubbles in asset markets. Owing to limited competition, asymmetric information and a high degree of uncertainty, the formation of strong trend fluctuations in the commodity market is highly likely. In the case of commodities, however, bubbles are not likely to last long. In sum, we can say that the value added of the aforementioned regulatory initiatives is in all probability very low. Supervisory authorities must nevertheless analyse whether rising investment in commodity derivatives is contributing to growth in systemic risk and must be prepared, where necessary, to react when financial institutions take on excessive risk.

Financial infrastructure systems are not signalling any risks

In 2010 and the first few months of 2011, activity in the CERTIS payment system remained at a lower level than in 2007–2008. This reflected the lower economic activity and the lower trading volume in the financial markets (see Chart III.21). The turnovers broken down by bank category reveal that in addition to large banks, branches of foreign banks are relatively active in the payment system. As regards the risks to financial stability associated with potential contagion through financial infrastructure systems, therefore, it is vital to take their relatively significant role into consideration. Generally, however, the risks of transmission of problems through CERTIS are minimal, not least because it is an RTGS (real time gross settlement) system.

CHART III.21

Average daily turnovers in CERTIS
(CZK billions)

	2006	2007	2008
	2009	2010	2011
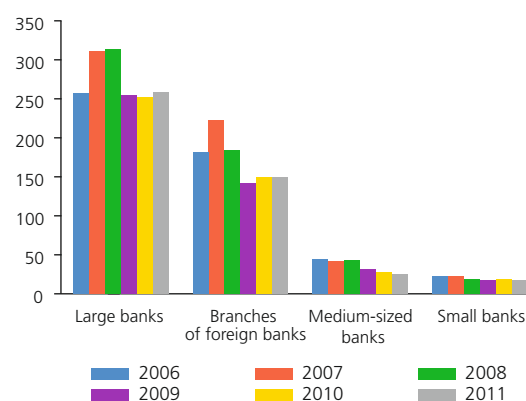
Source: CNB
Note: The turnovers in the case of building societies are negligible. 2011 comprises the period January-March.

Chart III.22

Use of intraday credit
(CZK billions)
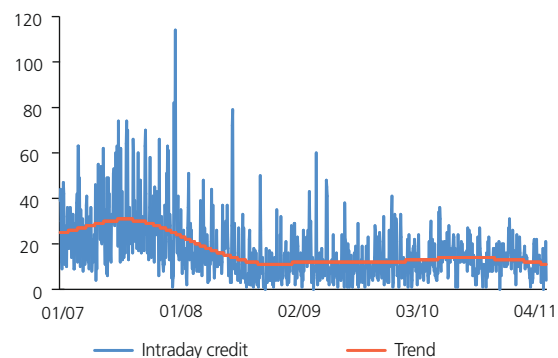
Source: CNB, CNB calculation
Note: The trend estimated by the HP filter.

As in previous years, the use of interest-free intraday credit with the CNB, which is available to banks in CERTIS against collateral provided in the form of short-term bonds in SKD, stayed at a relatively low level (see Chart III.22). This reflects not only the lower interbank payment activity, but also comparatively cautious intraday liquidity management at individual bank level. Intraday credit does not usually spill over into the CNB's marginal lending facility at the Lombard rate.

3.2 THE PROPERTY MARKET

The Czech residential property market recorded a continuing decline in apartment prices in 2010 and the first few months of 2011. However, the rate of decline slowed. In parallel with the price decline, there was also a fall in the number of transactions and a deterioration in progress with the sale of new apartments in residential developments. Towards the end of the year, however, activity in the market began to recover gradually, thanks mainly to renewed growth in mortgages. Next year, apartment prices can be expected to fall slightly initially and then flatten out owing to labour market developments. The downside risks are due mainly to the possibility of foreclosures linked with an increased NPL ratio in the property development sector and with rent deregulation. In the commercial property area, the industrial property sector recorded an improvement in demand. However, new demand remains subdued, as does the situation in the office property sector.

RESIDENTIAL PROPERTY PRICES

Property prices continued to fall in 2010...

After dropping quite significantly in 2009, property prices continued to fall in 2010 and early 2011 (see Chart III.23). Transfer prices of apartments fell by 3.6% compared to the end of 2009 and were down by 20.7% from their peak in 2008 Q3. Prices of family houses fell by 2% year on year (end-2010 Q1 figure) and were 4.6% below their peak. Prices of building plots and apartment blocks rose (building plots by 5.3% in 2010 and apartment blocks by 0.7% in 2009), but their shares in the total property index are relatively small (14.3% and 9.1% respectively). Moreover, a large proportion of the building plot price index (84.4%) reflects the sale of land as part of other type of real estate, so the representativeness of such prices is debatable. Likewise, for apartment blocks the number of transfers from which the index is calculated is relatively low (around 13 times lower compared to family houses and 19 times lower compared to apartments).

...but the year-on-year declines in transfer and supply prices were more moderate

Apartment prices, whose evolution can be compared across various alternative data sources, recorded slower year-on-year declines, mainly because of a lower base. In 2009, transfer prices had fallen much faster than supply prices, reflecting a widening of spreads[56] and a related reduction in the number of transactions in the property market (see below). By mid-2010, however, the dynamics of supply and transaction prices were similar (see Chart III.24). A comparison of the dynamics of supply prices for Prague and the rest of the Czech Republic reveals larger price declines in Prague.

---

56 The average difference between transfer prices and supply prices is around 7.5%.
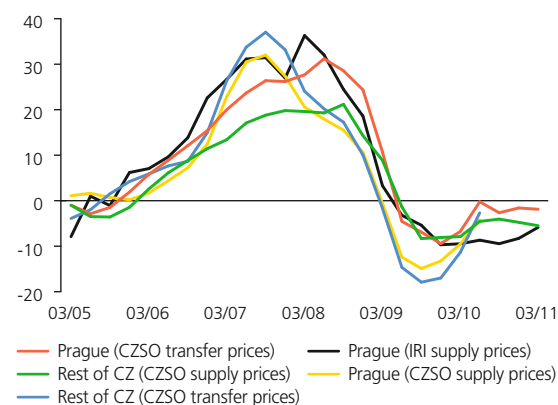
CHART III.25

Numbers of transactions in the property market
(thousands of transactions; moving sums for the past year)
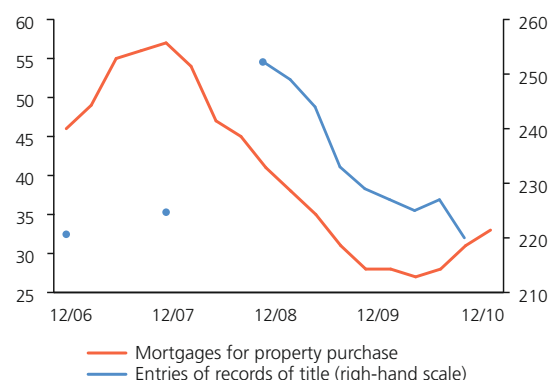
Source: CSCO, FINCENTRUM HYPOINDEX
Note: Entries of records of title to buildings and apartments only.

CHART III.26

Property prices – international comparison, advanced countries
(absolute index; 2005 average = 100)
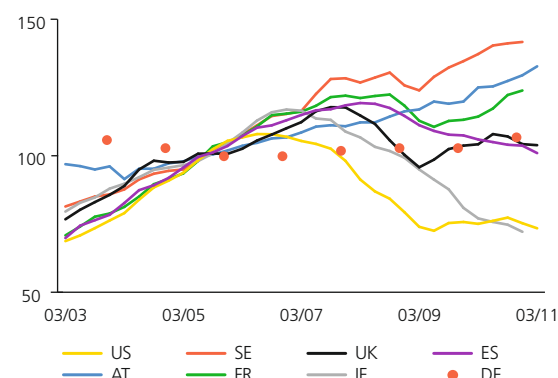
Source: BIS, Case-Shiller (US), Nationwide (UK)

CHART III.27

**Property prices – international comparison, selected
converging EU countries**
(absolute index; 2005 average = 100)
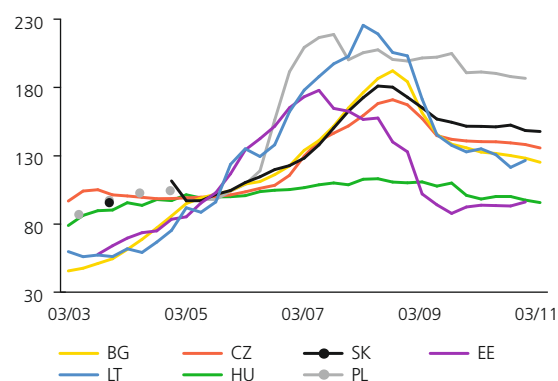
Source: BIS, national statistical offices and central banks

The decline in prices was accompanied by a fall in transactions

The continuing none-too-good situation in the property market can also be illustrated by a fall in the number of transactions in this market (see Chart III.25). The number of entries of records of title to buildings and apartments fell by 3.8% in 2010 compared to the previous year and by 12.5% from their 2008 peak.[57] The decline in the number of property market transactions is also linked with a fall in the number of mortgages for property purchase (such loans accounted for 62.3% of the total number of new mortgages provided in 2010; Fincentrum Hypoindex data). This decline had started to emerge back in 2008, when property prices were still rising. In mid-2010, the moving sum of the number of mortgages was still at one-half the level of the peak recorded at the end of 2007. In the second half of 2010, however, activity in the mortgage market recovered thanks on the one hand to a reduction in mortgage interest rates (year-on-year declines in interest rates on new house purchase loans of 1.0 percentage point and on mortgages of 1.3 percentage points) and on the other hand to substitution between mortgages and building savings loans (new mortgages rose by 28.4% year on year in 2010 H2, whereas new building savings loans fell by 24.6% year on year in the same period). In reaction to the fall in property prices, the average mortgage amount also decreased (by 7.1% from its mid-2008 high), although its decline was significantly smaller than the fall in property prices.

Property prices abroad were very mixed

The decline in property prices in the Czech Republic in 2010 also reflected the evolution of such prices abroad. Unlike in previous years, property prices were very mixed across countries (see Charts III.26 and III.27). It holds generally that the fall in property prices in 2008–2009 was more pronounced in countries that had conversely recorded the fastest price growth in previous years. In countries where the financial crisis had given rise to a public finance crisis in 2009, these falls continued in 2010 (10.8% in Ireland, 5.7% in Greece and 3.5% in Spain). However, other countries that had recorded declining prices in 2008–2009 enjoyed a recovery (with prices rebounding by 3.8% in the USA, 8.5% in the UK and a sizeable 12.1% in France). Likewise, prices started going up in countries where they had previously shown relatively modest growth (8% in Austria and 6.7% in Sweden year on year). The question is whether this upswing in prices, which may be closely linked with the easier monetary conditions in most of the countries mentioned, is a sign of renewed property market bubbles. For example, the IMF's April *Global Financial Stability Report* mentions the risk of a fall in property prices in the USA connected with mortgage defaults. The risk of a drop in prices in Sweden and the UK is also discussed. Turning to the converging countries of the EU, similar property price developments as in the Czech Republic were recorded in the past year, for example, in Slovakia (a year-on-year decline of 2.1% in 2010 and a fall of 18%

---

57 Data from the Czech Surveying and Cadastral Office. In addition to transactions based on purchase agreements the entry records contain gratuitous transfers based, for example, on donation agreements. As such transfers are relatively stable over time, the decline in standard market transfers may have been even larger.

from their peak), Bulgaria (5.6% and 33.3% respectively), Poland (2.2% and 14.7% respectively) and Hungary (3.5% and 13.9% respectively). In the Baltic States, the price declines were more sizeable (to roughly one-half of their peak values).

Property prices in the Czech Republic were affected above all by the labour market situation
Turning to the determinants of property prices, the decline in these prices was due above all to the persisting none-too-good situation in the labour market (see section 2.3) – historically low growth in nominal wages (of 0.9% year on year in 2010 Q4) and declining real wages, year-on-year declines in employment (a fall of 2.3% for 2010 as a whole) and a related rise in unemployment (of 0.4 percentage points year on year). The demographic determinants of property prices also deteriorated by comparison with previous years. Natural population growth fell by 5.3% and net migration by 44.8% year on year (net migration is at less than one-fifth of the record level achieved in 2007). Given the labour market outlook, a modest decline in property prices is forecasted for the remainder of 2011 in the *Baseline Scenario*. This will turn into stagnation and modest growth in 2012. In the less likely but conceivable *Asymmetric Developments* and *Renewed Recession* scenarios, property prices could fall by a cumulative total of 15% and 30% respectively (see Chart III.28). Besides the risk of macroeconomic deterioration, the downside risks to prices include risks associated with rent deregulation, which could lead to a higher supply of rental apartments in the open-market segment of the market (see below), and risks linked with the foreclosure of properties used as collateral either for mortgages provided to households or for loans granted to property developers.[58] The upside risks to prices include a planned increase in the rate of VAT on newly completed apartments. However, significant uncertainty surrounds the VAT increase, which, moreover, will probably mainly affect progress with the sale of new apartments and have a relatively limited impact on prices of older apartments. Its effect on the property market recovery will be only temporary.

Property price sustainability indicators improved
The standard indicators of property price sustainability improved further in response to the decline in prices and currently indicate no need for a major price correction. The price-to-income ratio fell by 4% on average over the course of the year and was down by 25.2% from the peak recorded in mid-2008. It is now only slightly above the levels observed prior to the rise in prices (see Chart III.29).

The rental return (see Chart III.30) increased slightly in all the monitored regions (by 0.2 percentage points on average in 2010), despite a fall in the returns on alternative assets (the ten-year government bond yield

CHART III.28

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

Baseline Scenario — Renewed Recession
Asymmetric Developments
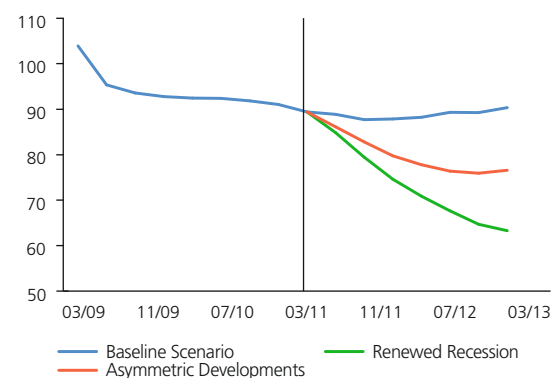
Source: CNB

---

58 In 2009 and 2010 there was a significant deterioration in progress with the sale of apartments in residential developments (see the thematic article *An Analysis of Progress with the Sale of Residential Developments* in this Report) and a rise in the number of completed unsold apartments in such developments. The latest figures from Ekospol reveal that the number of completed unsold apartments in Prague decreased from 2,519 in 2010 Q3 to 2,034 at the start of 2011.

CHART III.29

Price-to-income ratios
(ratio of price of 68 m² apartment to moving sum of wage for last four quarters)
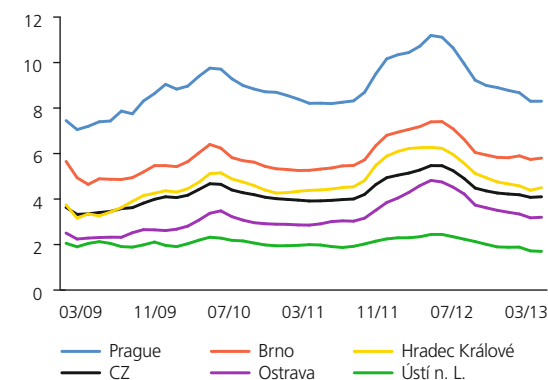
Source: CZSO, CNB calculation
Note: 2010 data preliminary or calculated from supply prices

CHART III.30

Rental returns
(averages for period in %; 2003–2006 yearly data, then quarterly; comparison with yields on 10Y government bond and house purchase loan rates)
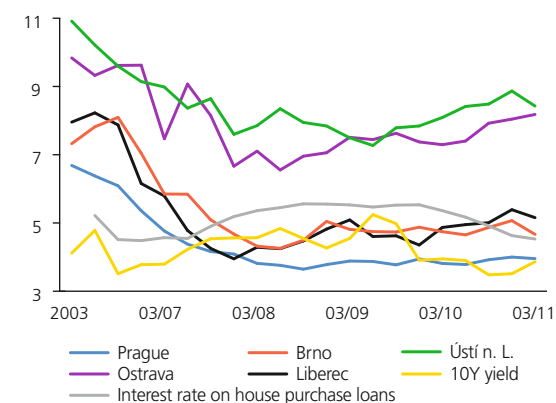
Source: IRI, CNB

CHART III.31

Numbers of starts and completions
(1998 = 100; moving sum for four quarters)
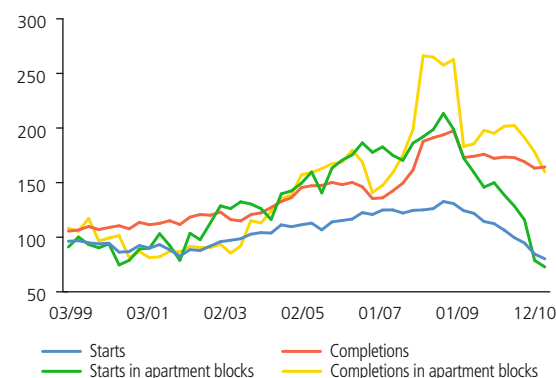
Source: CZSO

decreased by 0.4 percentage points in the same period) and a decline in interest rates on house purchase loans (of 1 percentage point). In all regions, therefore, the rental return is higher than the yield on long-term government bonds and, with the exception of Prague, higher than interest rates on house purchase loans. For the first time in around three years, this opens up the possibility of speculative property purchases financed by mortgages. There are also rent deregulation risks linked with the rental return going forward.[59] As this deregulation will concern approximately 700,000 of the total of around 900,000 rental apartments over the next two years, an increase in supply in the open-market segment of the rental market, related downward pressure on market rents and a reduction in the rental return cannot be ruled out. On the other hand, the full deregulation of almost 60% of apartments with deregulated rents as from 1 January 2011 has so far had a pretty limited impact on both regulated and market rents in these regions. In regional capitals, where the deregulation process will be spread over the next two years, the difference between open-market and regulated rents has already narrowed significantly in recent years.

The risks associated with residential development projects are significant

In the context of falling property prices, the sharp reduction in housing construction continued into 2010 (see Chart III.31). There were year-on-year decreases in both the number of apartment completions and the number of apartment starts (of 5.3% and 24.6% respectively). The decline in new construction projects chiefly concerned apartment blocks (a 20.8% fall in completions and a sizeable 47.5% decrease in starts), reflecting a reduction in the activity of developers. This is linked, in turn, with a sharp fall in demand for new housing and a related increase in the time to sell apartments in property developments. In 2007 almost 95% of all the apartments in a typical development were sold prior to completion, whereas in 2010 the figure was 60%.[60] The fall in property prices has led to a relatively rapid rise in the NPL ratio in this area to above that for the non-financial corporations sector as a whole (the NPL ratio for the set of selected developers has risen to a sizeable 12.7% and that for real estate firms and developers in NACE 68 and 411[61] to 9.2%; see Chart III.32).

---

59   On 1 January 2011, around 400,000 apartments with previously regulated rents ceased to be subject to regulation and the rents on them were put on a contractual basis at "normal local levels". The cessation of regulation does not concern the regional capitals (with the exceptions of Ústí nad Labem and Ostrava) and large municipalities in the Central Bohemia Region. For the remaining approximately 300,000 apartments, regulation will end in 2012.

60   See the thematic article *An Analysis of Progress with the Sale of Residential Developments* in this Report.

61   The NPL ratio for developers in Chart III.31 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. The set of NACE 68 firms recorded very buoyant credit growth in the past (a six-fold increase since the end of 2002, with a rise in share in the total volume of loans from 4.5% to 11.5%). Housing cooperatives and owners' associations, whose risk is comparable with housing loans provided to households, accounted for 38.6% of this growth. Of the rest, real estate management and rental firms accounted for 44.6%, real estate agencies for 7.5% and firms engaged in buying and selling their own real estate for 1.7%.

COMMERCIAL PROPERTY PRICES

The commercial property market saw a partial recovery, especially in the industrial sector

During 2010 the commercial property sector saw a gradual recovery in market demand following the sizeable fall recorded in 2009. The recovery pertained primarily to the industrial property segment, where net absorption increased by 45% year on year in 2010 (King Sturge data). This positive trend chiefly reflects a recovery in industrial production (production companies account for 31% of the total rental stock) as well as the fact that demand in the industrial property sector is increasing from a very low base (this sector recorded the biggest contraction in demand in 2009). The industrial property segment is also recording a falling vacancy rate, which decreased year on year by a full 7.2 percentage points to 10.4%. Despite the relatively strong recovery in demand, new supply remains low. It declined by a sizeable 66% year on year, mainly because of an almost complete halt in new construction in the first half of 2010. In the second half of 2010, however, new supply rebounded. The recovery in market demand was reflected in a decline in yields on commercial property across the entire market (see Chart III.33; given that rents have long been relatively flat, this is a sign of rising prices), although this was also linked with the parallel fall in the yield on government bonds.

Demand in the office property sector, however, continues to fall

In contrast to the industrial property segment, demand in the office property sector continues to fall (gross take-up went down by 12% in 2010). What is more, renegotiation of old contracts is contributing increasingly to this gross take-up (their share was 44%, i.e. 8 percentage points higher than last year). Consequently, net absorption (i.e. gross take-up net of renegotiations) was negative (-2,500 m²), mainly because of the situation in the first half of the year (-23,800 m²). The supply of new office buildings remained very low in 2010 (the lowest since 1995, a decline of almost 75% compared to 2009). This was reflected in stagnation of total office space (see Chart III.34). The office vacancy rate fell slightly to 13.2% in the second half of the year, but remains relatively high by international comparison (according to King Sturge the vacancy rate at the end of 2010 Q2 was 8% in Warsaw, 11.5% in Bratislava, 8.4% in Berlin and 5.9% in Vienna; Budapest and Frankfurt – at 25% and 17% respectively – had higher vacancy rates than Prague).

CHART III.32

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

— Non-financial corporations   — Selected developers
— Developers NACE 68+411   • Apartment prices (right-hand scale)
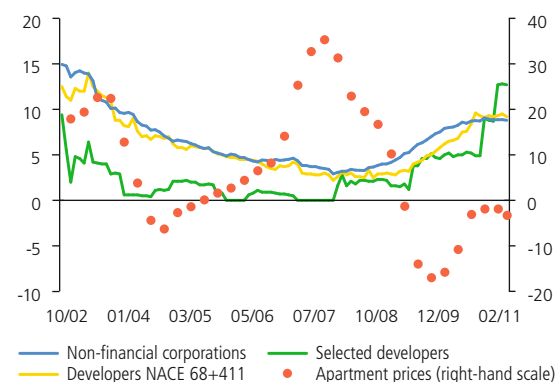
Source: CZSO, CNB

CHART III.33

Yields on commercial property
(%; 2000–2007 yearly data, subsequently quarterly)

— 10Y yield   — Office   — Industrial   — Retail
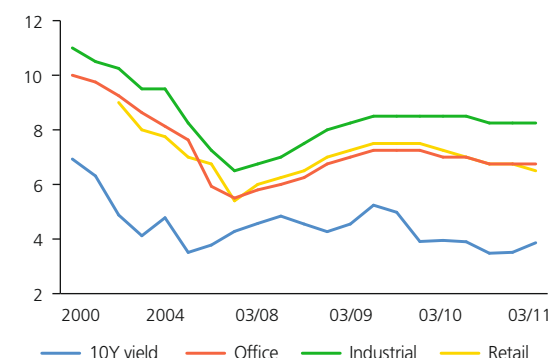
Source: King Sturge, CNB
Note: 10Y yield is 10-year government bond yield.

CHART III.34

Situation in the office property market
(vacancy rate in %; stock in thousands of m²)

— Vacancy rate   — Stock (right-hand scale)
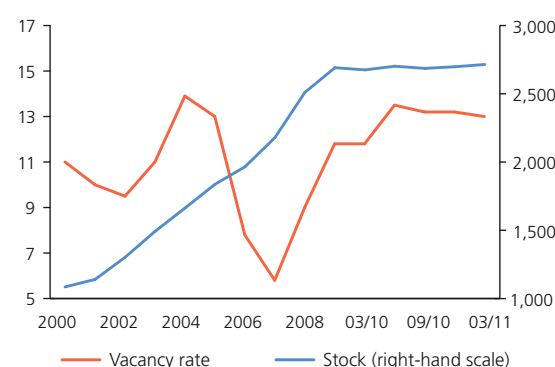
Source: King Sturge, Prague Research Forum

CHART IV.1

Depth of financial intermediation
(assets of financial corporations as % of GDP)
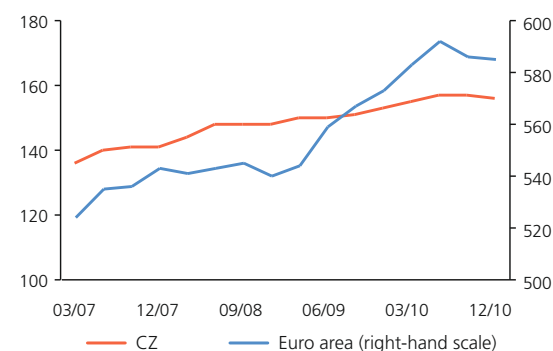
Source: CNB, ECB

CHART IV.2

Change in assets of individual financial sector segments
(CZK billions; change between end-2008 and end-2010)
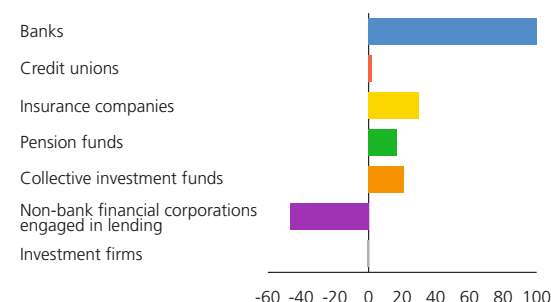
Source: CNB

CHART IV.3

Structure of banking sector assets and liabilities
(% of total assets/liabilities; December 2010)
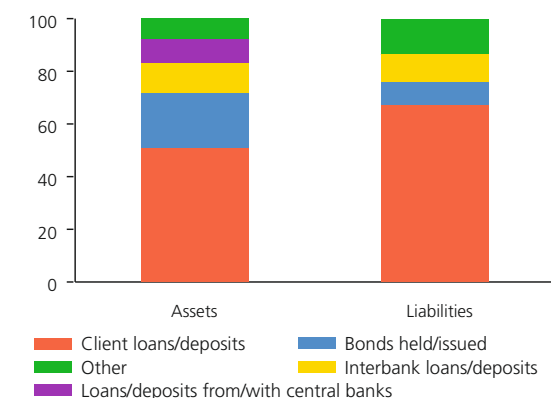
Source: CNB

4 THE FINANCIAL SECTOR

4.1 FINANCIAL SECTOR DEVELOPMENTS

The relatively good economic situation was reflected also in the financial sector. The banking sector has sufficient capital and remains highly profitable, but the available credit risk indicators are only partially showing a turnaround in the credit cycle. Insurance companies and pension funds have solid capitalisation and the collective investment funds sector is still recording an inflow of clients. Other financial corporations engaged in lending are continuing to lose market share.

The risks to the financial sector are similar as in the previous year. They include a return of recession associated with the collapse of some large debtors, losses from securities holdings in the event of renewed financial market turmoil (e.g. due to restructuring of the sovereign debt of some overindebted euro area countries), potential liquidity problems in the building society sector and the impact of new regulatory initiatives, mainly indirectly via links to parent companies abroad.

The depth of financial intermediation in the Czech Republic increased in 2010
The gradual economic recovery during 2010 had a positive effect on the domestic financial sector. After stagnating for a year the total assets of the financial sector returned to growth, which – together with the very low annual nominal GDP growth – helped to increase the depth of financial intermediation, which reached 156% of GDP at the end of 2010. A similar trend was recorded by the euro area financial sector, where, however, this trend reversed in 2010 H2 as a result of clean-ups of credit institutions through the transfer of bad assets out of the banking sector (see Chart IV.1).

The recession was most apparent in a contraction of the total assets of non-bank financial corporations engaged in lending
The global financial crisis and its effects in the Czech Republic in the form of recession affected the assets of the individual segments of the financial sector to different degrees (see Chart IV.2). Financial corporations engaged in lending recorded a sharp fall in market share compared to the pre-crisis period. The other financial sector segments were supported by a recovery of the real economy, a gradual rise in lending and a recovery in the financial markets. This had a particularly large effect on collective investment funds, whose total assets increased compared to the pre-crisis figures, although these funds had experienced a substantial outflow of clients and significant losses on invested assets in 2008 and 2009.[62]

62 See FSR 2009/2010.

The share of claims on central government in the otherwise conservative structure of domestic banks' balance sheets rose slightly

The balance-sheet structure of domestic banking institutions is characterised by high shares of resident client loans and resident deposits in total assets. Developments in the banking sector are closely linked with those in the domestic real economy, which is highly sensitive to developments abroad. Domestic banks are benefiting from the conservative preferences of households, who favour bank deposits over alternative forms of financial assets. This ensures a significant excess of client deposits over loans. Surplus funds are invested mainly in debt securities (particularly Czech government bonds, which accounts for 65% of debt securities holdings) or allocated in the interbank market or into repo operations with the CNB (see Chart IV.3).

As in other EU countries, the share of claims on domestic central government (chiefly through government bond holdings) has increased over the last two years (see Chart IV.4) owing to a change in the composition of bank assets towards safer instruments. In the case of some strongly overindebted governments, however, exposures to own governments may represent a sizeable risk for which banks may lack sufficient capital reserves, as exposures to domestic central governments usually have a zero risk weight in the current regulatory framework.[63]

Balance-sheet and off-balance-sheet items are developing in line with the modest economic recovery

The banking sector's total assets rose slightly in 2010, reaching CZK 4.2 trillion at the start of 2011. Some repercussions of the recession are still evident in the off-balance sheet, but the rate of decline in off-balance-sheet assets and liabilities slowed significantly in 2010 (see Chart IV.5). The decline in off-balance-sheet items mainly reflects a fall in the use of interest rate and currency derivatives and partly also in credit commitments given. In the case of derivative contracts with clients, banks usually enter into an opposite position with a parent or other foreign bank. This strategy reduces the risks associated with open positions arising from derivatives and also allows banks to profit from derivatives trades in the long run. As the use of derivatives by banks is closely linked with economic activity, they can be expected to grow gradually as the economy recovers. The end of 2010 saw a return to annual growth in client loans and a halt in the downward trend in bank commitments given, connected with favourable trends recorded by the Czech Republic's strategic trading partners (see Chart IV.6).

63 Such exposures must be in the domestic currency of EU Member States and must be financed in that currency. If the bank applies the advanced approach to setting capital requirements for credit risk (IRB) to exposures to central governments, the risk weight may be non-zero (see, for example, Box 11 in section 4.2).

CHART IV.4

Share of exposures to domestic governments in assets of MFIs excluding central banks
(%; MFIs comprise credit institutions and money market funds)
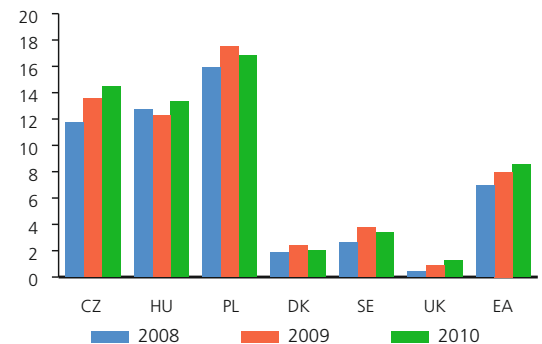
Source: ECB

CHART IV.5

Balance sheet and off-balance sheet
(CZK billions)

Off-balance-sheet assets   Off-balance-sheet liabilities
Balance sheet
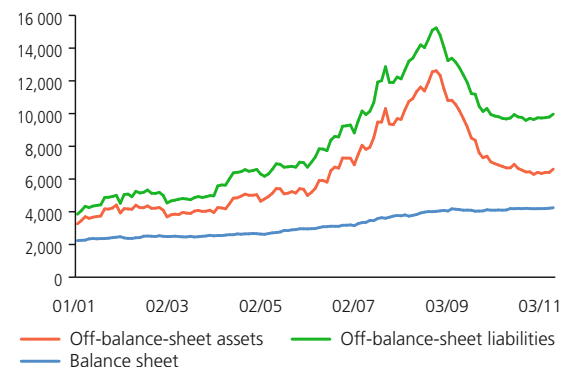
Source: CNB

CHART IV.6

Year-on-year growth in bank loans and commitments given to residents
(%)

Client loans   Commitments given   Total
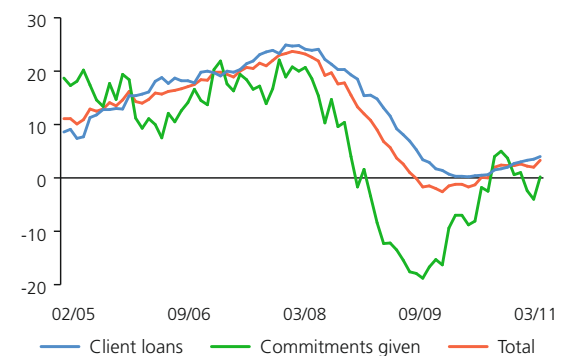
Source: CNB

Chart IV.7

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

— NPLs as % of total loans (right-hand scale)
■ Change in stock of NPLs in quarter (CZK billions)
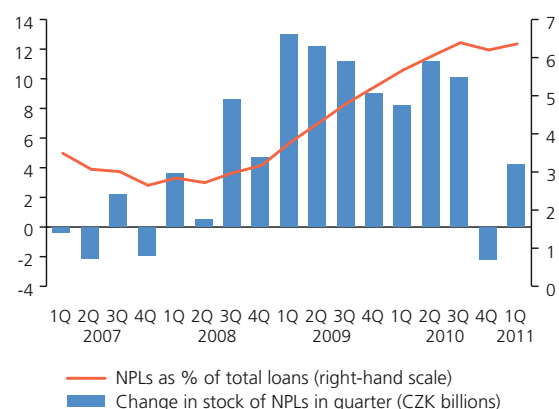
Source: CNB

Chart IV.8

Provisions and coverage of NPLs by provisions
(%)

— Loan loss provisions rate
— NPL coverage ratio (right-hand scale)
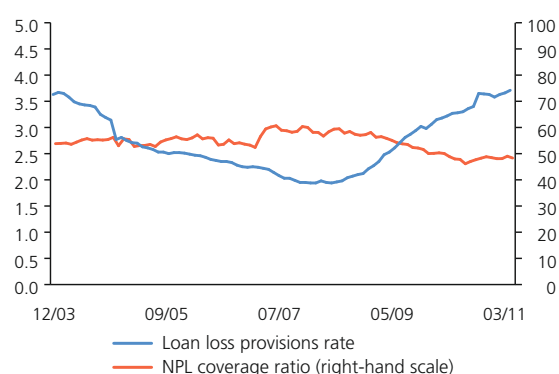
Source: CNB

Credit risk indicators are sending mixed signals: some are indicating a modest decline…

The volume of non-performing loans (NPLs) continued growing in 2010. Their share in total loans stabilised at the end of the year and reached 6.4% in March 2011 owing to lower growth in NPLs and a modest rise in total loans (see Chart IV.7).[64] Total provisions followed a similar trend, accounting for 3.7% of the loan portfolio in March 2011. As in 2009, the growth in provisions was smaller than the growth in NPLs. This was reflected in a further decline in the NPL coverage ratio to 48% in March 2011 (see Chart IV.8).[65]

The assumption that the level of provisions is still sufficient is supported by the following findings. First, the share of relatively well secured NPLs – in particular loans for house purchase and secured loans to corporations – increased further in 2010 (see Table IV.1).[66] As provisions are created only for the unsecured part of loans, a lower volume of provisions is needed to cover potential losses. A relevant question in this respect is the quality of collateral, which to a large extent determines the NPL recovery rate. Given the persisting uncertainty in the property market and falling prices in the residential and commercial projects segment (see section 3.2), the collateral on property is not necessarily sufficient. Data acquired from selected banks in the Czech Republic based on a one-off survey suggest relatively high recovery rates over the last two years. The recovery rate for mortgages is around 80–90% and that for loans to non-financial corporations around 85%. However, the recovery rate for consumer credit (which is usually unsecured) is just 65%.[67]

Mortgage loans are usually well collateralised. The LTV ratio for mortgage loans in the banking sector excluding building societies has been fluctuating around 57% over the last two years (54% for building societies). Almost 70% of house purchase loans provided by banks excluding building societies are at least 100% collateralised by real estate.

Second, the available information shows continuing prudent loan classification behaviour by banks in 2010 (as identified last year).[68] The NPL distribution indicates a still high share of claims that are classified as non-performing but are no more than 90 days past due (see Table IV.1). The coverage of NPLs that are more than 90 days past due is more than twice as high as the coverage of all NPLs and exceeds 100% in the banking sector as a whole.

---

64 2010 Q4 saw a one-off write-off of some NPLs and the transfer of a relatively large volume of primarily corporate NPLs to the non-default category.

65 Last year's FSR 2009/2010 used an NPL coverage ratio in which total provisions figured in the numerator. This ratio is 5–10 percentage points higher than in the case where the numerator only contains provisions for NPLs.

66 Information about the value of collateral for loans to non-financial corporations is not available on the aggregate level. The Central Credit Register maintained by the CNB contains only information about the existence of various types of collateral (property, claims, securities, guarantees, security, etc.). Loans secured by property plus two other types of collateral are considered loans with relatively good collateral.

67 The above data apply to claims where the recovery process had been completed and the debtor probably cooperated with the bank. Banks estimate lower recovery rates for claims where the recovery process had not been completed (70–80% for mortgages, 60–70% for corporate loans and 40% for consumer credit).

68 See FSR 2009/2010, pp. 61–62.

Third, the gradual economic recovery is increasing the probability that some NPLs so classified from the prudential point of view will prove to be viable and will gradually be moved to the standard loan category. The available data on corporate loans suggest that this has increasingly been the case since 2010 Q4.[69]

Fourth, implicit risk weights (calculated as the ratio of risk-weighted assets to total assets) decreased gradually in 2010, as risk-weighted assets grew more slowly than total assets (see Chart IV.9). This ratio was 52.1% at the end of 2009 and only 50.1% at the end of 2010. This was chiefly due to a modest fall in credit risk parameters in banks that use the advanced (internal ratings based, IRB) method for calculating capital requirements.

…while others are indicating that credit risks are still highly prevalent
However, the evolution of some indicators casts doubt on the decline in credit risk and the sufficiency of provisions. First, the default rates of non-financial corporations have not yet shown any major decline, and default rates in the segment of loans to households and sole proprietors are rising modestly (see sections 2.2 and 2.3). Second, within NPLs migration is taking place mainly to the most risky NPL category, i.e. loss loans, an insignificant number of which will start to be repaid again (see Table IV.1). If such migration were to occur to a larger extent, the need for additional loan loss provisioning could become a risk going forward. This would have an adverse effect on banks' profitability even if the total volume of NPLs did not rise much further.

Third, if we constructed the required coverage for the end-2010 NPL volumes using the LGD values reported by banks in the joint stress test project (see Box 11 in section 4.2), which were applied to individual relevant NPL segments (21.5% for house purchase loans, 53% for consumer credit and 41% for corporate and other loans), we would arrive at a coverage ratio of 40%, which is still below the reported 48%. However, with higher LGD values (e.g. 10 percentage points higher in each segment), the required coverage would be 50%, i.e. less than the current coverage level. An analogous analysis conducted for the end of 2009 indicated sufficient coverage even for stressed LGD values. This implies that in the event of less favourable developments and higher LGD values, the existing provisions would not provide a very large buffer.

Fourth, in the area of corporate NPLs a later phase of recession is visible where some large exposures are falling into default with a lag. Large loans (over CZK 1 billion) currently account for almost 10% of the NPL portfolio. Moreover, the degree of concentration of corporate portfolios, which was decreasing slightly in 2005–2009, showed a modest rise in 2010. At the end of 2010, the five largest corporate clients accounted

TABLE IV.1

Structure of NPLs
(%)

	Collateralised loans to households and corporations	Non-collateralised loans to households and corporations	Other loans	NPLs, total
2007	26.6	63.8	9.6	100.0
2008	26.8	63.9	9.3	100.0
2009	31.6	59.5	8.9	100.0
2010	36.0	57.4	6.7	100.0
	Non-standard	Doubtful	Loss	NPLs, total
2007	31.5	16.8	51.7	100.0
2008	31.3	15.0	53.6	100.0
2009	37.8	21.0	41.2	100.0
2010	39.1	13.4	47.5	100.0
	Not past due	Up to 3M past due	More than 3M past due	NPLs, total
2007	47.7	7.8	44.5	100.0
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

Source: CNB, CNB calculation
Note: 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.).

CHART IV.9

Assets versus risk-weighted assets
(index; 31 January 2008 = 100; excluding branches of foreign banks)
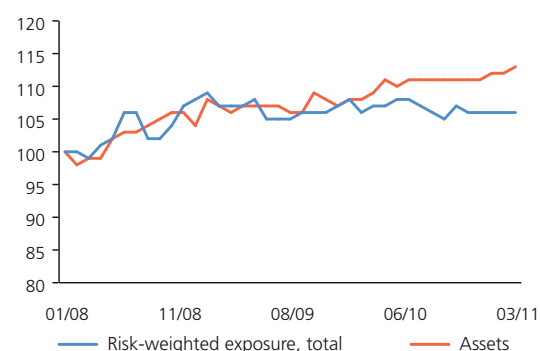
Source: CNB

---

[69] While in 2009 and 2010 H1 the number of non-financial corporations with NPLs reclassified to non-default loans was 270 on average every month, in 2010 H2 the figure was about 340.

TABLE IV.2

Structure of corporate NPLs
(%)

	Large loans to corporations	Small loans to corporations	…	Corporate NPLs, total
2007	5.0	95.0		100.0
2008	3.5	96.5		100.0
2009	3.4	96.6		100.0
2010	9.8	90.2		100.0
	Construction and real estate	Manufacturing	Other sectors	Corporate NPLs, total
2007	16.6	36.2	47.2	100.0
2008	18.6	39.7	41.6	100.0
2009	22.6	39.3	38.1	100.0
2010	29.5	31.9	38.6	100.0

Source: CNB, CNB calculation
Note: Large loans = > CZK 1 billion

CHART IV.10

Coverage of NPLs and loans more than 90 days past due
(%; March 2011)
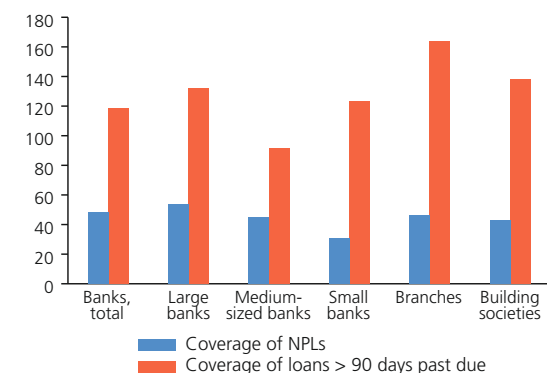
Source: CNB

TABLE IV.3

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

	Non-financial corporations	Households (house purchase loans)	Households (consumer credit)
2007	0.8	0.2	0.1
2008	0.4	0.2	0.1
2009	1.0	0.5	0.9
2010	1.9	0.6	1.6

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

on average for 18.3% of loans to legal entities. In 2009 this share had been 17.8%. As loans to the largest clients are usually less secured or not secured at all, there is still a risk of large losses if several of the largest clients of banks default (see section 4.2).

The share of "more risky" sectors (property development, construction) in NPLs, where the value of the pledged property need not correspond to the original expectations at the loan origination (see Table IV.2), is rising in parallel. Exposures to photovoltaic projects cannot be ignored either, as debtors here may get into difficulties with repaying loans due to a change in the legislative framework (see section 2.2).

Insufficient provisioning could represent a higher risk for small and medium-sized banks in particular. Small banks report the lowest NPL coverage ratio, whereas medium-sized banks report the lowest coverage ratio for loans more than 90 days past due (see Chart IV.10). However, this depends on the degree and quality of the collateral.

Growth in restructured loans continued in 2010
Loans continued to be restructured at a high rate in 2010. Almost CZK 20 billion in loans to the non-financial private sector was restructured (compared to CZK 11.5 billion in 2009). In the case of forced restructuring, when the restructuring is motivated by a debtor's worsened ability to repay loans, the bank has to classify the loan as an NPL and create provisions for it. The issue of restructured loans is monitored very closely by supervisors and the available evidence from examinations suggests that there is no major underestimation of the credit risks in this area.

Operating profit is still allowing banks to absorb loan losses
High operating profits[70] allow banks to create sufficient buffers to cover losses from credit exposures. The operating profit of banks in 2010 continued to offset loan impairment losses sufficiently, thereby ensuring a stable level of net profit (see Chart IV.11). Net profit fell slightly year on year to about CZK 56 billion in 2010 (see Chart IV.12). This decline was due mostly to base effects resulting from extraordinary revenues in 2009 Q4, augmented by a modest increase in administrative expenses in 2010 H2. Return on Tier 1 fell by more than 4 percentage points compared to 2009 to 21.8% in 2010.

Banking sector profitability should not be threatened even in the event of a monetary policy tightening by the CNB
Although the conservative business model of domestic banks is exposed mainly to the risk of a decrease in loan portfolio quality, as more than 50% of their funds are invested in client loans, this model at the same time generates sufficient income thanks mainly to stable profit components such as net interest income and profit from fees and commissions (see Chart IV.13). Both items showed 5% year-on-year growth in 2010. A stable base of savers, the limited ability of corporations to finance themselves in the market, and to a certain

70 Operating profit is calculated as profit excluding loan impairment losses (pre-provision profit).

extent limited competition in the banking sector[71] provides banks with stable interest margins on client loans (see Chart IV.14). Banks also benefit from their function as payment system intermediaries; net income from payment services accounts for one-half of their total profit from fees and commissions. By contrast, net interest income from repo operations with the CNB has been decreasing constantly since 2008 owing to falling monetary policy rates. Similarly, profit from financial revaluation[72] reflected the financial market developments during 2010. It remained positive, but fell by 57% year on year.

According to the available data, net interest income is not affected much by normal movements in the monetary policy rate (see Chart IV.14). The evolution of the interest margin for corporations and households, especially over the last two years, suggests that when monetary policy rates decrease, the margin tends to increase for households and decrease for corporations. Consequently, the expected tightening of monetary policy should not have a major effect on banks' profitability, although a fall in profitability in some small and medium-sized banks with lower shares of client loans in their balance sheets cannot be ruled out.

The capital adequacy of the banking sector increased further, but potential increased dividend payments are a risk

In 2010, banks increased their capital to the highest level since 2003, above all in the form of retained earnings. The overall capital adequacy ratio (CAR) was 15.5% at the end of 2010 and 15.6% in March 2011 (see Chart IV.15). All banks reported values over 10%. The high capitalisation helped to maintain the banking stability index at slightly higher values than in the previous year despite a rise in credit risk and a slight fall in profitability. The vast majority of regulatory capital consists of high-quality Tier 1 equity (the Tier 1 CAR was 14.1% both at the end of 2010 and in March 2011). As the Czech banking sector reports no hybrid instruments in its Tier 1 capital, Tier 1 is essentially identical to core Tier 1 and also to the common equity Tier 1 planned in Basel III (see Box 7).

Although the capital buffer of the Czech banking sector is relatively large, higher dividend payments from retained earnings, which account for a substantial part of the regulatory capital, could be a risk in the near future. Such a reduction of the capital buffer could be motivated by signs of the end of the crisis and by excessive growth in optimistic expectations about the future. It is important to warn against over-optimistic expectations, as developments abroad, where the problems of some indebted euro area countries are coming to a head, and the evolution of risks in the domestic economy do not yet provide sufficient support for claiming that the crisis is over.

---

71 The Hirschman-Herfindahl index of banking market concentration was 0.11, as compared to 0.04 for the Austrian banking sector in 2009 (Rumler, F., Waschiczek, W. (2010): *The Impact of Economic Factors on Bank Profits*, Monetary Policy & the Economy Q4/10, OeNB, pp. 49–67).

72 The term "profit from financial revaluation" is used as a shorter version of the correct term "financial asset revaluation gains/losses".

CHART IV.11

Operating profit and impairment losses
(CZK billions; quarterly values)

| | Operating profit | Impairment losses |
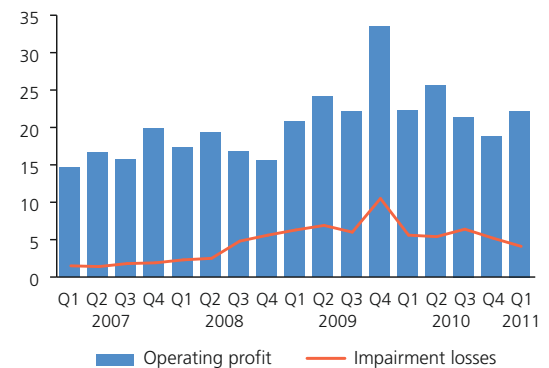
Source: CNB

CHART IV.12

Net profit and return on equity
(CZK billions; %)

| | Net profit (CZK billions) | Tier 1 RoE (%; right-hand scale) |
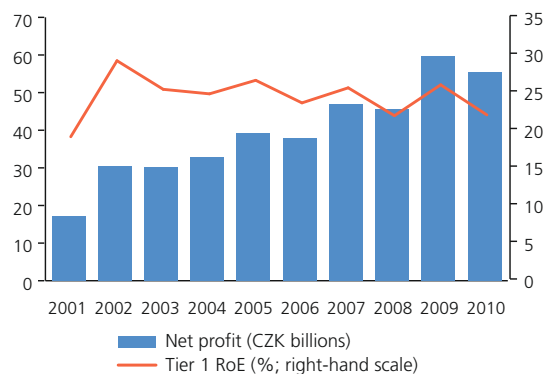
Source: CNB

CHART IV.13

Key components of profit from financial activities
(CZK billions)

Profit from financial revaluation
Net interest income from transactions with CNB
Profit from fees and commissions
Net interest income excluding transactions with CNB
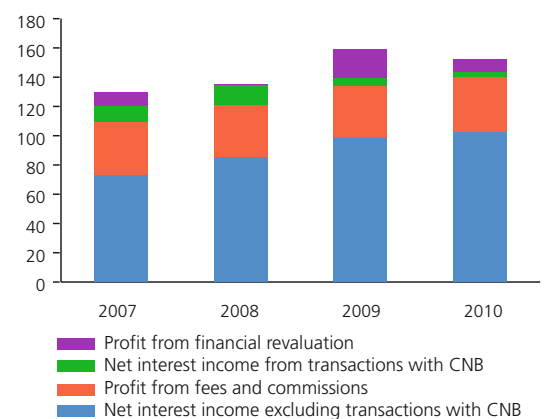
Source: CNB

CHART IV.14

Net interest income, interest margin and the 2W repo rate
(%; end of month)

- Interest margin – households
- Interest margin – corporations
- 2W repo rate
- Net interest income/assets
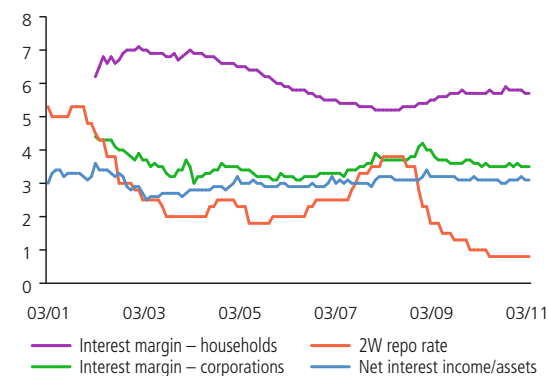
Source: CNB
Note: Interest margin = difference between interest on loans and deposits.

CHART IV.15

Capital adequacy ratio and banking stability index
(CAR in %; index in standard deviations from long-term average 1997–2010)

- Banking stability index
- Tier 1 CAR (right-hand scale)
- CAR (right-hand scale)
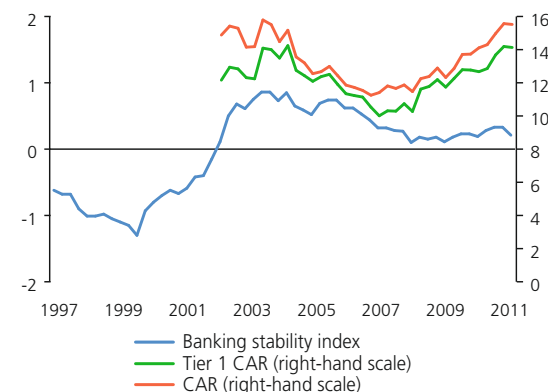
Source: CNB, CNB calculation

CHART IV.16

Structure of regulatory capital
(%)

- Other
- Retained earnings
- Subordinated debt
- Equity capital
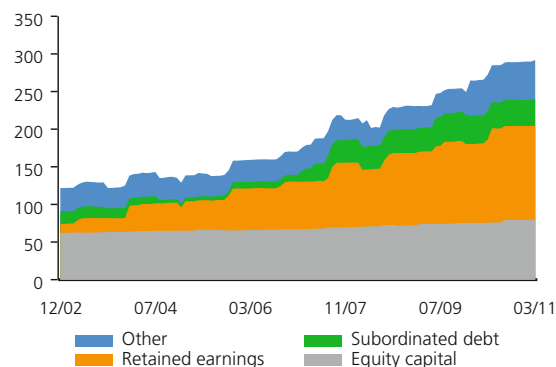
Source: CNB

Box 7:

THE NEW BASEL III REGULATORY FRAMEWORK

In December 2010 the Basel Committee on Banking Supervision issued new recommendations for strengthening the regulation, supervision and risk management of the banking sector (Basel III). The changes can be divided into four main areas.

First, the changes aim to enhance the quality and quantity of capital and generally increase the required minimum capital adequacy ratio (see Chart IV.1 Box). High-quality common equity Tier 1 is given preference over hybrid instruments and subordinated debt, deductions of some items from capital are stricter (for example, some are now only deducted from Tier 1) and the inclusion of minority shares in capital has been restricted. The indicator of minimum capital adequacy measured at the level of total capital is complemented with similar indicators at the level of individual components of capital. To reduce the procyclical behaviour of financial institutions, which contributes to a worsening of the situation in the real economy at times of shocks, Basel III introduces two capital buffers – a conservation buffer and a countercyclical buffer.[73] Both are aimed at forcing banks to limit dividend payments. Financial institutions will have to restrict the distribution of their profits in favour of creating capital reserves to cover potential losses.

Second, in the risk management area there are recommendations to reduce the importance of external ratings in favour of internal credit rating systems. The eligibility criteria for recognised rating agencies have also been made stricter. The global crisis showed that counterparty risk was not being addressed sufficiently. The list of measures dealing with this issue includes, for example, raising the capital requirement to cover counterparty risk and transferring OTC market transactions to markets with a central counterparty.

Third, capital adequacy is to be complemented with a new indicator called the leverage ratio. This ratio is intended to reduce the degree of external financing of the banking sector and to provide additional safeguards against model risk and the risk of measurement error. Initially, the leverage ratio will be used as a supplementary indicator and should be transferred to Pillar 1 after careful revision and calibration.

73 See the article *Excessive Credit Growth as an Indicator of Financial (In)Stability and its Use in Macroprudential Policy* (Geršl and Seidler) in the thematic part of this report.

Fourth, Basel III introduces two new standards to strengthen liquidity management (see also section 3.1).[74] The liquidity coverage ratio (LCR) focuses on strengthening 30-day liquidity and requires sufficient (at least 100%) coverage of a stress-tested net liquidity outflow by quick assets. The net stable funding ratio (NSFR) focuses on limiting the maturity mismatch of assets and liabilities so that banks do not rely on unstable short-term funds when financing long-term loans.

The Basel Committee on Banking Supervision recommends that the measures relating to capital and capital adequacy be applied gradually from 2013 and fully enforced as from 2018. The introduction of the leverage ratio will be preceded by a monitoring period. The period of simultaneous application should start in 2013, and in 2018 the Basel III leverage ratio should be transferred to Pillar 1. The liquidity standards should be introduced in 2015 and 2018 respectively. The Basel III recommendations will be implemented into European law through a directive and regulation on capital requirements (CRD IV). Deviations from Basel III may occur in specific cases, but the overall concept should be preserved.

Estimates of the effects of the changes in the definition of capital and the introduction of the leverage ratio indicate that the Czech banking sector as a whole should not be forced to increase its capital if the current capital level and risk profile are maintained. However, it is possible that some individual banks will need to increase their capital. So far, these estimates are based on data collected in regular reports, which do not contain all the data needed for the calculations. The estimation of the effects of the introduction of liquidity standards on the Czech banking sector requires data outside the framework of regular reporting and will be available during 2011 at the earliest. However, the analyses performed to date indicate, in accordance with the good liquidity position of the Czech banking sector, that compliance with both liquidity standards should pose no major problems to most banks, in contrast to many banks from advanced EU countries.[75]

In connection with the relatively long Basel III implementation period, it is worth mentioning that many countries, especially advanced ones, have decided to require earlier compliance with Basel III, i.e. before the official implementation deadline.

CHART IV.1 BOX

Comparison of capital adequacy ratios: Basel II versus Basel III
(requirements in % of risk-weighted assets)
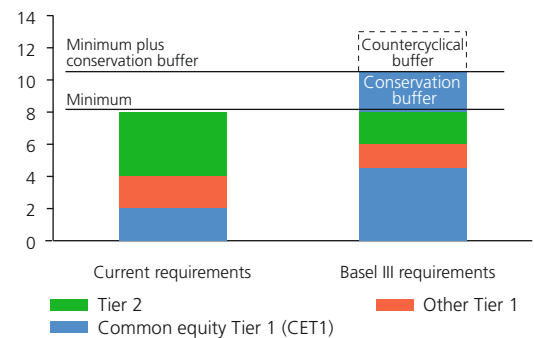
Source: BIS, Bank of England.
Note: Basel II does not specify an explicit standard of 2% of minimum CET1.

CHART IV.17

Liquidity situation in the banking sector and building society sector
(%; QA = quick assets; net position = client loans less client deposits)
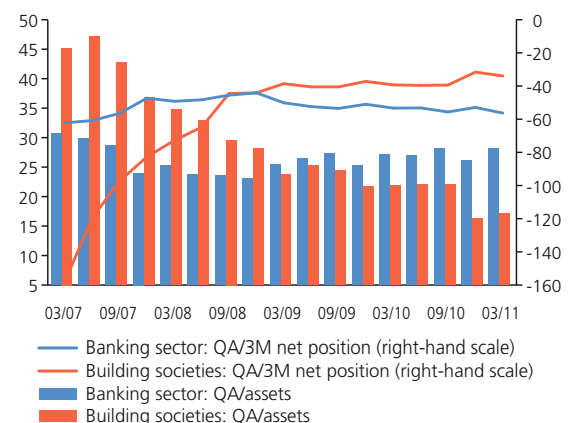
Source: CNB

CHART IV.18

Loan and deposit maturity mismatch: net balance-sheet position in the building society sector
(CZK billion; end-2010 position, standard loans less deposits)
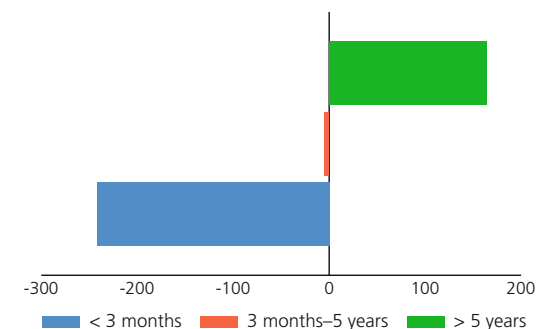
Source: CNB

---

74 BIS: *Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring*, December 2010.
75 See the results of the EU's Basel III QIS (EBA website).

Summary of assumptions for the short-term liquidity ratio

High-quality liquid assets	Weight
Cash	100%
Bonds issued by central banks and general government	
Residents and non-residents with 0% risk weight under Basel II	100%
Non-residents with 20% risk weight under Basel II	85%
Collateral with 0% risk weight under Basel II left to accounting unit less assets transferred in repo trades	100%
Cash outflow	**Rate of outflow**
Financial liabilities other than deposits repayable within 30 days	100%
Deposits	
Deposits repayable within 30 days	
Insured client deposits	10%
Uninsured client deposits	75%
Deposits of credit institutions	100%
Client deposits repayable in more than 30 days	10%
Commitments and guarantees given	10%
Cash inflow	**Rate of inflow**
Financial assets other than deposits that are not included in liquid assets and are repayable within 30 days	100%
Loans repayable within 30 days	
Loans to credit institutions	100%
Client loans	50%

Source: CNB, CNB calculation
Note: The table only contains items that are significant with regard to the domestic banking sector. Short-term liquidity ratio = high-quality liquid assets/total net cash outflow over the next 30 days.

Summary of assumptions for the structured liquidity ratio

Assets (calculation for required stable funding source)	Weight
Cash	
Debt securities with maturity up to 1 year	0%
Loans to financial institutions with maturity up to 1 year	
Claims on central banks	
Debt securities issued by government or central bank with maturity over 1 year	5%
Corporate debt securities with maturity over 1 year	20%
Equity instruments	
Loans provided to non-financial institutions with maturity up to 1 year	50%
Precious metals	
Loans provided and claims with maturity over 1 year	85%
All other assets not given above	100%

Liabilities (stable funding sources)	Weight
Tier 1	
Tier 2	100%
Liabilities with maturity over 1 year	
Liabilities with maturity up to 1 year to non-financial institutions	80%
Other liabilities and capital not given above	0%

Source: CNB, CNB calculation
Note: Structured liquidity ratio = (∑funding source*weight) / (∑assets*weight).

These countries include, for example, Australia, Canada, Spain, Norway, Sweden and Switzerland. In addition, some countries – most notably the United Kingdom, Spain, Switzerland and Sweden – consider some of the Basel III requirements (especially as regards capital) to be insufficient and will require higher standards from their banks.

The liquidity position of Czech banks is very good, although there are some exceptions in the building society sector
The liquidity situation of the banking sector remains stable, with quick assets accounting for 26% of total assets (see Chart IV.17). Some potential for an increase in liquidity risk exists in the building societies segment, where the share of liquid assets is falling over time and stood at 16% in 2010, i.e. 10 percentage points less than for the banking sector as a whole and down by 6 percentage points year on year. The coverage of the net 3-month position of client loans and deposits with quick assets likewise declined from 41% to 32%. One of the reasons for this gradual deterioration in the liquidity position is the fact that building societies compete with banks in the mortgage market and the maturity of their funds decreases after the binding period as the volume of deposits increases (two-thirds of their deposits). This is reflected in a rising maturity mismatch between assets and liabilities. Claims of over five years exceed long-term liabilities by almost CZK 164 billion (see Chart IV.18).

The weaker liquidity position of building societies compared to the banking sector as a whole is not due to shortcomings in liquidity management, but is primarily related to the configuration of the building savings system. In the event of significant changes in the macroeconomic environment or market conditions, building societies could face an outflow of deposits after the binding period. These are term deposits redeemable at notice of 3 months in nature and make up a significant share of the sector's deposits. This risk is still only potential in nature. Although an increase in withdrawals from building savings contracts was recorded in 2010 H2, the number of new contracts increased at the same time.[76] The increase in the number of new contracts in 2010 H2 exceeded the number of contract withdrawals. This had a positive effect on the share of deposits in the binding period, which rose by 3.3 percentage points between July and December 2010, reaching 33.7%.

Other risks in the building societies sector are linked with the regulation of the spread between interest rates on deposits and loans and the long-term fixation of these rates over the life of the building savings contract. As a result, the room for reaction available to building societies in the event of strong swings in market interest rates in either direction

---

[76] Overall, the reduction of state support approved by the Czech parliament in summer 2010 and repealed by the Constitutional Court in April 2011 did not lead to a sharp enough decline in the return on this product to cause a strong outflow of deposits.

is limited to new contracts. The stable interest rate environment, which should be maintained over the next two years, creates suitable conditions for making changes to the building savings system that would significantly mitigate the current sources of risks in this segment.

The Czech banking sector as a whole should not have significant problems with the planned liquidity regulation under Basel III

As the data available to the CNB do not enable the two Basel III liquidity requirements to be calculated exactly (see Box 7), the CNB – like other authorities[77] – used an approach based on proxy indicators. A "short-term liquidity ratio" was constructed as a proxy for the LCR and a "structured liquidity ratio" was used to proxy for the NSFR. In both cases the individual items were set as close as possible to the Basel III requirements, with more conservative procedures and weights generally being used in the case of uncertainty. Thus, the indicators calculated using end-2010 data can be interpreted as lower bounds for the actual values. In parallel, the CNB conducted a survey on both liquidity indicators at the level of selected individual banks. The results suggest that domestic banks are ready for the new liquidity regulation.

The short-term liquidity ratio is basically a stress test of liquidity, as it requires 100% coverage of a rapid liquidity outflow from the bank's balance sheet at the one-month horizon by high-quality liquid assets (see Table IV.4). An outflow of deposits and a restricted inflow of funds are assumed. The liquidity buffer consists basically only of cash, low-risk bonds and other high-quality collateral (e.g. CNB bills obtained in reverse repos). Despite the conservative setting of the rate of liquidity outflow due to sizeable uncertainty about the deposit structure[78], the value of the indicator for the banking sector as a whole should exceed the 100% level set by Basel III.

The structured liquidity ratio requires that the bank's available stable funds (i.e. above all retail deposits and long-term liabilities) be at least as high as the required stable funds, which are derived from the asset structure.[79] This indicator aims to maintain stable funding of banks' balance sheets. The results show that it would be above 110% for the Czech banking sector as a whole.

One of the main characteristics of the banking business is a maturity mismatch between assets (mostly long-term) and liabilities (mostly short-term). Limiting this mismatch to a "reasonable degree" is one of the aims of liquidity regulation under Basel III. The degree of maturity

---

CHART IV.19

Asset and liability maturity mismatch in the banking sector
(% of assets; cumulative 3M net balance-sheet position)
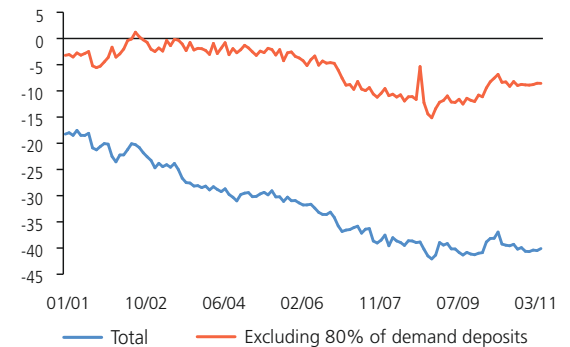
Source: CNB

CHART IV.20

Ratio of deposits to loans granted in selected EU countries
(%; end of 2010; deposits/loans to residents)
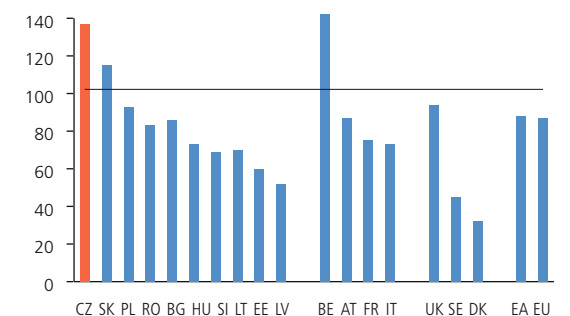
Source: ECB
Note: EA = euro area; EU = average for all EU countries.

CHART IV.21

Net external positions of banking sectors
(% of GDP; end of 2010)
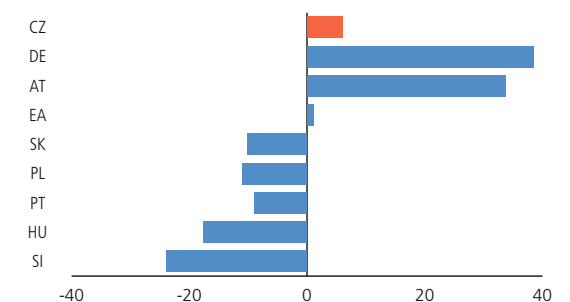
Source: IMF IFS, central banks
Note: Figure for AT is as of the end of 2009.

---

77 For example, IMF: *Global Financial Stability Report*, April 2011, and Riksbank: *Financial Stability Report 2/2010*.
78 The value of this indicator is very much dependent on what proportion of deposits can be regarded as "retail" (stable) and what proportion as "wholesale" (less stable).
79 Securities issued, retail deposits and other deposits with a maturity of over one year are generally considered to be stable funding sources. By contrast, loans from financial institutions maturing in less than one year are regarded as unstable. Bond holdings with longer maturities and high ratings that are traded on liquid markets require a smaller amount of stable funding (20%) than, for example, loans to corporations with a maturity of over one year (100% coverage with a stable funding source).

Situation of the parent groups of the four largest banks in the Czech Republic
(end-2010 data)

	Erste Group	KBC Group	Société Générale	UniCredit Group
Total assets (EUR bn)	206	321	1132	929
Net profit (% of assets)	0.5	0.6	0.3	0.1
Impairment losses (% of assets)	1.0	0.5	0.4	0.7
NPL (%)	7.6	5.2	5.4	6.6
NPL coverage ratio (%)	60.0	79.0	72.0	58.8
Credit cost ratio	155 bps	91 bps	77 bps	123 bps
Capital adequacy (Core Tier 1 ratio, %)	9.2	10.9	8.5	8.6
Ratio of exposure to indebted economies* to Tier 1 (%)	22.5	80.9	32.1	103.6

Source: Bank websites
Note: * Portugal, Ireland, Italy, Greece and Spain; data as of 31 March 2010.

Plan for the introduction of provisioning taking expected loan losses into consideration

IASB and FASB proposal — January 2011, comments by 1 April 2011

Approval by IFRS — 2011 Q2

Implemen-tation — not yet specified

Source: CNB

mismatch is difficult to measure, as, for example, retail deposits on the liabilities side usually have relatively short maturities yet are a very stable funding source. The evolution of selected maturity mismatch indicators shows that maturity mismatch in the Czech Republic is gradually widening because of growth in financial intermediation (credit expansion in the segment of long-term mortgage loans in particular) in a situation of low interest rates, where depositors often prefer to hold deposits in the form of demand deposits (see Chart IV.19).[80]

Bank funding sources in the Czech Republic are local and stable
One of the reasons why the Czech banking sector is successfully tested even for structured liquidity indicators is its high volume of client deposits, which account for about 70% of total liabilities. The Czech banking sector also maintains a very high deposit-to-loan ratio by international comparison (see Chart IV.20). In addition to deposits, the funding sources include interbank loans and bonds, especially mortgage bonds.

Banks are not dependent on funding from abroad and have long maintained a positive net external position (see Chart IV.21). This means that Czech banks tend to lend to their parent groups. The gross exposure of banks incorporated in the Czech Republic (excluding branches) to their foreign parent groups has long been around CZK 100 billion (i.e. roughly 3% of assets). For the banking sector as a whole it is around one-half of the regulatory limit of 25% of capital, which is, however, applied to net exposure.[81] In this context it is useful to track the position of foreign parent companies and the risks these groups face as a whole. The data for 2010 show that all four foreign groups controlling large banks generated net profits in 2010 despite persisting loan portfolio losses. They are relatively well capitalised, but they face risks associated with exposures to indebted EU countries (see Table IV.6).
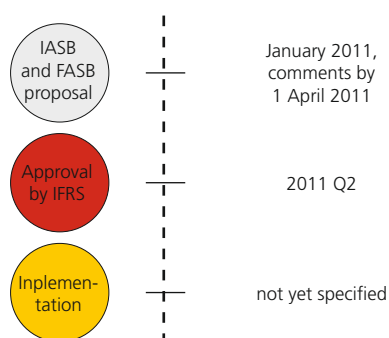
Box 8:

SELECTED INTERNATIONAL MACROPRUDENTIAL POLICY INITIATIVES

In response to the financial crisis, the G20 meeting held in London in April 2009 generated a number of initiatives to enhance the stability of the financial system. Reaching a consensus on how to minimise the overall costs of events like the recent financial crisis became a key task for international experts. In addition to the new Basel III framework for bank regulation (see Box 7), the effect of regulation on the business cycle and the potential role of loan provisions in mitigating the procyclical effect

---

80 This topic was discussed in detail in the article *Financial Stability Indicators: Advantages and Disadvantages of Their Use in the Assessment of Financial system Stability* (Geršl and Heřmánek) in FSR 2006.
81 A limit of 20% of capital applied until the end of 2010. Net exposure is calculated as gross exposure minus some deductible items, such as 75% of exposures (80% until the end of 2010) where the counterparty is an EU-based credit institution.

of the existing regulations are frequently discussed.[82] The aim of the measures debated in this area is to introduce mechanisms to reduce procyclicality.[83] Examples include dynamic provisioning, which – unlike the existing regulations in most countries – would reflect expected (i.e. not only realised) loan losses over the business cycle.

Many international and professional organisations are working on creating the new framework. In June 2010, the Basel Committee on Banking Supervision (BCBS) published a comment letter on a proposal by the International Accounting Standards Board (IASB) which contained specific steps to introduce dynamic provisioning.[84] In January 2011, the IASB and the US Financial Accounting Standards Board (FASB), which had previously had conflicting opinions, issued a joint proposal on provisioning favouring better accounting for future credit losses.[85] Under this proposal, loans would be classified into a *good book* and a *bad book* depending on whether the risk management objective is to routinely manage regular repayments or to get back at least a part of the loan when there is high uncertainty regarding repayment. For the first category the expected losses and related provisions would be calculated at the portfolio level, and either the time-proportional expected losses or the losses expected to occur within the foreseeable future (at least 12 months) would be selected, whichever were the higher. The time-proportional expected losses would be calculated either by multiplying the total losses expected for the remaining life of the portfolio by the ratio of the portfolio's age to its expected life (a linear approach), or by converting the total losses expected for the remaining life of the portfolio into annuities and accumulating these annuities for the portfolio's age (an annuity approach). Provisions for bad book loans would be created in the full amount of the expected losses. However, it is currently unclear when the system would be implemented (see Chart IV.2 Box).

82 In addition to simulations of the hypothetical impacts of dynamic provisioning on US banks' balance sheets during the financial crisis (Fillat J. L., Montoriol-Garriga, J. (2010): *Addressing the Pro-Cyclicality of Capital Requirements with a Dynamic Loan Loss Provision System*, Federal Reserve Bank of Boston Working Paper No. QAU10-4), research has focused, for example, on the provisioning method, the extent of bank loans and discretions in various provisioning regimes and their effect on banks' transparency and risk position (Beatty, A. L., Scott, L. (2009): *Regulatory Capital Ratios, Loan Loss Provisioning and Pro-Cyclicality,* Working Paper, and Bushman, R. M., Williams, C. D. (2009): *Accounting Discretion, Loan Loss Provisioning, and Discipline of Banks' Risk-Taking,* Working Paper, University of North Carolina).

83 Procyclicality stems from the accumulation of risks over the business cycle. In a period of economic contraction, banks increase their provisions in response to the deteriorating quality or risk profile of their loan portfolios. This higher provisioning leads to a decrease in capital right at the moment when banks need to increase their capital adequacy. One possible response to this situation is a reduction in lending, which causes the business cycle to deepen further.

84 BCBS (2010): *A Comment Letter on Financial Instruments: Amortised Cost and Impairment*, http://www.bis.org/bcbs/commentletters/iasb27.pdf.

85 IASB (2011): *Supplement to ED/2009/12 Financial Instruments: Amortised Cost and Impairment,* http://www.ifrs.org/NR/rdonlyres/2BD9895F-459F-43B8-8C4D-AFE8ACA0A9AD/0/SupplementarydocFinancialInstrumentsImpairmentJan2011.pdf.

Chart IV.3 box

Monthly default rate of corporations by year of loan provision
(monthly default rate in %)

Source: CNB, CNB calculation

TABLE IV.7

Selected indicators of credit unions as compared to banks
(%; 2010)

	Credit unions	Banks
Average interest rate on client loans (1)	7.2	5.2
Average interest rate on client deposits (2)	3.3	1.1
Interest margin (1)–(2)	3.9	4.1
Client deposits/loans	138.5	118.7
Client NPL ratio	10.3	6.4
Coverage of NPLs with provisions	9.3	49.0
Tier 1 capital adequacy ratio	12.6	14.1
RoE	2.1	21.8
RoA	0.2	1.3
Share of sector in client loans	0.6	99.4
Share of sector in client deposits	0.7	99.3

Source: CNB

The CNB discussed the issue of procyclicality of provisions in the Czech Republic in FSR 2008/2009.[86] As the dynamic provisioning system used in Spain was largely supported by analyses of the strongly procyclical behaviour of banks,[87] the question arises whether Czech banks also behave this way when lending. An analysis of loans to non-financial corporations in the Czech Republic by the year of loan provision (vintage analysis) reveals that the default rate observed in the crisis year 2009 is significantly higher for loans provided in years associated with the economic and credit boom in 2006 and 2007 than for loans granted earlier (see Chart IV.3 Box). This confirms the fact that in periods of optimism banks lend to comparatively risky clients that are vulnerable to business cycle fluctuations.

In addition to the new regulation of provisions, which relate more to the time dimension of systemic risk, the concept of systemically important ("too-big-to-fail") financial institutions (SIFIs), which is focused more on systemic risk at a particular moment in time, has found itself at the centre of interest.[88] SIFIs are specific institutions for which there is an increased risk of potential problems spreading to the entire system and in turn the real economy owing to their size, their links with other banks, or the specific nature of the services they offer within the banking sector. At the international level this issue is being addressed by the Financial Stability Board (FSB), which has its secretariat in Basel. One of the still unresolved issues is the identification of SIFIs and their approximate number. A number of methods, based on calculations of the contributions of individual SIFIs to systemic risk, have been created in this area in recent months.[89] According to the available information, the BCBS favours simpler indicators such as bank size and interbank loans accepted and granted.[90] However, although the BCBS will issue a recommendation, the final selection of indicators and the number of SIFIs will be up to the FSB.

86 Frait, J., Komárková, Z. (2009): *Instruments for Curbing Fluctuations in Lending over the Business Cycle*. FSR 2008/2009.
87 Jimenez, G., Saurina, J. (2006): *Credit Cycles, Credit Risk, and Prudential Regulation*, International Journal of Central Banking 2(2), pp. 65–98.
88 The time and cross-sectional dimensions of systemic risk are discussed in more detail in the article by Frait and Komárková (2011) in the thematic part of FSR 2010/2011.
89 For example, CoVaR, which is basically the conditional value-at-risk (VaR) for individual institutions. The conditionality is defined by the VaRs of other institutions in the system – see Adrian, T., Brunnermeier, M. (2008): *CoVaR*, Federal Reserve Bank of New York Working Paper. New York. System externalities can also be approximated by a deposit insurance premium which reflects the risk of default of individual banks, the risk premium and the correlation of defaults in the banking sector – see Huang, X., Zhou, H., Zhu, H. (2010): *Systemic Risk Contributions*, FRB Working Paper. An alternative, game-theoretic concept uses the Shapley value, which formalises the allocation of a collective benefit to individual contributors – see Tarashev, N., Borio, C., Tsatsaronis, K. (2009): *The Systemic Importance of Financial Institutions*, BIS Quarterly Review.
90 Drehmann, M., Nikolaou, K. (2011): *Systemic Importance: Some Simple Indicators*, BIS Quarterly Review.

Notwithstanding the continuing debate about the identification of SIFIs, work is also continuing on the method for regulating them. In November 2010, the participants of the G20 summit in Seoul supported the continuation of preparations in the SIFI area by the FSB and national regulators. The first round of the planned measures focuses on global SIFIs (G-SIFIs) and involves, among other things, an increased loss coverage capacity of SIFIs going beyond the stricter capital requirements set out in the new Basel III rules. The ways to increase this capacity include, for example, a systemic capital surcharge, which would be applied differently to each SIFI beyond the basic capital requirements, and "Co-Co bonds", which can be converted into shares when a pre-defined price is reached. Regardless of the mix of instruments that will be selected, the additional capacity should correspond to a capital surcharge of 1%–3% according to information from Reuters. The entire package of measures should be approved one year later, at the November G20 summit.[91]

The issue of global SIFIs will affect the Czech banking sector indirectly, through the parent companies of the largest Czech banks – in particular *Société Générale* of France and *UniCredit* of Italy, which ranked among the world's 20 biggest banks in terms of total assets in 2010.[92]

Chart IV.22

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)

— Banks versus OFIs (in % of bank assets)
— Banks versus PF+ins (in % of bank assets)
— OFIs versus PF+ins (in % of OFI assets)

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 corporations.

Credit unions are displaying a high NPL ratio amid buoyant growth in their deposit base

Despite a similar interest margin as in the banking sector, the absolute level of average interest on deposits and loans indicates that credit unions have long focused on riskier clients (see Table IV.7). This hypothesis is supported by a high ratio of non-performing client loans, which was 11.5% in March 2011, i.e. almost double the figure for banks. The rather disturbingly low coverage of NPLs with provisions (below 10%, as compared to roughly 50% for banks) is maybe partly offset by the requirement to pledge property when the loan is provided, which is the norm in this sector. There is a question as to whether credit unions can operate successfully in the long run with a higher level of risk than banks. Low profitability and relatively concentrated portfolios (the share of the five largest clients exceeds 50% in some small institutions) represent a significant risk for the future if the economy takes a turn for the worse. Although the aggregate Tier 1 capital adequacy ratio of credit unions is a relatively favourable 12.6%, credit unions that report values below 10% currently represent more than 50% of the sector's assets.

---

91 FSB (2011): *Progress in the Implementation of the G20 Recommendations for Strengthening Financial Stability*, http://www.financialstabilityboard.org/ publications/r_110219.pdf.
92 Global Finance (2011): *World's 50 Biggest Banks 2010*, http://www.gfmag.com/tools/ best-banks/10619-worlds-50-biggest-banks.html#axzz1IpsSIT6J.

CHART IV.23

Links of banks with other segments of the financial sector
(CZK billions; value of securities held by banks)
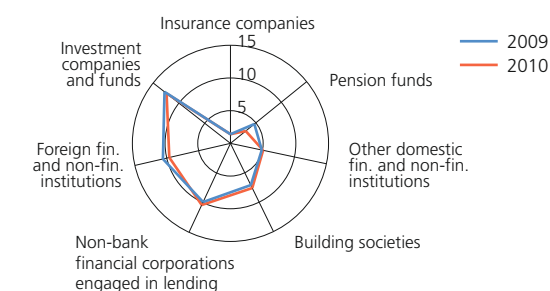
Source: CNB
Note: Value of securities issued by entities over which the monitored banks directly or indirectly exercise a controlling or significant influence. The monitored banks comprise the three biggest domestic banks: Česká spořitelna, Komerční banka and ČSOB. The chart does not contain Hypoteční banka, which is controlled by ČSOB.

CHART IV.24

Premiums written and claim settlement costs
(in CZK billions)

Source: CNB

Credit unions have a small share in the total client loans and deposits of the credit institutions sector (less than 1%). However, growth in deposits in the credit union sector has been higher than that in banks in each of the last three years.[93] The volume of client deposits in credit unions has almost tripled over the last three years and stood at CZK 20.3 billion in March 2011. Of this, 97% (i.e. CZK 19.7 billion) is insured with the Deposit Insurance Fund.

A situation where deposits are flowing into a sector with a high NPL ratio can be regarded as a potential risk. It is therefore necessary to pay attention to this sub-sector, as any problems there could spread to the rest of the financial system through reputational risk. Moreover, if significant problems of a systemic nature occurred in a majority of credit unions and depositors turned to the Deposit Insurance Fund for compensation, the money in this fund might not be enough to cover all compensation payments.[94]

Interconnectedness within the financial sector
The individual segments of the financial sector are significantly interlinked not only by exposures in the form of mutual deposits and loans, but also by ownership interests (see Chart IV.22). These links are increasing over time. Interestingly, they run not only between banks and other financial institutions, but also between non-bank financial institutions (e.g. pension funds and mutual funds).

Large banks in particular hold various forms of ownership interests in financial and non-financial institutions at home and abroad (see Chart IV.23). Links within the financial sector in the form of financial groups enable banks to cover other segments of the financial sector. This can have a stabilising effect on the profitability of the financial group as a whole. If households and corporations change their financing preferences, or if there are legislative changes in a particular segment of the financial sector, the group as a whole will not necessarily lose its clients. At times of crisis or heightened uncertainty, however, this stabilising mechanism may have a destabilising effect, especially if reputational risk materialises. If an institution in the financial group runs into difficulties and reputational risk materialises, problems could spread from that institution to other parts of the group. The risk of contagion exists not only in cases where a controlling bank has a holding in an ailing company, but also in the case of affiliates which are members of international financial groups.
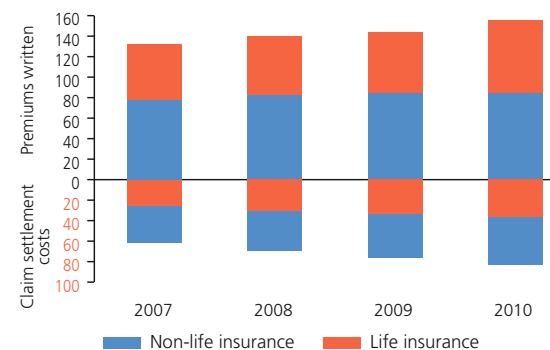
93 In 2010 the volume of deposits in credit unions with a valid licence as of 31 December 2010 rose by almost 70%, while bank deposits grew by only 3%.
94 At the end of 2010 the Deposit Insurance Fund contained about CZK 18 billion.

Premiums written remained flat in the non-life insurance sector only

In 2010 the insurance sector recorded no extraordinary changes or events jeopardising its proper functioning and stability. Nonetheless, total premiums written in non-life insurance adjusted for reinsurance edged down close to the levels observed in 2008. Since that year the sector has also included one domestic reinsurer. By contrast, premiums written in life insurance are rising rapidly and claim settlement costs are persistently far below premiums written (see Chart IV.24).

Funds are mostly invested in debt securities

Debt securities – especially those issued by OECD member countries or their central banks – are still the dominant item within financial placement of insurance companies (see Chart IV.25). Given the volatility in the financial markets, insurance companies often opt to classify them as held to maturity under the amended Act on Accounting, which further stabilises the performance of insurance companies, as financial market fluctuations are reflected in their profit or loss to only a limited extent. Overall, the insurance sector ended 2010 with a high profit of 26% of equity (compared to 21% in 2009).

The majority of insurance company owners are from the EU

Within the ownership structure of domestic insurance companies as measured by share in equity, the proportion of domestic capital has decreased gradually (by 2.4 percentage points over the last two years, to 22.4%). Owners from EU countries still have the largest share (see Chart IV.26). Although total assets, financial placement and premiums written in the domestic insurance sector are rising gradually, insurance penetration is one of the lowest by comparison with the home countries of parent European financial groups and other EU countries, indicating a still relatively underdeveloped market. This is due chiefly to reserves in the life insurance market, which is not as widely used by Czech citizens as in Western Europe.

The capital and solvency of Czech insurance companies are sufficient

The aggregate solvency of insurance companies operating in the Czech Republic (i.e. their ability to ensure that insurance claims can be settled at any time using their own funds), as measured by the ratio of the available to the required (regulatory minimum) solvency margin, remains very good. Good capitalisation is also indicated by an appropriate share of capital in total assets.

The impact of the planned changes in the EU regulatory framework on the domestic sector's financial stability will be negligible

Preparations are currently continuing for the new Solvency II regulatory framework requiring a systemic and comprehensive approach to risk management (see Box 9). The current capitalisation of insurance companies and their sufficient knowledge of this European concept, given, among other things, by the ownership structure of the insurance sector, mean that we can expect a smooth transition to the new regulatory framework, further improvements in the risk management system and an increase in the sector's financial stability.

CHART IV.25

Financial placements of insurance companies
(%)

- Government bonds of OECD countries* — 42.4%
- Other debt securities — 23.6%
- Securities issued by collective investment funds** — 8%
- Other equity securities, including shares — 9.2%
- Deposits — 7.4%
- Reinsurance receivables — 6.1%
- Other financial placements — 3.0%
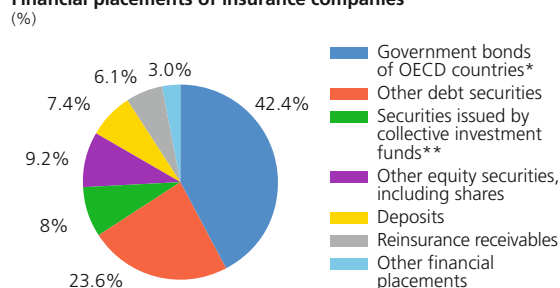
Source: CNB
Note: * Including bonds issued by central banks
** Meeting requirements of EC law.

CHART IV.26

Ownership structure of domestic insurance companies
(%)

- CZ — 22.4%
- Austria — 26.2%
- Netherlands — 25.7%
- France — 12.9%
- Other EU countries — 12.3%
- Non-EU countries — 0.5%
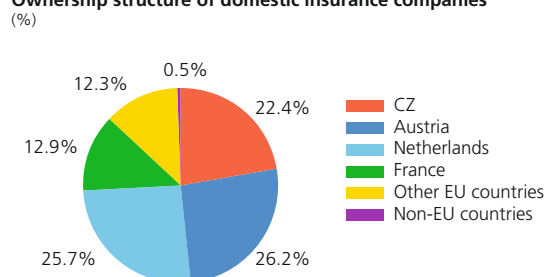
Source: CNB

CHART IV.4 BOX

Participation of Czech insurance companies in QIS5
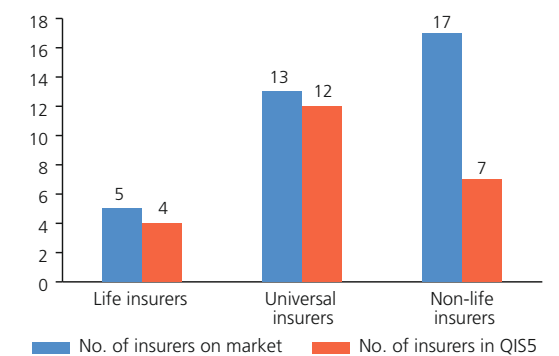
Source: CNB

CHART IV.5 BOX

Technical provisions according to accounts and according to Solvency II in QIS5
(CZK billions)
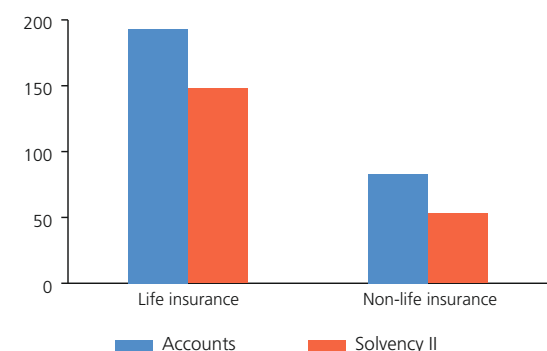
Source: CNB

CHART IV.6 BOX

Capitalisation according to Solvency I and Solvency II in QIS5
(CZK billions)
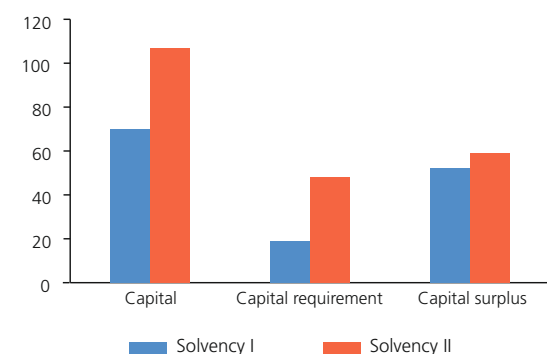
Source: CNB

Box 9:

SOLVENCY II AND ITS IMPACTS IN THE CZECH REPUBLIC

Solvency II is the new European regulatory framework for the insurance sector. It is based on risk assessment and aims to set new regulatory rules contributing to greater protection of policyholders and beneficiaries and deepening the functioning of the internal insurance market. Like the banking regulation, Solvency II consists of three pillars. Pillar 1 contains quantitative requirements (valuation of assets and liabilities, especially technical provisions, definition of own funds, and calculation of capital requirements). Pillar 2 puts an emphasis on qualitative requirements, above all for reliable internal control systems of insurance companies, including own risk and solvency assessment. Pillar 3 lays down requirements for the treatment of information vis-à-vis supervisory authorities as well as the public.

The fundamental regulatory principles are specified in the Solvency II framework directive[95] of 2009. Discussions are currently under way within the European Commission concerning a regulation specifying the rules in more detail. These rules will be complemented by standards and third-level recommendations dealing with technical details. The European Insurance and Occupational Pension Authority will be responsible for their content and publication. The new regulation is planned to take effect in 2013. The new concept introduces fundamental changes in the regulation of the insurance industry, so it is essential at the preparatory stage to test and assess the potential impacts of the proposed rules on the European insurance market. The fifth round of the quantitative impact study (QIS5) was conducted in autumn 2010. A total of 23 Czech insurance companies (see Chart IV.4 Box), covering 99.5% of the life insurance market and 94.4% of the non-life insurance market, participated in QIS5.[96]

The application of Solvency II means, above all, different valuation of assets and liabilities. There will be a fundamental change in the calculation of technical provisions. Their value will be equal to the expected present value of future cash flows stemming from insurance plus a risk margin. According to the results, this approach can be expected to lead to a decrease of 24% on average in the gross technical provisions of Czech insurance companies

---

95 Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of insurance and reinsurance (Solvency II).
96 The results of the study for the Czech insurance market are described in Justová, Kotaška: *QIS5: Výsledky českých pojišťoven se nevymykají z evropského průměru*, Pojistný obzor 1/2011. The European results are described in the *EIOPA report on the fifth Quantitative Impact Study for Solvency II*.

(see Chart IV.5 Box). The decrease in technical provisions will be reflected in own funds as a revaluation difference, causing an increase in own funds of 52%. As regards asset valuation, it is also worth mentioning that insurance companies will no longer be able to value part of their portfolios at amortised cost under the new regulatory framework.

QIS5 confirmed that Czech insurance companies cover their capital requirements with high-quality (Tier 1) own funds. Despite a strong increase in own funds there was a decline in the average solvency ratio (capital/capital requirement) from 376% to 222%. This was due to a marked increase in the solvency capital requirement (SCR). The ratio of the SCR to the current regulatory requirement was 258% on average. The overall impact of these changes led to a slight rise in the available capital of Czech insurance companies (see Chart IV.6 Box).

In Solvency II, the SCR represents the amount of own funds that would cover unexpected large losses within a one-year time frame with a probability of 99.5%. Non-life underwriting risk, especially the risk of floods, had the largest share in the SCR (see Chart IV.7 Box). Also important were market risk, in particular equity risk, and life underwriting risk (strongly influenced by lapse risk). QIS5 participants drew most attention to the potential overestimation of flood risk in the Czech Republic, but also mentioned that the proposed calculations were too complex and that some methodologies that have a large influence on the resulting solvency were ambiguous.

The results of QIS5, which are broadly in line with the European average, suggest that Czech insurance companies have sufficient capital to cover future capital requirements. However, the introduction of Solvency II will necessitate a transition to new risk management and reconfiguration of processes and reporting requirements, all of which will place a sizeable cost burden on insurers.

CHART IV.7 BOX

Relative shares of risks in the solvency capital requirement in QIS5

- Operational risk
- Market risk
- Intangible asset risk
- Counterparty default risk
- Life underwriting risk
- Health underwriting risk
- Non-life underwriting risk
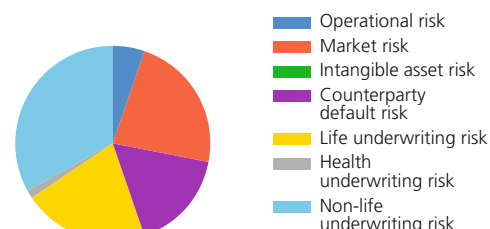
Source: CNB

CHART IV.27

Pension fund benefits
(%)

- Lump-sum settlements
- Surrenders
- Returned state contributions
- Contributions returned to planholders
- Retirement pensions
- Other pensions
- Inheritances
- Payments on terminated pension schemes
- Other benefits paid
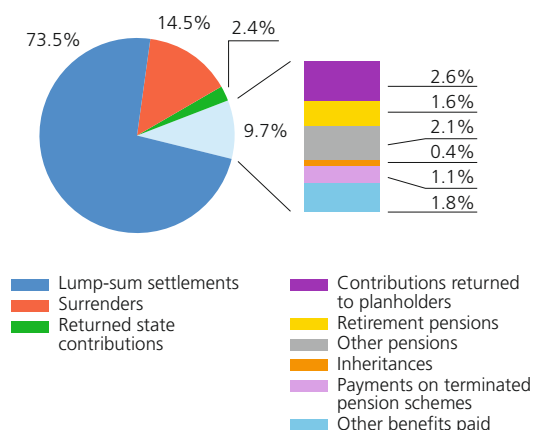
Source: CNB

The pension fund sector is not sufficiently prepared for the pension reform

Although total assets in the pension fund sector recorded a further marked increase, shareholder assets have yet to be separated from managed planholder assets, which is the main prerequisite for the further functioning of this fund pillar in the planned reform of the Czech pension system. The voluntary pension scheme pillar has a purely supplementary function, as is evident from the overwhelming predominance of lump-sum settlements in the benefits paid to planholders (see Chart IV.27). No annuities market has been launched in the Czech Republic yet either. Such a market would enable planholders to transfer funds in a market environment and at a reasonable cost into a lifelong pension, which is the most important aspect as regards providing for old age.

Pension fund asset allocation
(%)
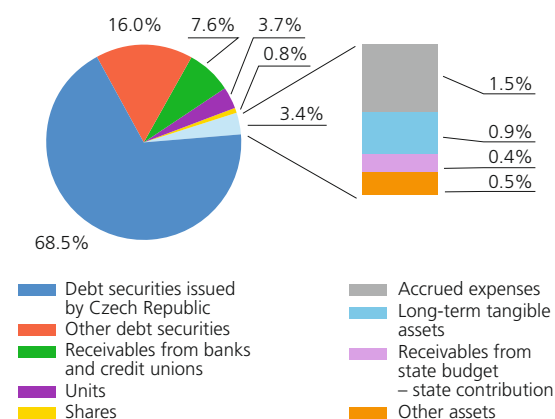
Debt securities issued by Czech Republic — 68.5%
Other debt securities — 16.0%
Receivables from banks and credit unions — 7.6%
Units — 3.7%
Shares — 0.8%
Accrued expenses — 3.4%
Long-term tangible assets — 1.5%
Receivables from state budget – state contribution — 0.9%
Other assets — 0.4%
0.5%

Source: CNB

Capitalisation of pension funds
(CZK billions; right-hand scale in %)

Equity, total
Valuation differences
Excess coverage of planholders' funds by investment assets
Equity/total assets (right-hand scale)
Valuation differences/total assets (right-hand scale)
Excess coverage/total assets (right-hand scale)
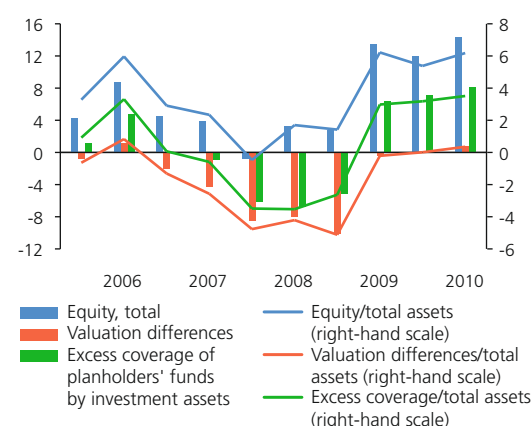
Source: CNB

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

Contributions received, total
Planholders' contributions
Employer's contributions
Amounts transferred to other pension funds
Balance of contributions and benefits
State contributions
Benefits
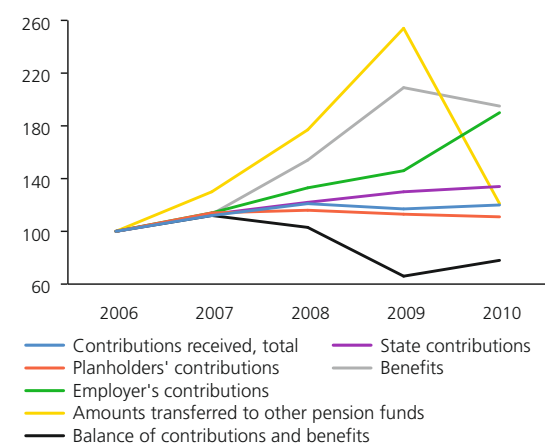
Source: CNB

The asset structure remains stable

The allocation of pension fund money into assets is conservative under the legislation in force, and its structure does not change substantially (see Chart IV.28). A positive aspect going forward is that the accrued expenses encumbering pension fund balance sheets started to be released gradually in 2009 H2. This item fell by almost 10% in 2010. Moreover, the non-negative yield guaranteed by the private pension insurance act ensured that the results of domestic pension funds at the peak of the financial crisis in 2008 and 2009 were much better than those of pension funds abroad. However, this guarantee is paid for during good times by relatively low yields on invested assets.

Capitalisation stabilised in 2010

Planholders' funds are the largest item of pension fund liabilities, corresponding to 93% of the balance sheet total at the end of 2010. Equity stabilised above 5% following the crisis period, having even fallen below zero in 2008 (see Chart IV.29). The improvement in capitalisation was due mainly to valuation changes, which moved close to zero also as a result of the introduction of the option of holding selected securities to maturity and thanks to the calmer financial market situation, and therefore lost significance compared to 2007–2009. The prudential mechanism introduced jointly by the CNB and the Association of Pension Funds is also important for maintaining financial stability. It governs regulatory capital and serves as an indicator of a pension fund's financial condition.

Demographic trends will lead to an increase in payments to planholders

The Czech Republic's large post-war generation, which has had the opportunity to accumulate significant savings in pension funds since private pension insurance was launched in 1994, is now retiring. As a result, the benefits paid to planholders remained high in 2010. The introduction of fees significantly limited the movement of planholders between pension funds to one-half of the figure observed in 2009. While the level of contributions was flat below the 2008 level, the balance of contributions and payments remains considerably lower than before the crisis (see Chart IV.30). Overall, however, pension funds continue to record a net inflow of funds, as the decline in planholder contributions was more than offset by a rise in contributions paid by employers. The total assets of the pension fund sector thus increased to CZK 232 billion. Further growth in total assets, as well as a period of higher payments to planholders, can be expected in the future. From this perspective, it is important that planholders' funds are covered by sufficiently liquid instruments that will store value even in the event of any financial market distress. Such distress is highly probable in the long run, which is what pension funds focus on given the nature of their business (see section 4.2).

Overall, the risks in the insurance and pension fund sectors remain similar as in 2009 and 2010. The risks for pension funds are increasing in proportion to the increasing volume of assets they manage.

New collective investment funds were established in 2010

2010 was a relatively favourable year for collective investment funds (CIFs). CIF assets increased continuously during 2010 and exceeded CZK 170 billion in March 2011 (see Chart IV.31). The rise in total assets was due mainly to the establishment of new CIFs. The number of CIFs increased by 31 year on year to 197 at the end of 2010.[97] Most of them were funds for qualified investors,[98] which are currently the fastest growing segment of the CIF sector. The development of the qualified investor segment significantly changed the structure of the CIF sector. While in 2009 funds for qualified investors represented 19% of the sector's total assets, this share increased to 27% at the end of 2010, at the expense of money market funds, which had the largest share in CIF assets until last year. The overwhelming majority of funds for qualified investors are funds investing in real estate, through which investors benefit from a lower legal entity income tax rate of 5% compared to standard commercial enterprises.

The situation in collective investment funds is stabilising

In a context of falling financial market volatility (see section 3.1), most types of CIFs recorded less volatile changes in the value of their units in 2010, in line with the previous trend. Funds of funds and equity funds continued to show volatility, although the latter are expected to be more variable given the usually higher investment risk involved (see Chart IV.32). By contrast, historically low volatility can be observed for money market funds and bond funds. The indicator of volatility of the value of units, which can be interpreted as a measure of investment risk, suggests a turnaround for the better in this sector. The risk of liquidity problems in the event of a sudden outflow of investors from CIFs, identified in FSR 2009/2010, is therefore significantly decreasing over time.

Collective investment funds are seeing a shift towards higher-yield investments

The relatively favourable trend in the collective investment segment led to an inflow of new investors. This was reflected in positive net sales of units of open-ended mutual funds intended for the public in all fund types except money market funds. The outflow of investment from money market funds is linked with the low interest rates, which are offering investors low returns compared to other investment opportunities. It was reflected in an inflow of investment into other, riskier funds (see Chart IV.33). Thanks to the growth of the stock markets in 2010, equity funds and funds of funds recorded profits on invested capital in 2010. Overall, the net assets[99] of open-ended mutual funds intended for the public increased by CZK 6 billion in 2010.

97 See the list of regulated and registered financial market entities on the CNB website.
98 Funds for qualified investors are CIFs intended for investors with previous experience in investing in investment instruments.
99 Net assets represent the difference between funds' total assets and liabilities and are equal to shareholders' equity.

CHART IV.31

Collective investment fund structure
(CZK billions; assets at the end of 2009 and 2010)
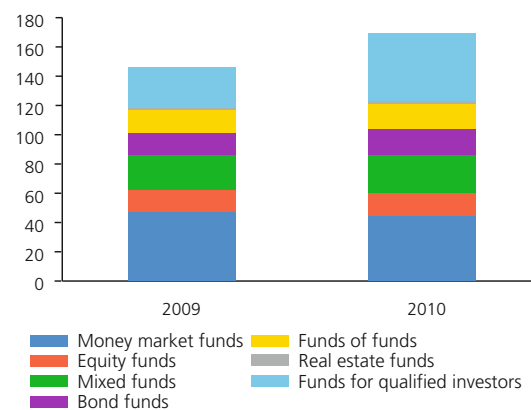
Source: CNB

CHART IV.32

Volatility of changes in the value of open-ended mutual fund units
(annualised standard deviations of week-on-week changes in monthly window; smoothed)
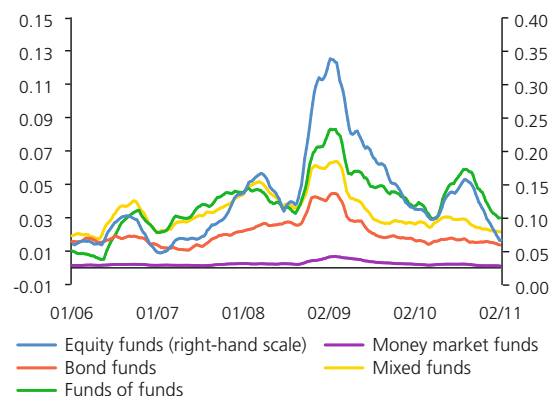
Source: AKAT CR, CNB calculation
Note: The chart excludes real estate funds owing to the absence of a representative sample.

Decomposition of changes in the net assets of open-ended mutual funds intended for the public
(CZK billions; for 2010)

Income from net sales of units
Profit from invested capital
Change in net assets
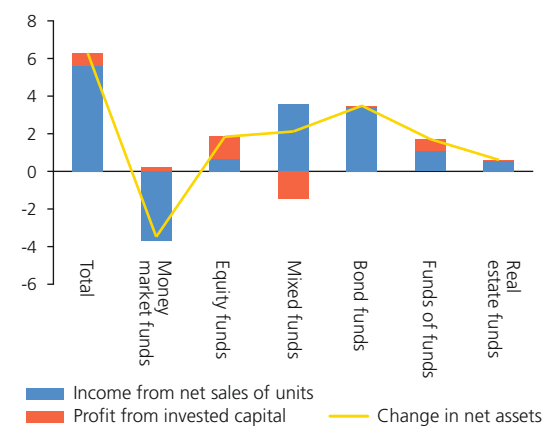
Source: CNB

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

Loans to non-financial corporations
Loans to households
Market share of non-bank financial corporations engaged in lending (right-hand scale)
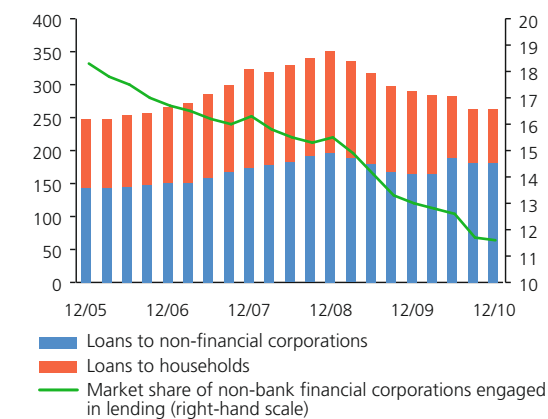
Source: CNB
Note: Market share in total loans provided to residents by banks and non-bank financial corporations engaged in lending.

The decline in the lending activity of non-bank financial corporations engaged in lending slowed

For non-bank financial corporations engaged in lending, 2010 was characterised by a continuing but slower decrease in the volume of loans provided. The total volume of loans provided was CZK 262 billion at the end of 2010, down by 10% from a year earlier, as compared to a decline of 16% in 2009 (see Chart IV.34). This decline was driven mainly by lower loans to households, which fell in both 2009 and 2010, to CZK 81 billion at the end of 2010. By contrast, the volume of loans provided by non-bank financial corporations engaged in lending to non-financial corporations rose by almost 10% in 2010 (compared to a year-on-year decrease of 16% in 2009) and stood at CZK 181 billion at the end of 2010. However, part of these loans was due to the financing of photovoltaic power stations, which recorded exceptionally strong growth last year (see section 2.2).

The overall market share of non-bank financial corporations engaged in lending developed in line with the long-running downward trend, reaching 11% at the end of 2010. This trend can be explained by several factors. First, households have long been turning away from the services of non-bank financial corporations engaged in lending in favour of banks. This is particularly true of leasing companies, which account for the largest share of non-bank financial corporations engaged in lending but are usually linked to banks through assets or loans (see Box 10). Second, a long-running shift from financial leasing to operational leasing[100] had been recorded until 2009. Following previous growth, the share of assets financed by operational leasing from members of the Czech Leasing and Finance Association has stabilised at around 26% in the last two years. This trend is underlined by the evolution of the structure of assets held by leasing companies – the share of non-financial assets in total assets has long been rising and currently stands at 14%.

Box 10:

LINKS BETWEEN BANKS AND NON-BANK FINANCIAL CORPORATIONS ENGAGED IN LENDING

The available data from the Central Credit Register allow the CNB to analyse the links between banks and non-bank financial corporations engaged in lending (hereinafter "NFCELs"). Individual data on 65 companies, whose share in the entire NFCEL sector was about 90%, were used to prepare this Box. As many NFCELs are part of bank groups, differences in activity and financing between independent NFCELs and bank NFCELs can be monitored.

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

Bank NFCELs can benefit from lower information-gathering costs within the bank group and easier access to financing from the controlling bank. However, the results of the analysis show that bank NFCELs do not have a dominant position in this sub-sector. The share of loans provided by bank NFCELs (most of which are direct subsidiaries of domestic banks) in the total loans provided by all the NFCELs analysed was only 32% at the end of 2010.

One interesting finding is that bank NFCELs are not funded exclusively by banks from the group to which they belong (see Chart IV.8 Box). The average number of banks which bank NFCELs use for their financing is around three. This is comparable to the figure for independent NFCELs. It turns out, though, that the average share of the controlling bank in all bank loans received is increasing over time. At the end of 2010 it stood at 77%. It is also true that banks' exposures to "their" NFCELs are usually among their largest.

The liabilities side of the NFCEL balance sheet consists mainly of loans received. Their share in total liabilities was almost 60% at the end of 2010. The role of bonds issued is negligible. In the case of bank NFCELs, bank loans represent the majority of loans received, with their share ranging from 80% to 90% over the last two years. The figure for independent NFCELs is lower at around 60%.

The data allow us to test the hypothesis that bank NFCELs recorded a smaller decrease in lending to corporations and households than independent NFCELs during the economic recession in the Czech Republic thanks to their advantageous position within bank groups. The results of the analysis show that the decline in loans provided by bank NFCELs in 2009 and 2010 was indeed lower than in the case of other NFCELs (see Chart IV.9 Box).

A risk of contagion of the impacts of a deterioration in the financial condition of bank NFCELs to their controlling banks can be identified on the basis of an analysis of the relationship between bank NFCELs and their controlling banks. This risk stems from the aforementioned exposure of controlling banks to bank NFCELs. In addition to this direct channel, an indirect channel can be identified whereby a deterioration in the financial condition of bank NFCELs could have a negative effect on the reputation of the entire bank group (reputational risk).

CHART IV.8 BOX

Funding of NFCELs that belong to bank groups
(number of banks; right-hand scale in %)

- Ratio of loans from controlling bank to total loans from banks (right-hand scale)
- No. of financing banks
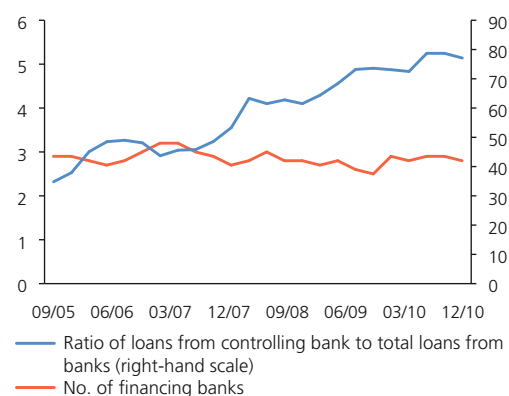
Source: CNB

CHART IV.9 BOX

Year-on-year change in loans provided by NFCELs to residents
(%)

Independent NFCELs   Bank NFCELs   Total
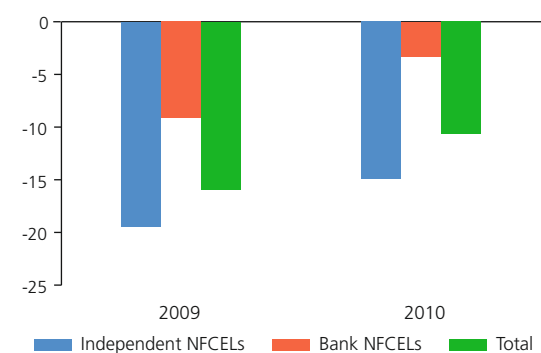
Source: CNB

GDP and credit losses: last year's scenarios versus 2010 outturns
(year-on-year real GDP growth in %; loan losses in CZK billions, right-hand scale)
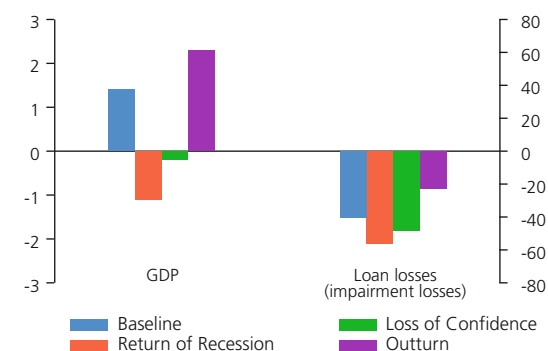
Source: CNB

CHART IV.36

CARs and NPL ratios: last year's scenarios versus 2010 outturns
(%)
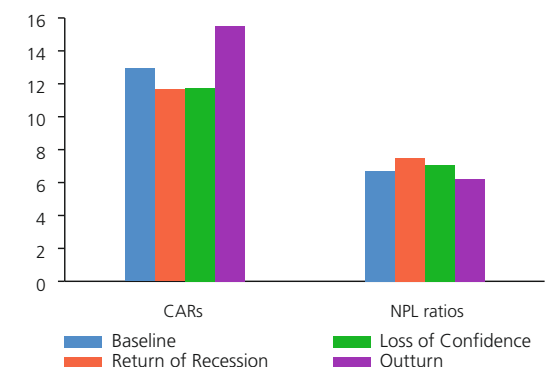
Source: CNB

4.2 ASSESSMENT OF THE FINANCIAL SECTOR'S RESILIENCE

The section below assesses the financial sector's resilience using stress tests. The results confirm that the banking and insurance sectors in the Czech Republic are as a whole sufficiently resilient to risks arising from potentially adverse developments in the economy and in the financial markets in 2011–2012. The pension fund sector has limited capital and in the event of financial market turmoil shareholders would have to supply new capital. The selected ad-hoc sensitivity scenarios indicate that, should certain supplementary shocks materialise, some financial institutions would incur losses requiring a sizeable increase of capital. Tests of banks' balance-sheet liquidity indicate that the banking sector is highly resilient to strong liquidity shocks.

The situation in 2010 was in line with the *Baseline Scenario*, but the impact of the risks was smaller in reality

In addition to the *Baseline Scenario*, FSR 2009/2010 considered two other adverse economic scenarios (*Return of Recession* and *Loss of Confidence*). Macroeconomic developments did not deviate significantly from the *Baseline Scenario* based on the official CNB forecast of May 2010. The exchange rate continued to appreciate against the major currencies, short-term interest rates continued to decline modestly and inflation still rose slowly within the bounds of the inflation target. Economic growth was higher in 2010 H2 than originally expected. This was favourably reflected, among other things, in lower credit losses of the banking sector (see Chart IV.35).

Compared to the previous year's *Baseline Scenario*, the relatively favourable economic developments were also reflected in a lower non-performing loan ratio and a generally higher capital adequacy ratio of the banking sector (see Chart IV.36). Capital adequacy was significantly strengthened by retained earnings. The more favourable banking sector developments compared to the assumptions of the tests were due not only to better-than-expected macroeconomic developments, but also to the conservative calibrations of the models used in bank stress tests, which slightly overstate the risks for prudential reasons.

The banking sector stress test methodology is being gradually developed and refined

The banking sector stress test methodology has gradually been enlarged to better capture the impacts of shocks and combinations thereof. Compared to FSR 2009/2010, which presented and described the main changes in the stress test methodology (consisting in dynamisation of the tests and extension of the test horizon to two years), this year's tests have been refined above all in the area of risk testing in the individual segments of the non-financial corporations sector. The credit risk of the nine basic segments (based on the NACE classification) affects bank balance sheets according to their exposures to these segments. This more precisely captures the transmission of shocks from the real economy to banking institutions' portfolios. The credit growth models have also been recalibrated and the PD and LGD risk parameters have been refined according to data reported by banks under the joint

stress testing project (see Box 11). In addition, since February 2010 the banking sector stress tests have been conducted quarterly and their results published on the CNB's website.[101]

Box 11:

JOINT STRESS TESTING BY THE CNB AND SELECTED BANKS

In 2009 the CNB supplemented its aggregated (top-down) macro-stress tests with (bottom-up) micro-stress tests, which are conducted semi-annually jointly with selected large banks in the Czech Republic and focus on credit risks.[102] The fourth round of joint stress testing took place in February and March 2011 on the data as of 31 December 2010 and was based on the macro-stress test scenarios of February 2011. The baseline scenario of the joint tests was only slightly more optimistic than the *Baseline Scenario* considered in this Report. Based on the decline in GDP, the stress of the adverse scenario is comparable with the *Renewed Recession* scenario.

The baseline scenario of the joint tests assumes a modest decline in credit risks for corporate exposures and a weak increase for retail portfolios (see Table IV.1 Box). The total impact of this scenario over the one-year horizon of the test, however, leads to increases in expected loan losses and also in capital requirements. If the capital requirements for the other non-tested segments and the amount of regulatory capital did not change, the aggregate capital adequacy ratio of the participating banks would fall slightly, from 15% to 14.8%. The adverse scenario assumes a greater rise in credit risks for all the portfolios tested, leading to a larger decrease in capital adequacy to 12.8% (see Table IV.2 Box). Given the resulting capital adequacy estimates well above the 8% regulatory threshold, the results of the current round indicate that the participating banks are sufficiently resilient to adverse loan portfolio developments.

Given the two-year duration of the joint stress test project of the CNB and the selected banks, we can compare the estimates of the basic risk parameters of the previous rounds of tests (the PD parameter in particular) with the subsequently reported actual outturns and verify how conservatively the estimated PD levels for the individual scenarios are set. The results of these comparisons for the individual periods indicate a modest overestimation of the risks in the baseline scenario and a greater overestimation of the risks in the adverse scenario (see Chart IV.10 Box).

TABLE IV.1 BOX

Approximate rise in PD for individual portfolios
(%; EAD weighted)

	Actual situation as of 31 December 2010		Baseline scenario	Adverse scenario
	PD (%)	LGD (%)	PD (%)	PD (%)
Corporate exposure categories	2.53	41.09	2.30	4.49
– large enterprises	1.71	39.96	1.56	3.03
– small and medium-sized enterprises (SMEs)	3.36	41.03	3.04	5.94
– specialised credit exposures	2.18	44.56	1.97	3.93
Retail exposure categories	3.16	31.09	3.70	4.98
– retail-assessed SMEs	4.15	44.03	4.22	6.96
– loans for house purchase	2.33	21.50	2.76	3.42
– other loans to individuals	5.11	53.07	6.11	8.58
Institutions	0.22	35.21	0.25	0.34
Central governments	0.03	25.82	0.03	0.07

Source: CNB

TABLE IV.2 BOX

Capital adequacy ratio for constant regulatory capital level
(CZK millions)

	Capital requirement				
	31 Dec. 2010	Baseline scenario	Change (%)	Adverse scenario	Change (%)
Capital requirements, total (including other risks)	128,041	129,810	1.38	150 776	17.76
Regulatory capital	240,429	240,429	0	240,429	0
Capital adequacy ratio (%)	15.02	14.82	-0.2 p.p.	12.76	-2.27 p.p.

Source: CNB, CNB calculation

---

101 http://www.cnb.cz/en/financial_stability/stress_testing/index.html. The tests are processed in February, May, August and November and published the same month, except for the May tests, which are included in the Financial Stability Report, usually issued in June.
102 Two more banks joined the joint stress tests in 2010 (the project thus currently has eight participants) and the test methodology was extended to include the *Institutions* and *Sovereign* portfolios. For more detailed information about the joint stress testing project and the selected banks see Box 8 in FSR 2009/2010.

CHART IV.10 BOX

Comparison of estimated PDs with outturns for corporate exposures
(%)
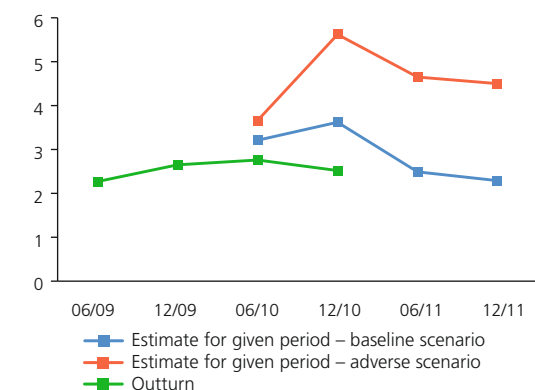
Source: CNB, CNB calculation

TABLE IV.8

Assessment of the impact of the alternative scenarios on the financial sector as a whole

		Baseline Scenario	Asymmetric Developments	Renewed Recession
Total impact of shocks (CZK bn)	Banks*	-26.1	-46.6	-66.6
	Insurance companies	-7.7	-18.2	-27.0
	Pension funds	-1.9	-12.6	-9.4
	Total in CZK billions	-35.7	-77.4	-103.0
	Total in % of assets	-0.8	-1.7	-2.3
Need for capital injections	Banks	0.0	0.8	17.3
	Insurance companies	0.0	0.0	0.2
	Pension funds	0.7	11.4	8.2
	Total in CZK billions	0.7	12.2	25.7
	Total in % of GDP	0.02	0.33	0.70

Source: CNB, CNB calculation
* The figure for banks is the average for 2011 and 2012.

Similar conclusions can be drawn for the retail portfolio sector. A detailed comparison of the estimates with the actual outturns of the selected variables in the aggregate stress tests was published in FSR 2009/2010,[103] with the conclusion that the model is calibrated on the correct – i.e. pessimistic side – and slightly overestimates the risks for prudential reasons.

The default rate in the non-financial corporations segment is now calculated on the basis of microeconomic data
The default rate of non-financial corporations is a flow indicator of newly created NPLs in the non-financial corporations segment over a certain period (12 months as a rule) expressed as a percentage of the initial portfolio. The stress tests use the estimate of this indicator for the period ahead to calculate loan losses and to estimate the evolution of capital requirements for credit risk. While in previous FSRs the default rate was calculated on the basis of aggregate data, this Report (see section 2.2) applies a more precise calculation based on data on individual corporate debtors taken from the CNB's Central Credit Register. The default rate calculated in this manner is slightly lower than the rate calculated using aggregate data.

The *Renewed Recession* stress scenario had the biggest effect on the stability of the financial sector
Turning to the assessment of the impact of the stress tests on the financial sector as a whole, the *Renewed Recession* scenario, which captures a fall in economic activity and adverse developments in the financial markets, had the strongest impact of the alternative scenarios presented in this Report (see section 2.1). Although this scenario generates smaller losses than the *Asymmetric Developments* scenario in the pension funds sector, the overall impacts on the financial sector as a whole are dominated by the results of banks and insurance companies (see Table IV.8). The aggregate impact on the entire sector would be just above 2% of assets and the capital injections into the entire sector would total almost CZK 26 billion (less than 1% of GDP).

The *Baseline Scenario* indicates a slight decline in risks for the corporate sector and a rise in risks for the household sector…
The stress tests of the banking sector are traditionally the most important component of stress testing. Alternative macroeconomic scenarios are defined for these tests using the quarterly evolution of key macroeconomic variables (GDP, inflation, unemployment, etc.) over the next eight quarters, which are generated by the CNB's official forecasting model. Other relevant parameters of the scenarios are estimated using submodels linked to macroeconomic developments or are set by expert judgement (see Table IV.9). Based on the evolution of the key risk parameter for credit risk, i.e. the expected default rate

---

103 See the thematic article *Stress Test Verification as Part of an Advanced Stress Testing Framework* (Geršl, Seidler) in last year's FSR 2009/2010.

in 2011 and 2012, it can be judged for the main credit segments of bank portfolios that for the *Baseline Scenario* the corporate sector risks will decrease gradually, whereas the household risks will again increase slightly this year (see sections 2.2 and 2.3).

…but the stress scenarios would result in pronounced growth in credit risk and related loan losses in the banking sector
In the alternative scenarios, the banking sector is exposed to relatively significant loan losses resulting from rising credit risk parameters. The risk costs, as measured by the amount of expected losses due to loan impairment in the initial portfolio of non-default claims (the loan loss rate), could increase from 1.1% for 2010 to around 3.5% in the *Renewed Recession* scenario. The impact of shocks is the greatest in this scenario, as high loan and market losses associated with a marked fall in adjusted operating profits lead to an accounting loss for the banking sector as a whole in 2012 (see Table IV.10). The impact of interbank contagion remains minimal in all the scenarios owing to the relatively low connectivity between domestic banks.

The capital adequacy of the banking sector exceeds the regulatory minimum in all the scenarios
The capital adequacy ratio exceeds the regulatory minimum of 8% in all the scenarios (see Chart IV.38). Tier 1 capital adequacy is roughly 1 p.p. lower than total capital adequacy. In the stress scenarios, however, the capital adequacy ratio might drop below 8% in several banks due to losses, and shareholders would be forced to increase their capital. In the *Asymmetric Developments* scenario, two banks would get into this situation and the topping-up of the capital adequacy of these banks to the required threshold would require capital injections amounting to CZK 750 million (i.e. about 0.3% of regulatory capital and less than 0.1% of GDP). In the more radical *Renewed Recession* scenario, the number of banks would increase to 11 and the capital injections would exceed CZK 17 billion (6% of regulatory capital and 0.5% of GDP).

Extraordinary dividend payments would be a risk should the stress scenarios materialise
The sensitivity analysis of all three alternative scenarios assumes that banks will change their behaviour regarding their targeted capital adequacy levels. In the standard case it is assumed that banks will endeavour to maintain the initial level of capital adequacy, which is currently quite high (15.6% in March), when deciding on profit distribution. The variant of the scenarios including the assumption of "extraordinary dividend" payments reflects the risk that banks, expecting favourable future developments, will decide to downsize their existing capital buffers to the level prevailing in the pre-crisis period (2004–2007) and will pay out extraordinary dividends in 2011 H1 without simultaneously increasing their capital in any other way.

However, in the variant of the adverse scenario *Renewed Recession* with extraordinary dividend payments, the capital adequacy ratio of the banking sector would fall below the 8% threshold (see Chart IV.39). After paying extraordinary dividends, banks would enter the period of

Table IV.9

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

	Actual value	Baseline Scenario		Asymmetric Developments		Renewed Recession	
	2010	2011	2012	2011	2012	2011	2012
Macroeconomic variables							
GDP (y-o-y %)	2.3	1.5	2.8	0.5	0.7	0.4	-4.1
CZK/EUR exchange rate	25.3	24.1	23.4	23.9	27.1	24.7	27.7
Inflation (%)	1.5	1.9	2.2	2.1	3.0	1.9	2.4
Unemployment (%)	9.3	9.1	8.6	9.4	10.4	9.3	12.0
Nominal wage growth (%)	2.0	3.7	5.4	1.0	2.6	0.6	2.1
Effective GDP growth in euro area (%)	3.0	2.3	2.2	2.1	2.0	2.0	-1.6
Credit growth (%)							
Total	3.5	3.9	4.8	1.2	-2.3	2.5	-6.0
Corporations	-0.3	2.7	4.3	1.6	-0.4	1.7	-4.3
Households	7.0	6.4	6.7	1.2	-4.8	-0.8	-9.6
Default rate (PD, %)							
Corporations	4.7	4.0	3.3	4.8	5.2	5.9	8.0
Loans for house purchase	4.4	5.0	4.3	5.3	5.8	5.5	7.0
Consumer credit	6.1	5.9	5.1	6.2	6.9	6.5	8.4
Loss given default (LGD, %)							
Corporations	45.0	45.0	45.0	48.9	53.3	49.5	72.6
Loans for house purchase	22.0	23.1	22.1	27.6	37.1	30.5	50.7
Consumer credit	55.0	54.5	51.6	55.7	61.0	55.4	68.6
Asset markets (%)							
3M PRIBOR	1.3	1.3	2.1	2.4	4.2	2.3	4.7
1Y PRIBOR	1.9	1.7	2.3	2.8	4.4	2.8	4.8
5Y yield	2.7	2.9	3.0	4.5	6.4	4.9	7.7
3M EURIBOR	0.8	1.6	2.6	2.5	3.6	1.6	3.8
1Y EURIBOR	1.4	2.0	2.9	2.8	3.8	2.5	3.9
5Y EUR yield	1.9	1.8	1.9	2.7	3.8	3.4	5.5
Change in res. property prices	-3.0	-3.5	2.8	-12.4	-4.0	-18.1	-15.2
Change in share prices	9.6	-5.0		-20.0		-40.0	
Banking sector earnings							
Adjusted operating profit (y-o-y %)	-0.4	-2.3	-1.7	-17.9	-3.0	-22.7	-6.6
Insurance sector							
Fall in premium written for motor vehicle insurance (%)		10.0		10.0		10.0	
Gross damage due to three floods (for whole sector, CZK bn)		24.0		24.0		24.0	

Source: CNB, CNB calculation

Chart IV.37

Risk costs of the banking sector
(impairment losses as % of initial non-NPL portfolio)
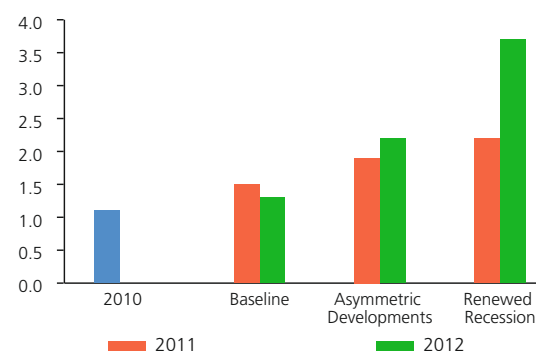
Source: CNB, CNB calculation

Impact of the alternative scenarios on the banking sector

	Baseline Scenario		Asymmetric Developments		Renewed Recession	
	2011	2012	2011	2012	2011	2012
Expected credit losses (minus sign for losses)						
CZK billions	-26.6	-27.6	-30.5	-45.4	-33.6	-75.4
% of assets	-0.6	-0.6	-0.7	-1.1	-0.8	-1.8
Profit/loss from market risks						
CZK billions	2.9	-1.0	-12.2	-4.9	-18.9	-4.4
% of assets	0.1	0.0	-0.3	-0.1	-0.4	-0.1
Interbank contagion						
CZK billions	0.0	0.0	0.0	-0.1	0.0	-0.8
% of assets	0.0	0.0	0.0	0.0	0.0	0.0
Earnings for covering losses (adjusted operating profit)						
CZK billions	78.1	76.7	65.7	63.6	61.9	57.7
% of assets	1.8	1.7	1.5	1.5	1.5	1.4
Pre-tax profit/loss						
CZK billions	**54.4**	**48.1**	**22.9**	**13.2**	**9.4**	**-23.0**
% of assets	**1.3**	**1.1**	**0.5**	**0.3**	**0.2**	**-0.6**
Capital injections						
CZK billions	0.0		0.8		17.3	
% of regulatory capital	0.0		0.3		5.9	
% of GDP	0.0		0.0		0.5	

Source: CNB, CNB calculation

Capital adequacy ratios in each scenario
(%)
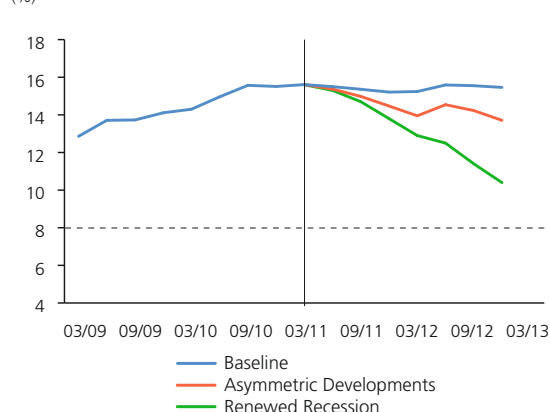
Source: CNB, CNB calculation

significantly adverse developments in 2011 H2 with a lower capital buffer. In this extreme case, 13 banks would get into a situation of insufficient capital adequacy and necessary capital injections would total CZK 39 billion (13% of the current regulatory capital level and more than 1% of GDP).

The test of portfolio concentration confirms significant impacts of potential bankruptcy of the largest debtors
As in FSR 2009/2010, a concentration stress test was carried out under the *Renewed Recession* stress scenario. This test involves bankruptcy of three largest debtors of each bank at the end of 2011. This scenario predicts the highest credit risk growth (see Table IV.9). It is an extremely implausible scenario, with a probability many times lower than even the crisis in the Czech Republic in the late 1990s, and its stress strongly exceeds all the routinely used stress scenarios.

The test was again performed for two alternative LGD assumptions, i.e. an LGD of 100% (reflecting the fact that loans to large debtors are often unsecured) and an LGD equal to the standard 45% for the corporate segment (reflecting the possibility that large firms have assets that would be used to meet creditors' bankruptcy claims. The test results are similar to last year's and indicate that with a 100% LGD the capital adequacy ratio of the banking sector would fall to the 8% threshold at the end of 2011 and drop dramatically below this threshold in 2012 (see Chart IV.40). However, we assess the test results as positive, as the stress involved is extremely high.

Ad-hoc sensitivity analyses capturing selected risks indicate that the banking sector is relatively resilient
The following exposures were identified as relatively risky in previous sections: (a) exposures to certain sectors, especially property development, construction and transport, (b) exposures to photovoltaic projects, which may run into loan repayment problems because of a change in state support, (c) exposures to highly indebted governments (debt of more than 80% of GDP). A number of sensitivity analyses reflecting these risks were performed in the *Asymmetric Developments* scenario.

In the case of sectoral risks, the (already relatively high) default rate in selected sectors (Real Estate activities NACE L, Construction NACE F, and Transport and Storage NACE H) was raised by expert judgement to approximately double the original level for 2011 Q2–2012 Q2. This modified scenario would lead to higher losses (see Table IV.11), but the banking sector as a whole would withstand this risk very well, with a capital adequacy ratio of 13% at the end of 2013 and slightly higher capital injections totalling CZK 1 billion.

Other ad-hoc analyses were performed by assuming impairment of selected exposures (with provisioning in 2011 Q3). Impairment of 50% was assumed for exposures to the largest property development projects (see section 3.2). Another sensitivity scenario assumes similar impairment of claims on photovoltaic projects. Impairment of 30%

was assumed for exposures to indebted countries.[104] The results show that the banking sector is resilient to individual risks, although it would incur accounting losses in 2011 in the event of problems regarding photovoltaic power stations and above all in the event of impairment of claims on indebted countries (see Table IV.12). Moreover, the banking sector would withstand the stress of simultaneous impairment of all three types of exposures with capital adequacy of 9.3% at the end of 2012 and capital injections totalling CZK 20 billion.[105]

A reverse stress test shows that a protracted decline in GDP is the main risk
There are a number of combinations of risk factors that would cause the capital adequacy ratio of the banking sector as a whole to fall to the regulatory threshold of 8% at the end of 2012. The analyses above show that such combinations include the payment of extraordinary dividends, the collapse of banks' largest debtors in a relatively adverse macroeconomic environment, and a decline in the values of selected exposures to selected sectors or countries assuming a high loss given default (e.g. an LGD for claims on indebted countries of 50%).

If we focus on macroeconomic developments only, the most significant risk to the banking sector would be a sharp decline in GDP of about 8% (and a related rise in the unemployment rate to just under 20%) in 2011 and 2012. Assuming that other macroeconomic variables develop in line with the *Baseline Scenario*, such a shock would cause the capital adequacy ratio of the banking sector as a whole to fall to the regulatory threshold of 8% at the end of 2012. Such an adverse economic scenario would not only cause high loan losses, but also lead to a drop in adjusted operating profit and accounting losses for the banking sector as a whole in both 2011 and 2012.

Liquidity shocks are now linked to developments in the macroeconomic scenarios
The two-round macro-stress-testing model presented in FSR 2009/2010 was used to test banks' liquidity risk. However, the liquidity tests have been better integrated with the aggregate tests of banks. In the current version, the liquidity shocks are linked to the macroeconomic stress scenarios and can therefore be presented as ad-hoc extensions incorporating the liquidity aspect.

By comparison with last year's methodology, modifications have been made to the first round of the impact of the shocks on banks' balance sheets.[106] While last year's model defined the first round "merely"

---

104 The government debt of the following countries will probably exceed 80% of GDP this year or the next: Belgium, Canada, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Portugal, the United States and the United Kingdom.
105 Simultaneous materialisation of all three risks has a non-linear effect on the banking sector and the capital injections needed in such a scenario are generally higher than the sum of the injections in the individual sensitivity scenarios.
106 The liquidity stress testing methodology is described in detail in Geršl, A., Komárková, Z., Komárek, L. (2011): *Models for Stress-Testing Czech Banks' Liquidity Risk*. CNB Working Paper, forthcoming.

CHART IV.39

Capital adequacy ratios in each scenario in the event of extraordinary dividend payments
(%)

— Baseline (extraordinary dividends)
— Asymmetric Developments (extraordinary dividends)
— Renewed Recession (extraordinary dividends)
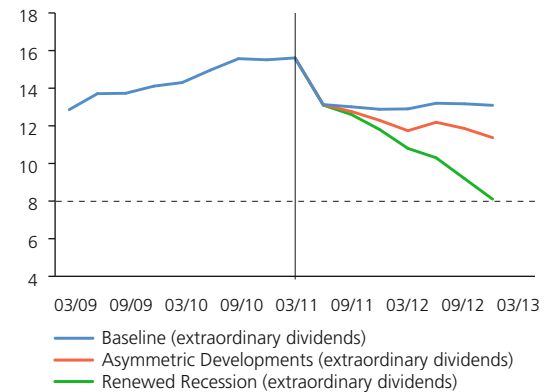
Source: CNB, CNB calculation

CHART IV.40

Results of the concentration stress test
(in *Renewed Recession* scenario)

■ Loan losses in 2011 (% of assets, left-hand scale)
■ End-2011 CAR (%, right-hand scale)
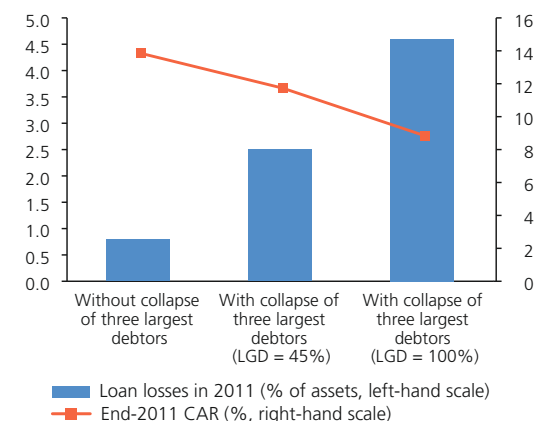
Source: CNB

TABLE IV.11

Results of the ad-hoc stress test with growth of risk in selected sectors
(in *Asymmetric Developments* scenario)

	Asymmetric Developments		...including growth of risk in selected sectors	
	2011	2012	2011	2012
Expected credit losses (minus sign for losses)				
CZK billions	-30.5	-45.4	-37.9	-50.7
% of assets	-0.7	-1.1	-0.9	-1.2
Average default rate				
Construction (NACE F)	15.4	16.4	27.4	19.2
Transport and storage (NACE H)	13.3	14.1	23.8	16.6
Real estate (NACE L)	6.3	6.7	11.6	8.0
Capital adequacy ratio				
total (%, end of period)	14.5	13.7	13.9	13.1

Source: CNB, CNB calculation

TABLE IV.12

Results of sensitivity analyses
(in *Asymmetric Developments* scenario)

	Indebted countries		Developers		Photo-voltaics	
	2011	2012	2011	2012	2011	2012
Credit and market losses						
CZK billions	-42.8	-50.3	-42.8	-50.3	-42.8	-50.3
% of assets	-1.0	-1.2	-1.0	-1.2	-1.0	-1.2
Losses on analysed exposures						
CZK billions	-93.0	0.0	-17.5	0.0	-26.8	0.0
% of assets	-2.2	0.0	-0.4	0.0	-0.6	0.0
Interbank contagion						
CZK billions	0.0	-1.4	-0.1	-0.2	-0.3	-0.8
% of assets	0.0	0.0	0.0	0.0	0.0	0.0
Earnings for covering losses (adjusted operating profit)						
CZK billions	63.4	51.9	65.1	60.3	64.7	58.2
% of assets	1.5	1.2	1.5	1.4	1.5	1.4
Pre-tax profit/loss						
CZK billions	**-72.4**	**0.2**	**4.7**	**9.8**	**-5.2**	**7.0**
% of assets	**-1.7**	**0.0**	**0.1**	**0.2**	**-0.1**	**0.2**
Capital adequacy ratio						
total in %	12.9	11.6	14.0	13.1	13.8	12.7
Tier 1 in %	11.5	10.3	12.6	11.8	12.4	11.4
Capital injections						
CZK billions	1.7		3.6		4.8	
% of regulatory capital	0.6		1.2		1.6	
% of GDP	0.0		0.1		0.1	

Source: CNB, CNB calculation

TABLE IV.13

Dependence of selected liquidity shocks on estimated bank balance-sheet indicators in the stress tests

Estimated RoA in 2011 (%)	Bank run	
	Asymmetric Developments	Renewed Recession
< -2%	10%	15%
-2% – -1%	8%	13%
-1% – 0%	6%	11%
0% – 1%	4%	9%
1% – 2%	2%	7%
> 2%	0%	5%

Estimated risk costs 2011 (%)	Reduction in value of assets sold before maturity	
	Asymmetric Developments	Renewed Recession
< 1%	10%	25%
1% – 2%	30%	45%
2% – 3%	40%	55%
> 3%	50%	65%

Source: CNB, CNB calculation

as a potential liquidity gap in the balance sheet caused by a higher requirement to finance assets with lower funds, this year the first round also includes a reduction in the value of some assets in order to make the test more realistic. The application of this additional effect leads to an immediate fall in the bank's original liquidity buffer,[107] worsening its financial position when closing the liquidity gap.

The liquidity gap now also takes into account the results of the credit and market risk stress testing. Banks that incurred accounting losses in the 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 (see Table IV.13). The second round of shocks, stemming from a rise in reputational and systemic risk caused by banks' efforts to close the liquidity gap, remained the same as in last year's methodology. Both scenarios were applied individually to 22 banks resident in the Czech Republic (i.e. excluding foreign bank branches).

The *Renewed Recession* scenario would cause liquidity problems, but these would not be systemic in nature
Banks were tested at the one-month horizon for a combination of idiosyncratic and market risk (see Table IV.14). The *Renewed Recession* stress scenario had a larger impact on the balance sheets of most banks. Banks lost more than 50% of their original liquidity buffers on average during the test. The causes are mixed across banks. Large banks faced a wider liquidity gap in the two scenarios owing mainly to their higher sensitivity to the shock to drawdown of credit facilities (see Chart IV.41). The test results show that banks are highly sensitive to a decline in the value of government bond holdings. Growth in the credit risk of Czech government bonds, be it due to domestic fiscal problems or due to contagion from abroad, would significantly worsen the liquidity position of Czech banks. Government bonds are usually held as liquid assets that can be used quickly in the event of sudden and unexpected balance-sheet fluctuations.

Although the conditions of the scenarios were set fairly strictly, the banking sector would withstand the simulated stress. In both scenarios, four banks would fully exhaust their liquidity buffers and, in an effort to close the liquidity gap, would be forced to raise extra funds by selling assets with maturities of over one month, albeit at a considerable loss. The results of the cross-bank liquidity stress test complemented and essentially confirmed the results obtained by applying the new liquidity ratios inspired by Basel III (see section 4.1). The low resilience of the banks that exhausted their liquidity buffers during the test was mainly due to their low initial buffer values, low client deposit-to-loan ratios and high credit facilities in relation to their balance-sheet structures.

---

107 The liquidity buffer (LB) consists of quick assets, securities and claims maturing within one month (including claims payable on demand). Quick assets are defined as the sum of cash, claims on central banks, bonds issued by governments or central banks and claims on other financial institutions payable on demand.

The capital of the pension fund sector is significantly lower than that of the other sectors of the financial market

The current stress tests of pension funds focus on relevant risks and model losses on asset holdings in the event of adverse developments in the financial or property markets at the one-year horizon. The tests assume that 85% of the 2010 income, currently recorded under equity, will be allocated to planholders in 2011 H1. In line with the long-term trend of low pension fund returns,[108] we do not expect the 2011 income to contribute to an increase in equity.

The total equity available to the funds is sufficient for the situation modelled by the *Baseline Scenario*. After the application of the *Asymmetric Developments* and *Renewed Recession* scenarios, which work with greater levels of stress, pension funds' equity would fall to very low levels and would not even be sufficient to cover the losses in the *Asymmetric Developments* case (see Chart IV.42). Given the existing prudential mechanism agreed between the Association of Pension Funds and the CNB after the problems in 2007–2009 (see section 4.1), shareholders would have to increase the funds' capital in both stress scenarios – by CZK 11.5 billion in the *Renewed Recession* scenario and by CZK 8 billion in the *Asymmetric Developments* scenario.[109]

The test results show that foreign exchange risk is the biggest risk to pension funds in the *Baseline Scenario*, as 14% of the sector's assets are allocated in foreign currency (see Table IV.15). Bond revaluation losses[110] and losses on shares and units play the key role in the *Asymmetric Developments* and *Renewed Recession* scenarios. The risks arising from property price changes are negligible in both stress scenarios. However, the scenarios differ fundamentally in respect of exchange rate risk, as a depreciation of the koruna during the assumed *Renewed Recession* would lead to part of the losses being covered by an increase in the value of the foreign currency portfolio. In the *Asymmetric Developments* scenario, this effect will not arise and the overall outcome will be worse despite smaller other market risks.

Ad-hoc sensitivity analyses reveal a significant impact of regulatory risks and possible liquidity problems

The measure initiated by the CNB allowing pension funds to classify part of the bonds in their portfolios as held to maturity turns out to be a significant help for pension funds. If the funds experienced a liquidity crisis and were forced, under the conditions of the individual stress scenarios, to revalue this part of the portfolio in line with its current market value, their losses would rise by a further CZK 5–6 billion.

---

108 See *Selected Financial Stability Indicators.*
109 In the calculation of the necessary capital injections, we assume that pension funds should have capital of at least 4% of assets.
110 In the *Baseline Scenario,* as in the insurance company tests, bond revaluation only reflects interest rate risk due to growth in the swap curve amid an unchanged spread between swaps and government bonds. By contrast, the stress scenarios assume a widening of this spread, due, for example, to a decline in sovereign credit quality or a higher liquidity premium as in October 2008.

TABLE IV.14

Scenario type and shock size in the bank liquidity test

Scenario type	Asymmetric Developments	Renewed Recession
Bank run (average for banks, %)	5	10
Drawdown of credit facilities (credit lines, % of volume)	20	10
Share of short-term claims on banks that will become unavailable (%)	50	100
Share of short-term claims on other clients that will become unavailable (%)	20	30
Reduction in value of government bonds eligible as collateral in CNB liquidity-providing operations (%)	20	30
Reduction in value of other securities (%)	20	40
Reduction in value of assets sold before maturity (average for banks, %)	30	50

Source: CNB, CNB calculation

CHART IV.41

Results of the liquidity test
(%; share in original total assets)
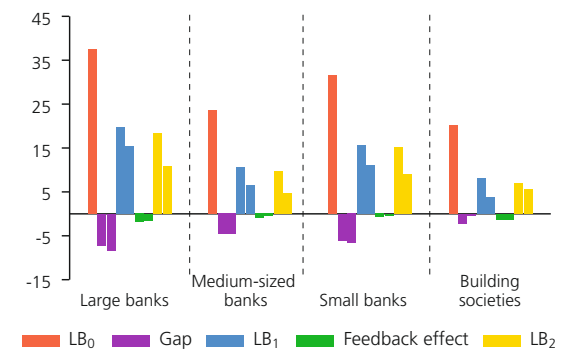
Source: CNB, CNB calculation
Note: The first column of each pair of identically coloured columns expresses the value for the *Asymmetric Developments* scenario and the second expresses that for the *Renewed Recession* scenario. Gap = liquidity gap. Feedback effect = additional stress caused by banks reactions in markets. LB_0 = initial liquidity buffer; LB_1 = buffer after first round of shocks; LB_2 = final liquidity buffer.

CHART IV.42

Estimate of the capitalisation of pension funds
(CZK billions)
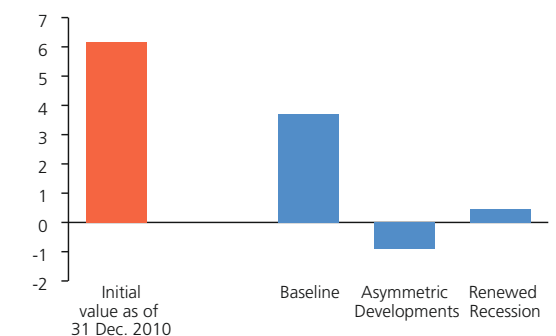
Source: CNB, CNB calculation

TABLE IV.15

Results of the pension fund stress tests

	Baseline Scenario	Asymmetric Developments	Renewed Recession
Equity (as of start of 2011)			
CZK billions	14.4	14.4	14.4
% of assets	6.2	6.2	6.2
Allocation of 2010 earnings for policyholders			
CZK billions	-3.9	-3.9	-3.9
% of assets	-1.7	-1.7	-1.7
Bond revaluation gains/losses			
CZK billions	-0.3	-8.0	-8.9
% of equity	-2.2	-55.7	-62.3
Gains/losses from changes in share and unit value			
CZK billions	-0.5	-2.1	-4.2
% of equity	-3.7	-14.7	-29.4
Exchange rate gains/losses			
CZK billions	-1.0	-2.2	4.2
% of equity	-6.7	-15.6	29.0
Gains/losses from changes in property value			
CZK billions	-0.1	-0.2	-0.4
% of equity	-0.4	-1.7	-2.6
Impact of risks on equity			
CZK billions	-1.9	-12.6	-9.4
% of assets	-0.8	-5.4	-4.0
Equity (as of end of 2011)			
CZK billions	8.6	-2.1	1.1
% of assets	3.7	-0.9	0.5

Source: CNB, CNB calculation

TABLE IV.16

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

	Baseline Scenario	Asymmetric Developments	Renewed Recession
Release of deferred costs in 2011			
CZK billions	-3.5	-3.5	-3.5
% of assets	-1.5	-1.5	-1.5
Revaluation of instruments held to maturity			
CZK billions	-0.2	-5.2	-5.7
% of assets	-0.1	-2.2	-2.4
Equity (as of end of 2011)			
CZK billions	4.9	-10.8	-8.1
% of assets	2.1	-4.7	-3.5

Source: CNB, CNB calculation

CHART IV.43

Capitalisation of individual funds after application of the stress scenarios, including the ad-hoc extension
(as % of total assets of fund; anonymised)
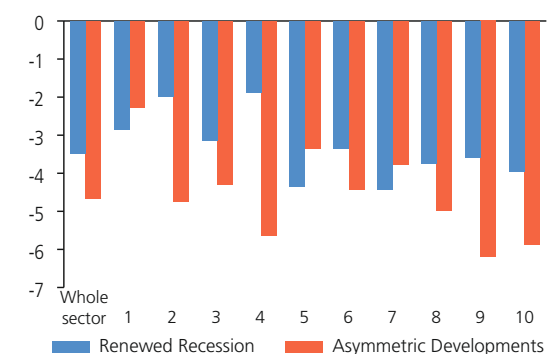
Source: CNB
Note: The figures for the individual funds 1–10 are ranked by resulting equity.

In an ad-hoc sensitivity test, this assumption was extended to include the impact of regulatory risk. Given the insufficient preparedness of pension funds for the pension reform, we assumed a faster release of all deferred costs into the profit and loss account in 2011 (see Table IV.16). The results of the extended test for individual pension funds show that owing to their similar investment profiles and balance sheet structures, all pension funds would have to top up their capital (see Chart IV.43). Total capital injections would rise to CZK 20 billion in the least favourable *Asymmetric Developments* scenario. However, this is an extreme stress assuming a simultaneous impact of all risk factors.

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

As with the other financial sectors, the stress tests of insurance companies were conducted for three alternative scenarios – the *Baseline Scenario, Asymmetric Developments* and *Renewed Recession* – using end-2010 data. As with the pension fund tests, the insurance company tests assume a one-year horizon. The methodology has been further refined compared to FSR 2009/2010. The tests now use more detailed data reported to the CNB in a joint stress testing project of the CNB and selected insurance companies (see Box 12). Some non-life insurance risks (motor vehicle insurance risk and catastrophic flood damage risk) are also tested in addition to market risks.

As expected, bond revaluation risk had the largest impact of the assumed market risks. Given the size of the stress, equity risk also had a significant impact. The total impact of the risks (including insurance risks) on the available solvency margin (ASM) in the strongest *Renewed Recession* scenario would be about CZK 26 billion, which corresponds to 7.5% of assets (see Table IV.17). Taking into account projected earnings from insurance activities in 2011 and planned dividends, the available solvency margin would drop from CZK 58 billion (16.6% of assets) to CZK 34 billion (9.5% of assets). The impacts of the *Asymmetric Developments* scenario and the *Baseline Scenario* are smaller. The insurance sector can be regarded as stable despite these losses. The estimated solvency indicator of the whole sector for the individual scenarios, expressed as the ratio of the disposable to the required solvency margin, does not fall below the regulatory minimum of 100% in any of the scenarios, suggesting sufficient risk coverage. Some insurance companies could fall below the regulatory solvency threshold in isolated cases in the *Renewed Recession* scenario, but would require capital injections of only around CZK 220 million.

Box 12:

JOINT (BOTTOM-UP) STRESS TESTING BY THE CNB AND SELECTED INSURANCE COMPANIES

Along the lines of the joint stress testing project of the CNB and selected banks (see Box 11), a similar project was launched for insurance companies in 2010. Its aim is to assess the ability of insurance companies to absorb the impacts of possible adverse

economic developments. This box summarises the results of the second round of joint stress testing, conducted in April 2011. The participants were selected insurance companies whose share of the domestic market based on gross premiums written was more than 90% in 2010.

The stress test assesses the impact of significant changes in risk parameters on the value of the insurance company's assets and liabilities, and hence on the available and required solvency margins (in line with the principles of Solvency I), at the one year horizon. The investment risks examined were equity risk, assets and liabilities interest rate risk, real estate risk, foreign exchange risk, credit risk and the risk of a decline in government bond prices, and the non-life insurance risks were motor vehicle insurance premium risk and the risk of claims due to natural catastrophe. The adverse scenario for insurance companies followed the *Unexpected Recession* stress scenario applied to the banking sector in February 2011, with risk factors relevant to insurance companies.[111] For insurance companies the scenario was extended to include a 10% decline in premiums written for motor vehicle insurance at the same level of costs as in 2010. In addition, the extended scenario tested how the capitalisation of insurance companies would be affected if floods occurred at the same time. The extended scenario thus contained a series of three floods, two of which were local with claims corresponding to a roughly five-year return period and one with claims corresponding to a 50-year return period. The tests used data as of 31 December 2010.

The aggregate results show that thanks to sufficient available capital, the sector as a whole, represented by the participating insurance companies, would absorb the impacts of large movements in risk factors, including simultaneous floods (see Chart IV.11 Box). The sector stays relatively high above the 100% solvency threshold even after the application of significant shocks. The resulting available solvency margin at the one-year horizon was affected not only by the impact of the shocks in the test and by the loss of insurance companies so generated, but also by the value of dividends planned to be paid in 2011 (see Chart IV.12 Box). The aggregate impact of the shocks for assets and liabilities interest rate risk and the risk of a decline in government bond prices has a dominant role in the loss caused by the impact of the stress scenario (see Chart IV.13 Box). The asset-side impact of these shocks for individual insurance companies depends largely on the proportion of bonds classified

[111] We assumed a 40% reduction in the value of shares, a 20% fall in property prices, an increase in the swap (IRS) curve of about 2 p.p., an increase in the government bond yield curve of about 4 p.p., a depreciation of the koruna of 13% and an increase in the spread of corporate bonds relative to their rating.

TABLE IV.17

Results of the insurance company stress tests

	Baseline Scenario	Asymmetric Developments	Renewed Recession
ASM (as of start of 2011)			
CZK billions	58.08	58.08	58.08
% of assets	16.58	16.58	16.58
Bond revaluation gains/losses			
CZK billions	-2.49	-10.22	-14.41
% of ASM	-4.28	-17.59	-24.80
Gains/losses from change in technical provision			
CZK billions	0.30	1.06	1.07
% of ASM	0.51	1.83	1.84
Gains/losses from changes in share and unit value			
CZK billions	-0.70	-3.63	-7.53
% of ASM	-1.20	-6.25	-12.97
Exchange rate gains/losses			
CZK billions	0.39	0.10	-0.35
% of ASM	0.66	0.16	-0.60
Gains/losses from changes in property value			
CZK billions	-0.11	-0.49	-0.76
% of ASM	-0.19	-0.85	-1.31
Gains/losses from fall in non-life insurance premium			
CZK billions	-2.46	-2.46	-2.46
% of ASM	-4.24	-4.24	-4.24
Gains/losses from catastrophic flood damage			
CZK billions	-2.60	-2.60	-2.60
% of ASM	-4.48	-4.48	-4.48
Impact of risks on ASM			
CZK billions	-7.68	-18.24	-27.05
% of assets	-2.19	-5.21	-7.72
Planned dividends for payment in 2011			
CZK billions	-16.25	-16.25	-16.25
% of assets	-4.64	-4.64	-4.64
Projected earnings from insurance activities in 2011			
CZK billions	16.99	16.99	16.99
% of assets	4.85	4.85	4.85
Other impacts (tax)			
CZK billions	-1.86	-0.20	1.30
% of assets	-0.53	-0.06	0.37
ASM (as of end of 2011)			
CZK billions	49.29	40.38	33.08
% of assets	14.07	11.53	9.44

Source: CNB calculation
Note: ASM = available solvency margin.

CHART IV.11 BOX

Solvency ratio for the adverse scenario extended by flood scenario
(%)

Source: CNB

Change in the available solvency margin
(CZK billions)
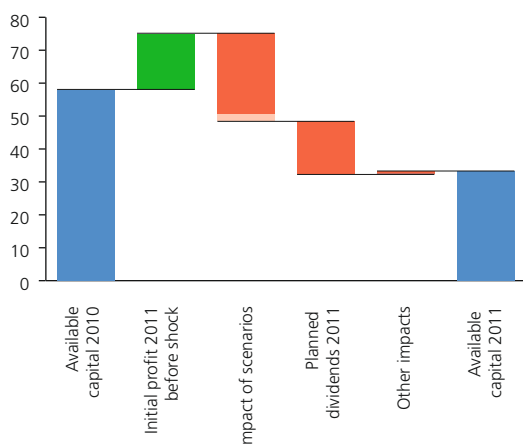
Source: CNB
Note: In the *Impact of scenarios* column, the impact of the floods is indicated
          by the wave pattern.

**Shares of individual risks in the decrease of the available
solvency margin caused by the impacts of the shocks**
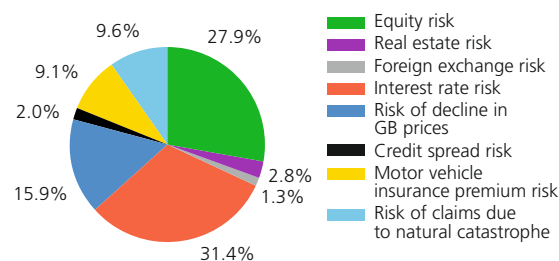
Source: CNB

**Comparison of the impacts of the scenarios for interest rate
risk and the risk of a decline in government bond prices
on the change in capital in relation to the valuation approach**
(CZK billions)
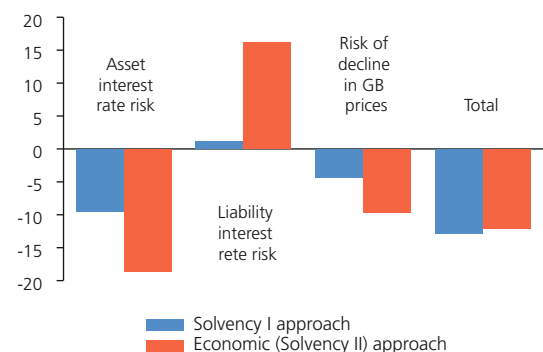
Source: CNB

as held to maturity valued at amortized costs. The interest rate sensitivity of the book value of technical provisions under Solvency I is relatively low. The significance of the impact of the shock for the risk of a decline in government bond prices is also related to the fact that government bonds account for 46% of the investment allocation of the participating insurance companies. Although the volume of equity positions is low, its impact is also significant owing to the size of the equity shock. The relatively small result of the shocks for the risk of floods compared to the other risks shows that insurance companies have well-structured reinsurance programmes for catastrophic claims caused by floods in respect of the tested scenario.

The stress test was also extended to include an economic view of the sensitivity of insurance companies' assets and liabilities to movements in interest rates and government bond yields, i.e. an approach consistent with the Solvency II valuation principles. On the asset side, all bonds, including bonds classified as held to maturity valued at amortised costs, were valued at fair value and exposed to a shock in the economic view. On the liability side, the interest rate sensitivity of the value of insurance liabilities was estimated with respect to the defined stress. The effect of the shocks for interest rate risk and the risk of a decline in government bond prices rose significantly for assets and liabilities separately, but the overall impact on the change in capital is almost the same for the participating insurance companies as under Solvency I (see Chart IV.14 Box). The same does not apply for many of the individual results of insurance companies. Some recorded a decline in interest rate sensitivity under the Solvency II principles, while others recorded an increase. This difference is due mainly to the structure of insurance companies' assets and insurance liabilities, the accounting classification of assets, and asset and liability management policy.

PART II – THEMATIC ARTICLES

FINANCIAL STABILITY, SYSTEMIC RISK AND MACROPRUDENTIAL POLICY

Jan Frait, Zlatuše Komárková

This article aims to open a debate on creating a macroprudential policy framework in the Czech Republic. It starts by describing how the CNB defines financial stability and what place macroprudential policy has within it. It then gives the sources of systemic risk and outlines the mechanisms which lead first to the accumulation and subsequently to the materialisation of such risk. It goes on to compare the operational framework of macroprudential policy with the traditional monetary policy framework. Tools and actions which can be included in the financial stability and macroprudential policy toolkit are subsequently incorporated into this framework.

> " … in tracking systemic risk … we should avoid a false sense of precision …
> it is better to be approximately right than precisely wrong"
> *Borio (2010, p. 9)*

1. INTRODUCTION

Ways of incorporating a new pillar – macroprudential policy – into the financial stability toolkit have started to be discussed at various levels (international, European and national) in response to the global financial crisis. In the EU, this debate has led to the creation of the European Systemic Risk Board (ESRB), which is set to become the European authority for macroprudential oversight. Numerous initiatives have also been set up to produce macroprudential regulations. Some of these have already been incorporated into the "Basel III" proposals of the Basel Committee on Banking Supervision (see BCBS, 2010a). Others are being discussed or prepared by other international authorities, specifically the European Commission at EU level and the Financial Stability Board at global level.

This article aims to open a debate about how the concept of macroprudential policy should be developed in the Czech Republic in the coming years given its financial market structure, its existing monetary policy regime and its historical experience with regulating and supervising financial institutions over the preceding two decades. The article includes descriptions and definitions of a whole range of terms and concepts that have started to be used routinely – and often also inaccurately – in the debate on the pursuit of financial stability goals through macroprudential policy. The starting point for realising the aim mentioned above is *the CNB's financial stability concept*, which has been applied since 2004. The original narrowly defined macroprudential policy framework advocated by economists from the Bank for International Settlements (BIS)[1] will be incorporated into this starting concept and supplemented by information obtained from assessments of the causes of the latest global financial crisis.

The article is structured as follows. Section 2 examines the objective of financial stability and defines macroprudential policy and systemic risk. Section 3 focuses on the time dimension of systemic risk – procyclicality and the financial cycle – and section 4 deals with the cross-sectional dimension of systemic risk. Section 5 describes methods for identifying and assessing the magnitude of systemic risk. Section 6 compares the operational frameworks for macroprudential and monetary policy, and Section 7 presents individual macroprudential policy tools, putting them into context with various phases of the financial cycle and different sources of systemic risk. Section 8 concludes by summarising the main aspects of the macroprudential policy framework. The article will not deal in any depth with the full spectrum of systemic risk sources, analysis and instruments that are currently included in the field of financial stability. It will instead focus on the part of the spectrum that is macroprudential in nature and is simultaneously relevant to the CNB given the structure of the Czech financial sector and economy as a whole.[2]

---

1 One of the consequences of the ongoing "macroprudential revolution" is that the multi-dimensional concept of macroprudential policy is getting more and more blurred. Until 2008, the term "macroprudential" was used almost exclusively in the context of BIS analyses focused primarily on risks associated with the financial cycle. Since then, it has become a highly fashionable expression used in an increasingly wide context moving further and further away from its original meaning (see discussion in Clement, 2010; Borio, 2010). The main papers by BIS economists which defined the original concept of macroprudential policy are Borio (2003), Borio and White (2004) and White (2006).

2 This article does not examine the role of monetary policy in supporting financial stability or the links between monetary policy, asset prices and financial stability. Detailed discussions of these issues are presented by Frait, Komárková and Komárek (2011) and Zamrazilová (2011).

2. FINANCIAL STABILITY AND MACROPRUDENTIAL POLICY

There is currently a consensus in the central bank community that the *financial stability objective* is to achieve a level of stability in the provision of financial services (i.e. lending, insurance, execution of payments, etc.) over the entire business cycle which will support the economy in attaining maximum sustainable economic growth. The CNB adopted a definition consistent with this current thinking about the financial stability objective back in 2004. It 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. Another core element of the CNB's financial stability framework is its definition of *financial stability analysis* as the study of potential sources of systemic risk arising from the links between vulnerabilities in the financial system and potential shocks coming from various sectors of the economy, the financial markets and macroeconomic developments.

The aforementioned definitions explicitly emphasise the *macroprudential orientation of the CNB's financial stability policies*. Figure 1 shows that the job of these policies is to ensure that the financial system does not become so vulnerable that the shocks ultimately cause financial instability in the form of a crisis. The CNB's financial stability analyses contained in its Financial Stability Reports are therefore focused on determining whether weak spots are forming in the financial system which might reduce its resilience to shocks and whether conditions are being created in which the interaction of macroeconomic factors

STABILITY STATES OF THE FINANCIAL SYSTEM

and policies, excessive household, corporate, government or financial institution debt, and financial market volatility could cause a financial crisis.

The main, although not only, element of financial stability policy is *macroprudential policy*. The primary distinguishing feature of macroprudential policy is that unlike traditional microprudential regulation and supervision (focused on *the resilience* of *individual* financial institutions to mostly *exogenous* events) it focuses on the stability of the system as a *whole*. It primarily monitors *endogenous processes* in which financial institutions that may seem individually sound can get into a situation of systemic instability through common behaviour and mutual interaction.[3] The only "true" macroprudential policy instruments are those which are explicitly focused on the financial system as a whole and on the endogenous processes going on within it. Other measures that can be used to a certain extent to support financial stability and can also have macroprudential aspects include microprudential regulatory and supervisory instruments and monetary, fiscal and tax policy tools (for more details see section 7).

The *macroprudential policy objective* is to prevent systemic risk from forming and spreading in the financial system and thereby reduce the probability of occurrence of financial crises with large real output losses for the entire economy.[4] By suppressing channels of formation and spread of systemic risk, macroprudential policy should therefore act primarily preventively against signs of financial instability in the future and secondarily at least to mitigate their impacts if prevention fails.

The object of macroprudential policy is systemic risk, which has two main dimensions. The *time dimension* reflects the build-up of systemic risk over time. The source of this dimension is *procyclicality* in the behaviour of financial institutions contributing to the formation of unbalanced financial trends, which sometimes slip out of the control of institutions themselves or their regulators (see, for example, Brunnermeier et al., 2009 or Borio and Drehmann, 2009a). Systemic risk of this type manifests itself primarily as correlated exposures to the same macroeconomic factors across financial institutions (section 3). The second dimension of systemic risk is *cross-sectional* and reflects the existence and distribution of systemic risk at any given moment in time.

---
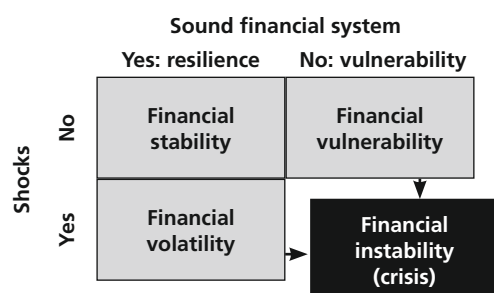
3   The job of financial stability analysts is to avoid risks due to the fallacy of composition, which arises when the whole is wrongly assessed only as the sum of mutually independent parts.

4   Reinhart and Rogoff (2009) document that systemic crises have a long-term negative impact on economic activity. In such crises, GDP contracts for a period of around two years on average and returns to its original trend only after four years.

The source of this dimension is mutual and chained exposures among financial institutions (section 4). Such institutions can underestimate the potential impact of their own activities on the risk of the financial network as a whole, thereby creating negative externalities for other parts of the system.

The time and cross-sectional dimensions to a large extent evolve jointly and so cannot be strictly separated. In a growth phase of the financial cycle, rapid credit growth is accompanied by a growing exposure of a large number of banks to the same sectors (usually the property market) and by increasing interconnectedness in meeting the growing need for balance-sheet liquidity. Financial institutions become exposed to the same concentration risk on both the asset and liability side. This makes them vulnerable to the same types of shocks and makes the system as a whole fragile. The time dimension shows up in degree of solvency, while the cross-sectional dimension manifests itself in the quality of financial institutions' balance-sheet liquidity. However, solvency and liquidity are also interconnected, as liquidity problems often transform quite quickly into insolvency.

From the general perspective, and given the character of the Czech economy and its financial system, the time dimension of systemic risk can be regarded as dominant. Empirical analysis of the history of financial crises reveals that the financial cycle – whose primary features are changes in credit growth and in the level of debt of economic agents – usually lies at the heart of systemic financial crises with strong negative impacts on output. The 1997–1999 crisis in the Czech Republic and the 2007–2009 global crisis were both of this nature. However, the cross-sectional dimension should not be underestimated either. Especially in a small open economy, connections between institutions in the domestic economy and their links with the international economy can both be sources of contagion. While acknowledging the greater importance of the time dimension, the approach to macroprudential policy must therefore cover both dimensions.

Given the aforementioned characteristics of systemic risk, *macroprudential policy* can be defined as the application of a set of instruments that have the potential to reduce the vulnerability and thereby increase the resilience of

the system by creating capital and liquidity buffers, by limiting procyclicality[5] in the behaviour of the financial system or by containing risks that individual financial institutions may create for the system as a whole.

3. PROCYCLICALITY, THE FINANCIAL CYCLE AND SYSTEMIC RISK

The combination of liberalised financial markets and their increased procyclicality since the 1990s has made economies prone to *endogenous boom and bust cycles*. In good times, financial institutions and their clients can start to underestimate the risks associated with their economic decisions or, in an environment of increased competition, can even be exposed to strong incentives to take on bigger risks. A major incentive for such behaviour is easier access to external financing, which is strongly dependent on current risk perceptions reflecting the currently high economic activity. If economic agents start to misconstrue a temporary cyclical improvement in the economy as a long-term increase in productivity, virtuous cycle can start to develop, supported by an increased willingness of households, firms and government to accept a higher level of debt and use it to buy risky assets. Such cycles are common in converging economies, where it can be particularly difficult to distinguish between long-term productivity gains (due, for example, to the positive effects of foreign direct investment) and cyclical improvements.

This sets off a spiral (positive feedback loop) manifesting itself as a decreasing ability to recognise risk, trend growth in asset prices, weakened external financial constraints and high investment activity supported by output growth, increased revenue growth and improved profitability. In the background of this cycle, financial imbalances grow and systemic risk builds up unobserved. This often shows up openly later on, when economic starts to weaken as a result of a negative stimulus. Recession subsequently sets in and the spiral turns around. Economic agents realise that their income has been rising at an unsustainably high rate, they are burdened with too much debt, their asset holdings have fallen in value and so they need to restructure their balance sheets. In this situation, banks and their clients can, by contrast, start to display excessive risk aversion.

---

[5] Procyclicality of the financial system means its ability to magnify swings in the economic cycle through lending and other activities of financial institutions as a result of feedback between macroeconomic developments and the financial system.

To a large extent, these processes are as natural as the business cycle itself. However, the financial imbalances can sometimes get too big and, as a result, a dangerous vicious cycle can arise in the contraction phase. If the desirable adjustment is combined with strong increase in general uncertainty, a sharp fall in access to external financing due to capital or balance-sheet liquidity problems in banks, and with panic selling of overvalued assets, the downward movement can become very rapid and destabilising. The most recent episode of financial instability, which started in 2007, was largely global in nature and entailed huge macroeconomic costs. Even though the Czech financial system remained stable during the crisis and was exposed only to its indirect effects, it will take the Czech economy at least three years to return to its pre-crisis output level (as in the previous crisis of 1997–1999). For the hardest-hit countries, this process will take much longer.[6]

All this implies that the main source of the time element of systemic risk is the *financial cycle*[7] and one of the primary objectives of macroprudential policy must therefore be to create incentives for financial institutions to behave less procyclically (Geršl and Jakubík, 2010). A key variable describing the evolution of the financial cycle over time is *leverage*. In its narrower sense, this term[8] concerns the relation between the assets of an economic agent and the debt that was used to acquire them. In its increasingly used broader sense, it approximates the overall nature of the financial cycle and the position of a given economy within it (the indebtedness of economic agents, stocks and dynamics of loans, the availability of external financing, the size of interest rate margins and credit spreads, the ratio of assets and capital in financial institutions, the length of lever of financial market investors, etc.).

Chart 1 shows the evolution of leverage over the financial cycle. The leverage increases until the financial cycle turns over. Sometimes the turn is disorderly and presents itself

Chart 1

THE FINANCIAL CYCLE AND THE EVOLUTION OF SYSTEMIC RISK
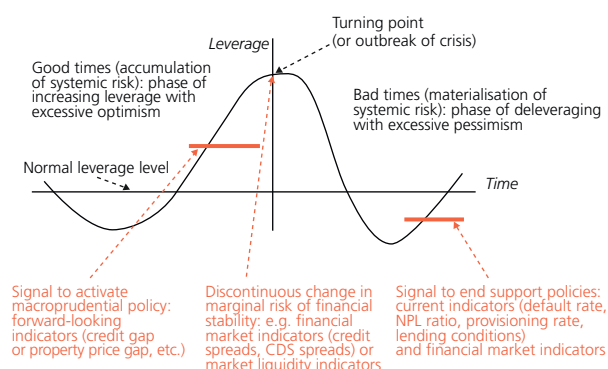
as the eruption of financial crisis. Leverage then starts to decline, although in the early phase of the crisis it remains high (given falling nominal GDP it can even rise in the initial post-crisis years). The deleveraging phase can therefore last several years, and in the event of a deep crisis the leverage ratio can, after a time, fall below its long-term normal value. Although the leverage level is high on both sides of the crisis point, the economic situation is very different on either side. In the pre-crisis optimistic phase there is a financial boom going on, whereas in the post-crisis phase the economy is exposed to financial stress. Consequently, the leverage ratio adjusts to economic conditions after a considerable lag, so stock measures have only a limited information value as a guide for the macroprudential policy response during the financial cycle. For this purpose, in section 5 we will define forward-looking variables that can be used to identify situations where the tolerable limit for systemic risk has been exceeded. Likewise, we will define indicators of the start and end of the financial instability phase and indicators for determining the scale and seriousness of an ongoing systemic risk materialisation phase.

---

6 Another danger of such crises is that they can give rise not only to output losses, but also to other long-term economic efficiency losses as a result of a potentially incorrect economic policy response, including in terms of financial market regulation. Significant efficiency losses may also arise in response to the current crisis owing to the introduction of ill-conceived measures adopted under political and time pressure as part of the regulatory "whirlwind" in the EU and the USA.

7 We can define the financial cycle as a process in which mutually strengthening credit creation and asset price behaviour amplifies the business cycle, resulting, under certain conditions, in a financial crisis due to excessive debt manifesting itself as financial stress and major macroeconomic disturbances. The credit expansion and subsequent credit contraction in this process have a strong effect on the volatility of real economic activity and in particular on the allocation of capital, with excess capacity being first created and then being liquidated (usually most visibly in the construction sector). Moreover, the financial cycle precedes and to a large extent causes the risks that are characteristic of the cross-sectional dimension.

8 The term leverage is used in number of areas and therefore has number of different definitions. In the financial market area it generally describes the ratio between the total investment and own funds of an investor and indicates the degree of use of borrowed external funds. In the case of banks, it referred, for example, to the assets-to-equity ratio.

4. THE FINANCIAL NETWORK AND THE RISK OF CONTAGION WITHIN THE FINANCIAL SYSTEM

The financial crisis has demonstrated that in order to ensure financial stability it is not enough to have financial institutions that are individually sound and resilient to fundamental risks. It is also vital to track and assess the links between them, because efforts to enhance the financial position of one institution can paradoxically undermine the stability of another institution or of the system as a whole. The links between individual financial institutions can act as channels through which shocks or contagion can propagate. *Contagion* thus stands at the centre of the cross-sectional element of systemic risk. Owing to a shortage of information, a financial institution is not itself usually capable of judging what effect its behaviour will have on other institutions in the system. For the same reason, it is not capable of defending itself sufficiently against the negative impacts of the behaviour of others. This means that if a financial institution is part of the financial network, it bears *network risk*, which it cannot effectively defend itself against or otherwise hedge against (Haldane, 2009). However, whether negative shocks are propagated or absorbed within the financial network depends on the phase of the financial cycle (see above).

Contagion channels can be divided into two types (Dijkman, 2010): real and information. The *real channel* refers to the direct knock-on effects from a stressed institution (or market or infrastructure) to others through direct links (such as existing gross exposures or financial flows through payment systems). Literature from the 1990s (Rochet and Tirole, 1996) draws attention to the dangers of excessively large exposures between banks, especially in the case of the unsecured money market. It points out that the benefits of interconnectedness in the form of risk-sharing between financial institutions always come at the expense of contagion risk.[9]

The spread of contagion through the *information channel* is much simpler, but more difficult to predict. Information contagion can be defined as a sudden and sometimes also unexpected change in the behaviour of economic agents, which can take the form of herd behaviour (when diverse investment categories are bucketed together in the same high risk category), information cascades (when every agent chooses the same action, regardless of his own private information), or sudden reappraisals of economic fundamentals (so-called sunspots; Vaugirard, 2007).[10] The current crisis has demonstrated that asymmetric information, which leads to the phenomenon of adverse selection (Kwan, Flandery and Nimalendran, 1996), contributed significantly to the spread of the crisis. The inability of banks or other creditors to distinguish between good and bad assets or counterparties led to reduced lending and accumulation of liquidity and caused the money market to stop functioning (Ferguson et al., 2008).

The contagion effect within the financial system can be illustrated with the aid of a contagion matrix composed of the three main parts of the financial system – institutions, markets and infrastructure – and their principal interconnections (see Table 1).

The intricate structure of the linkages within a modern financial system can also be illustrated and tracked by means of network analysis (see Chart 2; e.g. Upper, 2007, Allen and Gale, 2000, Freixas, Parigir and Rochet, 2000, and Nier et al., 2007).

Network analysis essentially involves defining a collection of nodes (financial institutions or markets) and the direct and indirect links between them (credit relationships, exposures, liquidity flows in the payment system, etc.). As a consequence of the current financial crisis, a "too interconnected to fail" paradigm has emerged alongside the traditional "too big to fail" paradigm. Parameters for identifying important nodes (a concept known in social network analysis as centrality) have come to the fore.[11] The importance of a key financial institution (or market)

---

9   However, the risk of contagion within the financial network depends to a large extent on the network type (complete, random or scale-free; ECB, 2010) and also on the quality of the links.

10 The type of triggering event can play a significant role in the impact intensity of a negative shock. The triggering event can be an idiosyncratic shock (e.g. problems within a single bank) which then spreads to the financial system through propagation channels, but it can also be a systematic shock (e.g. an unsustainable fixed exchange rate) which hits several institutions at the same time. Several idiosyncratic shocks can exist in the system simultaneously, spreading and escalating inside the system through propagation channels.

11 The properties and behaviour of a node cannot be analysed on the basis of its own properties and behaviour alone, as these may be affected by other nodes linked to it either directly or via another node. An important node can be defined according to the following criteria: (i) the function it performs is important for the business of other nodes in the system, (ii) its balance sheet and transactions are relatively large, and most importantly (iii) its function cannot be assumed by anyone else within a reasonable time and at a reasonable price. Using these criteria, which should, moreover, be relatively stable in the medium term, it is possible to identify a key financial institution, market or infrastructure – e.g. a large and active bank, the largest credit market in terms of transaction volume and frequency, a central counterparty or a large-value payment system (ECB, 2006).

TABLE 1

THE CONTAGION MATRIX

		Contagion to		
		Institutions	Markets	Infrastructure
Contagion from	**Institutions**	credit risk exposures, shareholder links, contingent credit lines, access to key financial infrastructure	market makers for derivatives, provision of credit support through CDSs, fire sales of assets	operational disturbances
	Markets	investment losses in the trading and available-for-sale portfolio, losses through the revenue channel, problems with funding and liquidity management	information channel – sudden loss of confidence	margin calls (financial asset prices may come under pressure)
	Infra-structure	delays in incoming and outgoing payments complicating liquidity management	operational disturbances in system can negatively affect market turnover and distort price formation	supporting services, technical links and connected ICT systems can spread disruptions

Source: Dijkman (2010)

CHART 2

ILLUSTRATION OF FINANCIAL LINKS IN THE CZECH ECONOMY
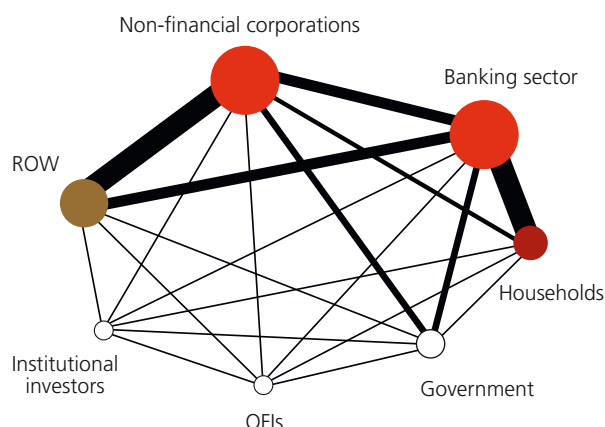
Source: Authors' calculations using data from Komárek, Kubicová and Plašil (2011)
Note: OFIs: other financial intermediaries; ROW: rest of world. Node size is given by the sum of the assets and liabilities of the relevant sector (excluding the ROW node), while link strength is given by gross exposure between the relevant nodes. The ROW node reflects only the sum of the gross exposures that Czech sectors have w.r.t. the rest of the world (usually equity holdings). The size of the other nodes is additionally given by intra-sectoral links. Based on data as of 2010 Q2.

is therefore measured not only by its absolute size, but also by its interconnectedness with other financial institutions (ECB, 2010).[12] Consequently, the measurement of importance combines two aspects: the functionality of the institution or market within the system, and the degree to which others in the system rely on the smooth provision of services by the given institution or market. Moreover, the systemic relevance of an institution can increase over time, especially in the growth phase of the financial cycle. If the system contains an important node that is irreplaceable by others in the system, the system as a whole will be as vulnerable to shocks as the important node is.[13] Financial networks containing several important nodes can therefore be extremely volatile and vulnerable. A shock might affect just a few of them, or even just one, but if they are heavily intertwined within the system – and especially with other important nodes – a sudden breakdown in the provision of their services will lead almost certainly to propagation of the shock and probably also to amplification of its impact on the system as a whole.

Contagion in the systemic risk sense is not limited to the financial system alone (the horizontal perspective). Negative shocks also propagate from the financial system to the real economy (the vertical perspective). This means that a systemic event or systemic risk spreads out of the financial system via the real or information channels to the real economy and affects consumption, investment, economic growth and overall wealth. The opaque and intertwined nature of the financial system magnifies or accelerates the impact of such a shock. The objective of macroprudential policy in this regard is to adopt measures

---

12 Traditional measures of centrality include the number of links that terminate on a node (in-degree) or that depart from a given node (out-degree), or the distance from other vertices (closeness) via the shortest paths.
13 The collapse of Lehman Brothers in September 2008 was a classic example of a transformation in behaviour from a pessimistic and disorientated mood into full-blown panic (Tett, 2009) that paralysed the money market. As the money market can be regarded as a typical important node, it was vital for some other node to assume its function. As the money market is quite difficult to replace by another market, it was replaced by central banks, which gradually introduced unconventional monetary instruments.

to reduce the size or interconnectedness of systemically important nodes[14] or to make them more resilient to systemic shocks.

5. IDENTIFICATION AND ASSESSMENT OF SYSTEMIC RISK

The two main tasks of macroprudential policy – to prevent systemic risk and, if prevention fails, to mitigate the impacts when it materialises – are given by the existence of two phases of development of systemic risk. From the prevention perspective, the main task of financial stability analysis is timely identification of the marginal contribution of the current financial environment to the *accumulation* of systemic risk (see the left-hand side of Chart 1). This contribution, which can be termed *the risk of future financial instability*, adds to the build-up of systemic risk in a phase of increasing leverage against a backdrop of easy access to cheap credit and over-optimistic expectations regarding future income and asset prices. At a certain moment, however, economic agents will radically revise their expectations as a result of particular information or a particular event, and a change will occur. Aspects of crisis will start to become apparent and a phase of materialisation of the risk accumulated in the preceding phase will occur in the form of financial stability. Banks will revise upwards their view of the credit, market and liquidity risk in their balance sheets, increase their credit margins or credit spreads, and tighten their lending conditions. Subsequently, a process of deleveraging will start, during which the systemic risk will gradually "de-accumulate".

Chart 1 illustrates how the process of accumulation of systemic risk (on the left-hand side) is followed by the materialisation of systemic risk (on the right-hand side). The magnitude or intensity of materialisation is easier to observe. Compared with the risk of financial instability, it has the opposite time profile. This is a reflection of the *financial stability paradox*: sources of systemic risk have a tendency to increase when banks and their clients consider their business risks to be the lowest. In other words, a system is most vulnerable when it looks most robust. In boom times, when the risk of future financial

stability is increasing, the current indicators of existing financial risks are usually improving – default rates and NPL ratios are falling and banks are provisioning to a lesser extent and reporting smaller credit losses. On the basis of current risk measures, the resilience of the financial sector can seem very high at such times.

Success in pursuing financial stability is to a large extent a function of the authorities' ability to identify and correctly assess the sources and evolution of systemic risk over the financial cycle. With regard to the two main tasks of macroprudential policy – *prevention and mitigation* – the competent authorities (the CNB in the case of the Czech Republic) must in boom times focus on assessing the risk of future financial instability and during crises on assessing the scale of the risk materialisation problem. The primary objective must be *to act preventively against growth in systemic risk in the risk accumulation phase*, when conditions are being created for future financial instability. During this phase, macroprudential analyses must be focused primarily on the identification of *latent risks* being generated in the balance sheets of financial intermediaries and their clients. Analytical attention, however, must also be paid to the quality of cash flows, as financial institutions with structural problems in their balance sheets (e.g. weak balance-sheet liquidity or excessively long maturity transformations) are naturally far more prone to cash-flow problems.

When identifying hidden risks, it is important to realise that *current indicators* based on the present levels of financial variables provide information about the degree of materialisation of systemic risk, but not about the probability of occurrence of financial stability in the future.[15] In pursuing their objectives, however, authorities must focus on a set of *forward-looking indicators* providing information on the possibility of the future materialisation of systemic risk as a result of currently emerging financial imbalances. This refers mainly to "gap" indicators based on the assessment of deviations of factors determining the degree of leverage from their normal or equilibrium values.[16] For example, deviations of the ratio of credit to the private sector to GDP[17] or the ratio of property prices

---

14 Such measures can include money market financing caps or additional regulatory capital requirements for highly interconnected institutions.

15 In this sense, in the pre-crisis period the CNB regularly drew attention in its analyses and its Financial Stability Reports to the fact that the existing NPL ratio could not be considered evidence of low risk, since at a time of rapid credit growth, new loans, which are naturally of higher quality initially, dilute the proportion of problem loans.

16 A complicating factor is the fact that the risk of financial instability emerges at longer and irregular intervals, reflecting the fact that the financial cycle is usually longer than the normal business cycle.

17 See the thematic article *Excessive Credit Growth as an Indicator of Financial (In)Stability and its Use in Macroprudential Policy*.

to income from their long-term trends would seem to be relatively reliable indicators. Such indicators send out a signal several years ahead about financial imbalances in financial institutions' balance sheets and about the potential for the creation of dangerous bubbles (for more details, see Borio and Drehmann, 2009).[18] There is an extensive debate in the economic literature about the possibility of using forward-looking indicators to construct early warning systems (EWSs; see Alessi and Detken, 2009). EWSs are used on the practical level by, for example, the International Monetary Fund (IMF-FSB Early Warning Exercises). However, their information value and practical applicability remain limited (Ghosh et al., 2009).

Thanks to the financial stability paradox, current indicators can also be used in the identification of the accumulation of systemic risk. Where the values of current indicators (such as the NPL ratio, the default rate or the provisioning rate) are significantly "better" than their usual values or their historical means, this can be regarded as an indicator of a growing risk of financial instability. Such indicators can be regarded as complementary to forward-looking indicators and as applicable primarily for determining the position in the financial cycle or estimating the probability of a change in the financial cycle.

For a small and very open economy such as the Czech Republic, risk sources associated with the economy's links with the external environment have specific significance. In its financial stability analyses, therefore, the CNB traditionally puts great emphasis on vulnerabilities resulting from internal and external macroeconomic imbalances and negative international positions of the financial sector. If the economy is strong in these areas, its susceptibility to contagion from abroad is greatly reduced (this was confirmed in the case of the Czech economy in the acute phase of the crisis in late 2008 and the first quarter of 2009). If, on the contrary, the economy is vulnerable in these areas, it can be hit relatively easily by financial instability as a result of a sharp change in capital flows, financial market volatility linked with public debt financing, or the drying-up of sources of balance-sheet liquidity from abroad.

When assessing systemic risk during the accumulation phase, authorities must first of all reach a general consensus on the normal or sustainable values of the relevant indicators and then continuously assess whether the deviations of actual values from normal levels are becoming critical. In the systemic risk *accumulation phase*, this process will not be easy. It is quite difficult to distinguish normal cycle fluctuations and long-term trends from a dangerous financial cycle in timely fashion. Preventive macroprudential tools are not usually activated until a consensus has been reached that the critical values of individual indicators – or rather a combination of a set of forward-looking indicators – that have a strong information content regarding the current level of risk of future financial instability have been exceeded. These indicators of the time dimension of systemic risk will also have to be used when assessing the moment at which the pre-materialisation effects are ceasing to act in a systemic fashion and the anti-crisis measures and support policies can therefore be discontinued. These two critical moments that macroprudential analysis is tasked with identifying are marked by red lines in Chart 1.

If prevention is not sufficiently effective and a systemic risk *materialisation phase* occurs, the macrofinancial policy focus must be shifted to *mitigating the impact of the crisis*. The start of this phase is usually quite easy to identify, since the onset of a crisis tends to be clearly visible thanks to a sharp deterioration in market variables (e.g. credit spreads or CDS spreads). In this phase, it is vital to assess the financial system's ability to withstand the emerging risks. *Stress tests* of the financial system's resilience are a suitable analytical instrument for performing this task. With the aid of such tests, supervisory authorities should be able to estimate whether the financial sector will withstand the adverse effects associated with risk materialisation at the given level of capital and liquidity.[19] In addition to stress tests, the aforementioned current indicators in stock or flow form can be used to estimate the extent of financial stress.

---

18 It is much more difficult to obtain reliable forward-looking indicators of the cross-sectional dimension of systemic risk. Such indicators are often obtained from prices on financial markets. However, their reliability as risk indicators is reduced by the limited efficiency of financial markets.

19 Stress tests can be an important analytical tool in the systemic risk accumulation phase as well. That said, they remain primarily an indicator of resilience in the materialisation phase. This is due to two factors. First, they are based primarily on current risk indicators, which in good times are usually low in value and the starting position of the segment of the financial system under test therefore tends to be relatively strong. Consequently, the results of stress tests conducted in good times often have a limited information content even for high-stress scenarios. In bad times, by contrast, when the starting position of the relevant segment is fragile, and additional stress can have a much more visible effect. Second, in their current form, stress tests are focused on evaluating the impacts of mostly exogenous shocks. As the stress test methodology is gradually developed and more endogenous mechanisms are added, the information content and applicability of stress tests in the risk accumulation phase can be expected to increase.

In a small open economy, financial or informational contagion resulting from links between the economy and its institutions and the external environment can be a major source of materialisation of systemic risk and of discontinuities in the evolution of such risk. The analytical approach to identification and assessment will differ significantly from country to country depending on factors such as the share of foreign ownership of finance institutions, the dominance of subsidiaries or branches of foreign banks, the share of foreign currency loans, and the net external and foreign exchange position of the banking sector and the economy as a whole.

Indicators for the two phases of development of systemic risk and for the two dimensions of systemic risk are listed in Annex 1.

6. OPERATIONAL FRAMEWORK OF MACROPRUDENTIAL POLICY

An important condition for efficient and effective implementation of macroprudential policy is operationalisation of that policy. In constructing such policy, the competent authorities should gradually head towards a similarly sophisticated operational framework as that currently applied in flexible inflation targeting. Table 2 outlines such a framework. As in the case of monetary policy, the use of tools in macroprudential policy-making should be accompanied by sophisticated and sometimes also forceful communication. At least in boom times, it may be necessary to complement macroprudential policy with monetary policy that "leans" against financial imbalances (see Borio and White, 2004, Zamrazilová, 2011,

TABLE 2

COMPARISON OF MONETARY AND MACROPRUDENTIAL POLICY FRAMEWORKS

	Monetary policy	Macroprudential policy
Horizon	• 1–3 years	• longer and more variable
Ultimate target	• price stability, defined as maintaining low and stable inflation • reasonable volatility of economic activity	• preventing the formation and spread of systemic risk (reducing the probability of occurrence of financial crises with large output losses and/or costs for public budgets) • mitigating the impacts of the materialisation of systemic risk if prevention fails
Indicators for identifying risks and assessing their intensity	• inflation forecast in relation to target • output gap, indicators of capacity utilisation and producers' profit margins, etc.	• excessive debt measures • asset overvaluation measures • risk undervaluation measures • excess liquidity indicators and property construction and trading activity indicators • indicators of internal and external balance of the economy • indicators of the external position of the financial sector • extent of leverage among institutions and investors • market funding ratio and other balance-sheet liquidity indicators • asset and liability maturity and currency mismatch indicators (for details see **Annex 1**)
Intermediate targets	• money market interest rates • exchange rate	• resilience and shock-absorbing capacity of the financial system • amplitude of the financial cycle • asset price volatility • level of uncertainty regarding the soundness of the system at times of financial instability
Instruments	• monetary policy interest rate • foreign exchange market interventions • other reserve requirement instruments • communication	• built-in stabilisers oriented towards creating and releasing buffers • macroprudentially applied supervisory and regulatory instruments • communication (for details see **Annex 1**)
Transmission mechanisms (instruments functioning via)	• bank asset financing costs • credit costs for bank clients • foreign trade prices • asset prices	• bank capital and liquidity requirements • banks' costs relating to the risk of new and existing exposures • penalisation of increasing scale of risk assumed by banks and other financial institutions

or Frait, Komárková and Komárek, 2011). As an integrated monetary and supervisory authority, the CNB introduced greater interconnectivity of monetary and macroprudential policy back in 2009. Members of the CNB Bank Board meet every quarter with experts from key sections in so-called *macro-financial panels* to discuss the current risk outlook. These panels take place before the Bank Board's monetary policy meetings discussing the CNB's new macroeconomic forecast and provide the participants with a comprehensive view of the economic and monetary situation.

The ultimate objectives of macroprudential policy were described in section 2. The *main intermediate target of the preventive instruments used in the accumulation phase of the time component of systemic risk* is to increase the resilience of the financial system by creating buffers which are then used in the period of materialisation of this risk.[20] Sufficient capital buffers and a suitable level of provisions increase the ability to absorb unexpected and expected losses, while stable balance-sheet liquidity enhances the ability to absorb source shocks. The secondary intermediate target is to reduce the amplitude of the financial cycle by suppressing lending growth and preventing excessively long maturity transformations. Experience with the use of macroprudential tools in some countries suggests that their individual effect on the financial cycle is limited (Borio, 2010). However, a combination of macroprudential tools and macroprudentially applied microprudential instruments (e.g. those which create additional capital requirements for risk exposures) could help to eliminate manifest excesses over the financial cycle. They might also contribute to enhancing the management of risks in individual institutions, including risks linked with cyclical increases in maturity transformations in bank financing and with the tendency of banks to rely on short-term market financing at times of easy access to liquidity.

A comparison of the individual aspects of the monetary and macroprudential policy operational frameworks (see Table 2) reveals that the macroprudential policy framework will always be associated with a higher degree of uncertainty and a lower level of accuracy than the monetary policy framework. This is due to the multi-dimensional nature of the financial stability objective, the generally longer length of the financial cycle than the monetary cycle, and more complex transmission from macroprudential tools to changes in the behaviour of financial institutions and their clients. Macroprudential policy can therefore have a longer and more variable reaction horizon. Years can pass from the time the financial system becomes vulnerable to the time a financial crisis erupts. Then, however, the conditions suddenly change and the adjustment process is highly non-linear (a sharp transition from good to bad times). However, these factors do not necessarily rule out macroprudential policy, because – as the quote at the start of the article says – when analysing financial stability it is better to be approximately right than precisely wrong.

7. TOOLS FOR PREVENTING SYSTEMIC RISK AND MITIGATING ITS IMPACTS

After identifying systemic risk, authorities can use relevant tools to prevent it or mitigate its impacts. The two development phases and two dimensions of systemic risk can necessitate the use of different tools or combinations thereof. In the systemic risk materialisation phase, the macroprudential policy priorities will be to prevent the elements of instability from escalating, to reduce the probability of panic adjustment by financial institutions and their clients in response to the revision of expectations, and to mitigate the negative impacts of the significantly worse conditions. Countercyclical buffers created in good times can be regarded as the most important macroprudential tool for this phase. In a systemic crisis, however, a whole range of monetary policy instruments and regulatory and supervisory measures can become macroprudential in nature. On a concrete level, macroprudential policy in this phase will act via built-in stabilisers (the release of buffers and the use of central banks' automatic facilities) or crisis management tools (government guarantees for bank assets, bad asset transfer programmes and balance-sheet cleanups, and capital injections for ailing institutions). Active communication with the financial markets and the public, including disclosure of stress tests results, in order to reduce the level of uncertainty about the stability of the financial sector will also be important. For example, the CNB moved into more active communication mode during the financial crisis and since February 2010 has been providing the public

---

20 The main point of macroprudential buffers is to reduce the probability of sudden or panic changes in the behaviour of financial institutions during a crisis. Capital buffers, for example, allow banks to lend to the private sector even when their losses on previously granted loans are rising and negatively affecting their capital adequacy. Liquidity buffers can prevent panic sales of assets under pressure caused by a need to obtain liquidity quickly to cover deposit withdrawal requests or by investors' unwillingness to roll over short-term bonds issued by banks.

with quarterly information about the results of its macro stress tests of the banking sector. Communication is a very important tool in the systemic risk accumulation phase as well. Although systemic risk was growing to only a relatively limited extent in the Czech Republic in the pre-crisis years, the CNB in its Financial Stability Report 2006 (published in spring 2007) warned against over-optimistic expectations typical of the peak of the business cycle and against risks emerging on the property market.

At present, there is not a complete consensus on what tools can be regarded as *macroprudential policy tools*. Given that a whole spectrum of measures can have macroprudential aspects, a wide range of financial stability measures are usually included in the macroprudential toolkit (see Annex 1).[21] However, it is more appropriate to divide this broad category into macroprudential tools, microprudential tools applied in a macroprudential way, and other financial stability tools. True macroprudential tools are those which can be applied in the form of rules and can therefore take the form of built-in stabilisers (the tools marked in bold in Annex 1). They should automatically limit the procyclicality of the financial system or the risky behaviour of individual institutions.

In addition to true macroprudential tools, *various microprudential regulatory and supervisory tools can be used for macroprudential purposes*.[22] If these tools are applied not to individual institutions, but across the board to all institutions in the system, they can be regarded as macroprudential instruments (the tools marked in italics in Annex 1). Measures of this type, along with *monetary policy tools, fiscal policy tools and tax measures*, have been applied in many countries in the past in an effort to slow excess credit growth (see some of the tools listed in Annex 1). Many of these tools can also be used in a symmetrically opposite manner in a systemic risk materialisation phase in order to preserve access to credit for the private sector as well as at times of greatly increased risk perceptions.

True macroprudential tools in the form of built-in stabilisers, whose introduction is currently the subject of an international debate, are targeted more at the time component of systemic risk. The first set of such tools is aimed at the capitalisation of banks, which by 2018 at the latest should face an obligation to create countercyclical capital surcharges above and beyond the macroprudentially derived minimum capital adequacy ratio to reflect the extent of changing systemic risk over the cycle.[23] According to the agreed version of Basel III, which in future years will be implemented in the Czech Republic via the CRD directive, in good times, when a particular aggregate level of credit in the economy is exceeded, banks will have to start creating a capital buffer that can be used to absorb the negative impacts of future financial instability (Drehmann et al., 2010, or BCBS, 2010). Another set of proposals is directed at ensuring provisioning across the cycle so as to better capture expected credit portfolio losses and force banks to create buffers to cover credit risk.[24] Macroprudential tools of the built-in-stabiliser type but oriented towards the cross-sectional dimension include, for example, capital surcharges set for individual institutions (see the next paragraph). Basel III also includes liquidity indicator compliance requirements, which are also targeted mainly at the cross-sectional dimension (a requirement for a specific ratio of stable sources of balance-sheet liquidity or coverage of potential outflows by highly liquid assets). Margining, i.e. the requirement for a buffer between the value of collateral and the amount which an institution borrows against it, can also be regarded as an instrument fostering the creation of buffers for liquidity risk. This buffer should allow for the absorption of even a large fall in collateral value resulting from a crisis in asset markets. The possibility of configuring liquidity risk management tools so that they have a countercyclical effect is also being discussed.

When using tools oriented towards the cross-sectional dimension of systemic risk, the intermediate target in

---

21 The ESRB has prepared an internal survey of financial stability tools called the *Yellow Pages*. The regulatory, material and legal aspects of applying each tool are being addressed.

22 Over the past decade, the application of macroprudential tools has been observable mainly in emerging economies (see, for example, CGFS, 2010, or Moreno, 2011). One possible reason is that the existing international regulatory framework applied in advanced economies, including the EU, can put tight constraints on national macroprudential discretion.

23 For more details, see Box 8 and the thematic article *Excessive Credit Growth as an Indicator of Financial (In)Stability and its Use in Macroprudential Policy* (Geršl and Seidler) in this Financial Stability Report.

24 The concepts of this type include the through-the-cycle expected loss model (the European Commission opened a discussion on this proposal in 2009), partially also the expected loss impairment model (a concept advocated since January 2011 jointly by the IASB and the US FSAB) and statistical provisioning (a system applied by the Spanish central bank since 2000). At present, it is not clear whether any of these proposals will be implemented and what approach to provisioning will be applied internationally in the future. Frait and Komárková (2008) present a detailed discussion about procyclical provisioning.

the preventive phase should be to contain the risks that individual financial institutions, markets and instruments can create for the system as a whole. To limit this dimension of risk, associated with interconnectedness, size or significance within the system, it is necessary first to assess the contribution of individual institutions, markets and instruments to systemic risk (see, for example, Tarashev et al., 2010) and then to reduce this contribution or set a limit on it. This should give rise to lower probability of collapse of large, complex or excessively interconnected institutions as a result of credit, market or liquidity risks, greater resilience of institutions, markets and instruments to contagion within the system, and a related overall reduction of loss of confidence in the financial system. The macroprudential tools of the built-in stabiliser type currently under consideration include, for example, systemic surcharges in the form of additional capital or liquidity requirements set for individual institutions taking into account their contribution to systemic risk by dint of their size, complexity and interconnectedness. Several methods for assessing the marginal contribution to systemic risk can be used to determine the size of the systemic surcharge (Bank of England, 2009, Chan-Lau, 2010, or Tarashev et al., 2010). The practical method chosen should reflect the specifics of the financial sector of the country concerned.[25] The point of applying systemic surcharges as a macroprudential policy tool is to inform a specific financial institution about the authorities' assessment of its systemic significance or excessive interconnectedness and thereby give it an incentive to change its structure.

8. CONCLUSION

This article set out to open a debate on creating a Czech macroprudential policy framework as a key component of the financial stability policy framework. The macroprudential policy objective is to prevent systemic risk from forming and spreading in the financial system and thereby reduce the probability of occurrence of financial crises with large real output losses for the entire economy. Macroprudential policy should act primarily preventively against signs of financial instability in the future and secondarily to mitigate their impacts if prevention fails. These two main tasks reflect the two phases of evolution of systemic risk – its accumulation

and subsequent potential materialisation. When conducting macroprudential policy it is also vital to respect the fact that systemic risk has two different dimensions. The time dimension is linked with procyclicality in the behaviour of financial institutions and their clients, manifesting itself as financial cycles. The cross-sectional dimension arises as a result of mutual exposures and network linkages between financial institutions. Given the character of the Czech economy and its financial system, the time dimension of systemic risk is identified as being more important and the Czech Republic is advised to prefer a relatively narrow macroprudential policy concept focused primarily on risks associated with the financial cycle. Given also that financial or informational contagion resulting from links between the economy and its institutions and the external environment can be a major source of systemic risk, the macroprudential policy framework must also include the cross-sectional dimension.

Constructing a sophisticated operational framework linking the individual dimensions and development phases of systemic risk with relevant indicators and instruments will be an important condition for efficient and effective implementation of macroprudential policy. When performing the two main tasks mentioned above, macroprudential authorities must focus their attention on forward-looking indicators and simultaneously take into account the potentially high degree of discontinuity in the evolution of systemic risk. To this end, they need to use specific sets of indicators and tools reflecting the different dimesions and phases of systemic risk.

Over the financial cycle it will be necessary, using forward-looking indicators, to catch the moment at which systemic risk starts to accumulate, identify the point at which the tolerable limit for systemic risk has been exceeded, and send out a signal that macroprudential tools need to be activated. If prevention fails, it will be necessary, using a different set of indicators, to determine the point at which a financial instability event has to be declared, assess the potential scale and seriousness of the manifestations of the crisis, and recommend appropriate anti-crisis tools. Forward-looking tools should then ultimately help us to detect when systemic risk has fallen below the critical level and tell us when we can discontinue the anti-crisis measures and support policies.

---

25 Given the characteristics of the Czech financial sector, it would make sense to track the size factor rather than the interconnectedness factor when calculating the systemic surcharge, as it is highly likely that any negative externalities for the Czech economy would be linked more with the failure of large financial institutions or with concentration risk (financial institutions hold identical or correlated assets in their balance sheets or finance themselves on identical or correlated markets).

Within the macroprudential policy operational framework there must still be a trigger mechanism for the use of tools in the risk inception and manifestation phase. This mechanism should be relatively complex yet flexible. When implementing such policy, it will be vital to combine a rigorous analytical approach with a large dose of judgement. Although the priority should be to use rules and tools of the built-in stabiliser type, it will be necessary to leave the macroprudential authority considerable room to exercise discretion.

REFERENCES

ALLEN, F., GALE, D. (2000): *Financial Contagion*, Journal of Political Economy 108, pp. 1–33.

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.

BANK OF ENGLAND (2009): *The Role of Macroprudential Policy,* Bank of England Discussion Paper.

BCBS (2010a): *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems*, Basel Committee on Banking Supervision.

BCBS (2010): *Consultative Document: Countercyclical Capital Buffer Proposal*, Basel Committee on Banking Supervision.

BORIO, C. (2003): *Towards a Macroprudential Framework for Financial Supervision and Regulation?* BIS Working Paper No. 128.

BORIO, C. (2010): *Implementing a Macroprudential Framework: Blending Boldness and Realism*, HKIMR-BIS Conference, Financial Stability: Towards a Macroprudential Approach, 5–6 July.

BORIO, C., DREHMANN, M. (2009a): *Towards an Operational Framework for Financial Stability: Fuzzy Measurement and its Consequences*, BIS Working Paper No. 284.

BORIO, C., DREHMANN, M. (2009): *Assessing the Risk of Banking Crises – Revisited*, BIS Quarterly Review, March, pp. 29–46.

BORIO, C., WHITE, W. (2004): *Whither Monetary and Financial Stability? The Implications of Evolving Policy Regimes*, BIS Working Paper No. 147.

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

CGFS (2010): *Macroprudential Instruments and Frameworks: A Stocktaking of Issues and Experiences*, Committee on Global Financial Systems, BIS.

CHAN-LAU, J. (2010): *Regulatory Capital Charges for Too-Connected-to-Fail Institutions: A Practical Proposal*, IMF Working Paper WP/10/98.

CLEMENT, P. (2010): *The Term "Macroprudential": Origins and Evolution*, BIS Quarterly Review, March, pp. 59–67.

CNB (2004–2010): *Financial Stability Report,* Czech National Bank.

DIJKMAN, M. (2010): *A Framework for Assessing Systemic Risk*, Policy Research Working Paper 5282, World Bank.

DREHMANN, M., BORIO, C., GAMBACORTA, L., JIMÉNEZ, G., TRUCHARTE, C. (2010): *Countercyclical Capital Buffers: Exploring Options*, BIS Working Paper No 317.

ECB (2006): *Financial Stability Review,* December 2006.

ECB (2010): *Recent Advances in Modelling Systemic Risk Using Network Analysis*, summary of a workshop of the same name organised by the ECB in October 2009.

FERGUSON, R. W., HARTMANN, P., PANETTA, F., PORTES, R. (2007): *International Financial Stability*, Geneva Report on the World Economy, No. 9.

FRAIT, J., KOMÁRKOVÁ, Z. (2009): *Instruments for Curbing Fluctuations in Lending over the Business Cycle*, Financial Stability Report 2008/2009, Czech National Bank, pp. 72–81.

FRAIT, J., KOMÁRKOVÁ, Z., KOMÁREK, L. (2011): *Monetary Policy in a Small Economy after the Tsunami: A New Consensus on the Horizon?* Czech Journal of Economics and Finance 61, No. 1, pp. 5–33.

FREIXAS, X., PARIGI, B.M., ROCHET, J.-C. (2000): *Systemic Risk, Interbank Relations, and Liquidity Provision by the Central Bank*, Journal of Money, Credit and Banking 32, pp. 611–638.

GERŠL, A., JAKUBÍK, P. (2010): *Procyclicality of the Financial System and Simulation of the Feedback Effect*, Financial Stability Report 2009/2010, Czech National Bank, pp. 110–119.

GHOSH A. R., OSTRY, J. D., TAMIRISA, N. (2009): *Anticipating the Next Crisis*, Finance & Development, September, No. 3.

HALDANE, A. G. (2009): *Why banks failed the stress test*, Speech given at the Marcus-Evans Conference on Stress-Testing, 9–10 February 2009.

KOMÁREK, L., KUBICOVÁ, I., PLAŠIL, M. (2011): *Analýza makrofinančních rizik a jejich přenosů v kontextu zranitelnosti české ekonomiky*, Národohospodářský ústav Josefa Hlávky, forthcoming.

KWAN, S. H., FLANERRY, M. J., NIMALENDRAN, M. (1999): *Market Evidence on the Opaqueness of Banking Firms' Assets*, Federal Reserve Bank of San Francisco Working Papers in Applied Economic Theory, No. 99–11.

MORENO, R. (2011): *Policymaking from a "Macroprudential" Perspective in Emerging Market Economies*, BIS Working Paper No. 336.

NIER, E. W., YANG, J., YORULMAZER, T., ALENTORN, A. (2007): *Network Models and Financial Stability*, Journal of Economic Dynamics and Control 31, pp. 2033–2060.

REINHART, C., ROGOFF, K. (2009): *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press.

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

TARASHEV, N., BORIO, C., TSATSARONIS, K. (2010): *Attributing Systemic Risk to Individual Institutions*, BIS Working Paper No. 308.

TETT, G. (2009): *Markets 12 Months after Lehman Collapse*, Financial Times, 9 September 2009.

UPPER, C. (2007): *Using Counterfactual Simulations to Assess the Danger of Contagion in Interbank Markets,* BIS Working Paper No. 234.

VAUGIRARD, V. (2007): *Informational Contagion of Bank Runs in a Third-Generation Crisis Model*, Journal of International Money and Finance 27, pp. 403–429.

WHITE, W. (2006): *Procyclicality in the Financial System: Do We Need a New Macrofinancial Stabilisation Framework?* BIS Working Paper No. 193.

ZAMRAZILOVÁ, E. (2011): *Měnová politika: staré lekce, nové výzvy,* Politická ekonomie LIX, No. 1, pp. 3–21.

FINANCIAL STABILITY INDICATORS AND TOOLS

Phase	Dimension	Indicators	Tools
Risk accumulation	Time	• debt-to-assets ratio (H,C) • debt-to-income ratio (H,C) • interest-to-income ratio (H,C) • price-to-income ratio (P) • loan-to-value ratio (P) • price-to-rent ratio (P) • market liquidity in the form of market turnover (P) • capital adequacy ratio (F) • leverage ratio (F) • credit spreads and risk premia (F) • credit conditions and characteristics of new loans from BLS (F) • default rate, NPL rate (F) • level of provisions (loan-loss provision rate, coverage ratio, F) • credit-to-GDP (deviation from long-term trend or normal) • gaps in asset prices and yields (deviations from long-term trend or normal) • rate of growth of loans and asset prices • early warning systems • composite indicators of financial stability or leverage level	• **countercyclical capital buffers** • **ceiling on leverage ratio*** • **provisioning trough financial cycle** • **introduction of "through-the-cycle" elements into risk management models and asset valuation models** • **countercyclical setting of margins and haircuts for contracts used to raise funding*** • *increased risk weights for certain types of loans (e.g. loans for residential or commercial property and foreign currency loans)* • *increased loan loss provisions depending on period in default* • *ceilings on LTV ratios for loans for house purchase (or increased capital requirements for loans with high LTV ratios)* • *ceilings on debt-to-income or payment-to-income ratios for household borrowing (or increased capital requirements for loans with high ratios)* • *increased collateral requirements for loans to corporations* • *additional reserve requirements in the event of a change in credit dynamics* • *rules for reference rates for loans for house purchase* • monetary policy tools: interest rates, minimum reserve rates and marginal reserve rates for selected liability sources, foreign exchange market interventions • fiscal and tax policy tools: tighter property taxation rules (for second and additional homes), reduction or elimination of tax deductibility of interest on loans for house purchase, introduction of transaction taxes for certain items of capital inflows from abroad, government spending cuts
	Cross-sectional	• loans-to-deposits ratio (F) • ratio of funds acquired on interbank market (F) • maturity transformation ratio (maturity mismatch indicators, customer funding gap, F) • composite liquidity index (F) • liquidity gap tests (F) • indicators of scale of activity within financial system (e.g. flows between institutions, F) • degree of asset and liability concentration (F) • share of large exposures in balance sheet (F) • capital quality structure (F) • leverage ratio (F) • scale and structure of off-balance-sheet items (F) • bank foreign debt to bank foreign asset ratio (net external assets of banks, F) • currency mismatch indicators (open foreign exchange position, share of foreign currency loans, F) • composite volatility index (M) • macroeconomic imbalance indicators (government deficit and government debt, current-account deficit and external debt, national investment position, foreign exchange reserves, external financing requirements, currency under- or over-valuation)	• **capital or liquidity surcharges for size, complexity and interconnectedness** • **liquidity buffers and requirements for stable balance-sheet liquidity sources** • **maturity transformation limits (maturity ladders, liquidity coverage ratio)** • *loan-to-deposits ratio ceilings* • *changes to margins and haircuts for fundraising contracts* • *reserve requirements (e.g. for sources in domestic or foreign currency)* • *leverage limits for financial investors* • *limits on intra-institution exposures (e.g. between parent and subsidiaries) and interbank exposures* • *limits on currency mismatches (net open positions, share of net external liabilities)* • *changes to capital requirements for large exposures** • *limits on sector concentration for lending or investment* • increased disclosure of risky positions • active communication by authorities regarding changes in risk

Phase	Dimension	Indicators	Tools
Risk materialisation	Time	• dynamics of default rate and NPL ratio (F) • dynamics of provisioning (coverage ratio, LLPR, F) • profitability (F) • change in CAR (F) • macro stress tests of markets and credit risks (F) • credit spreads (H,C,G,M)	• **release of capital and liquidity buffers** • capital injections for selected banks* • active communication by authorities to explain extent of problem* • disclosure of stress test results*
	Cross-sectional	• macro stress tests of liquidity (F) • changes in market liquidity measures (M) • activity and spreads on interbank money market and government bond market (F) • CDS spreads (F) • interbank contagion tests (F) • CoVaR (F) • joint probability of distress (F) • contingent claim analysis (F)	• easier access to central bank refinancing facilities* • activation of contingency funding plans • protection of bank creditors (e.g. government guarantees for bank liabilities)* • greater or wider deposit insurance • programmes to transfer bad assets to bad banks and clean up of balance sheets • transparency regarding exposures and risks of individual market segments (e.g. CNB has disclosed extent of exposures to highly indebted governments) • communication regarding methods for dealing with illiquid and insolvent institutions • living wills

Note: The table contains a list of selected instruments. Many of these tools can be directed at both the time and cross-sectional component of systemic risk. The table gives the predominant target. Asterisks (*) denote tools that are also highly relevant to the second dimension. Macroprudential tools of the type of built-in stabilisers are highlighted in bold. Potential macroprudential uses of supervisory and regulatory tools are highlighted in italics. Other financial stability tools are given in normal text. Sector abbreviations: H – households, C – corporations, F – financial institutions, P – property market, M – financial markets, G – government. No abbreviations are shown next to indicators that are valid for the economy as a whole.

EXCESSIVE CREDIT GROWTH AS AN INDICATOR OF FINANCIAL (IN)STABILITY AND ITS USE IN MACROPRUDENTIAL POLICY

Adam Geršl and Jakub Seidler

Excessive credit growth is often considered to be an indicator of future problems in the financial sector. This article examines the issue of how best to determine whether the observed level of private sector credit is excessive in the context of the "countercyclical capital buffer", a macroprudential tool proposed by the Basel Committee on Banking Supervision. An empirical analysis of selected Central and Eastern European countries, including the Czech Republic, provides alternative estimates of excessive private credit and shows that the HP filter calculation proposed by the Basel Committee is not necessarily a suitable indicator of excessive credit growth for converging countries.

1. INTRODUCTION

The Basel III reforms to the banking sector regulatory framework agreed in 2010 contain an important macroprudential element intended to dampen the potential procyclicality of the previous capital regulation. The Basel Committee on Banking Supervision (BCBS, 2010a) has introduced a "countercyclical capital buffer" aimed at protecting the banking sector from periods of excessive credit growth, which have often been associated with growth in systemic risk.[1] In good times, banks will – in accordance with set rules – create a capital reserve which can then be used to moderate contractions in the supply of credit by banks in times of recession.

One region that recorded a boom in lending to the private sector in the lead-up to the global financial crisis was the Central and East European (CEE) countries.[2] The observed credit expansion was driven by many factors relating to both the demand and supply side of the credit market. Although the credit growth in these transition economies started from very low levels, the rate of growth in many countries has raised concerns about how sustainable such growth is in the medium term and whether it poses significant risks to the stability of the financial sector.

This article aims to draw on the historical experience of the CEE countries with credit expansion and, using the method proposed by the Basel Committee, to calculate and discuss what countercyclical capital buffer level these countries might have had if the newly proposed regulation

on the creation of capital buffers had existed before the crisis. The motivation for this analysis is to determine how suitable the Basel Committee's proposed method for calculating excessive credit using the Hodrick-Prescott (HP) filter is for the countries of Central and Eastern Europe. In these countries, rapid credit expansion may simply mean convergence to values typical for the advanced nations, and not excessive borrowing. For this type of country, we propose to use a method involving estimation of the fundamental-based equilibrium private credit level. Given that different countries have different characteristics, the Basel Committee allows national regulators to exercise discretion and specify different methods for setting the countercyclical capital buffer.

The article is structured as follows. Section 2 discusses the risks associated with excessive credit expansion, looks at the situation in selected EU countries before the global financial crisis broke out, and briefly examines the logic of the countercyclical capital buffer as proposed by the Basel Committee. Section 3 takes a closer look at the disadvantages of applying the HP filter method and proposes an alternative technique for calculating excessive credit – the out-of-sample method. Both these calculation methods are then used on data for ten CEE countries. Section 4 illustrates the different implications of the alternative indicators of excessive credit growth for the countercyclical capital buffer settings of the banking sectors of the countries analysed. The conclusion attempts to generalise the results of the analysis and formulate recommendations for the national authorities responsible for macroprudential policy.

---

[1] For a more detailed discussion of the systemic risk associated with the macrofinancial cycle, see the article *Financial Stability, Systemic Risk and Macroprudential Policy* (Frait and Komárková) in this Financial Stability Report.

[2] In this study, the group of CEE countries consists of Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

2. EXCESSIVE CREDIT GROWTH

Credit growth in CEE countries has caught the attention of many studies over the past decade. These studies have tried to identify not only the determinants of credit growth, but also its equilibrium level (Enoch and Ötker-Robe, 2007; Égert et al., 2006). The credit boom in some transition economies was strong enough to raise concerns about whether this trend was simply a manifestation of convergence to the average credit levels in advanced nations, or whether it was a case of excessive growth posing a risk to macroeconomic and financial stability (Hilbers et al., 2005). The central banks and supervisory authorities of some countries even assessed the situation as critical and in 2004–2007 introduced a series of tools for limiting credit growth (Dragulin, 2008; Herzberg, 2008). These tools ranged from "soft" measures, such as increased risk weights on selected loans and the introduction of guidelines and limits (e.g. Estonia), through to very "hard" administrative restrictions on credit portfolio growth (Bulgaria). The extent of the measures, as measured by the number of different tools used to limit credit growth, was correlated to a large degree with the credit growth rate (see Chart 1). However, it is difficult to assess the effectiveness of the tools used, since most of them were applied just before the global financial crisis erupted. The decline in credit growth observed since then may thus have been due more to the sharp economic contraction and reduced demand for loans. The studies conducted up to now tend to conclude that the aforementioned tools are pretty ineffective and that credit booms can be limited in only a very limited way during good times (Kraft, 2005; Herzberg, 2008).

**CREDIT GROWTH AND NUMBER OF TOOLS APPLIED
TO LIMIT CREDIT BOOMS**
(number of measures on x-axis; average year-on-year real credit growth in 2005–2007 on y-axis)

Source: IMF, national authorities' websites

Despite the comparatively strong credit boom observed in 2003–2007, the stock of loans in many CEE countries in the pre-crisis year 2007 was still relatively low, especially in comparison with other EU countries. Nevertheless, in terms of the private-credit-to-GDP ratio, some countries of the region had reached levels typical of some euro area countries (see Chart 2). The question therefore arises whether they were already showing excessive credit levels. One limitation of this comparison is that data used in this analysis is based solely on data on domestic bank loans. This indicator understates total private credit, as it neglects loans provided by non-bank financial intermediaries and loans provided directly from abroad.

PRIVATE CREDIT RATIOS IN SELECTED EU COUNTRIES
(as % of GDP; 2007 Q4)
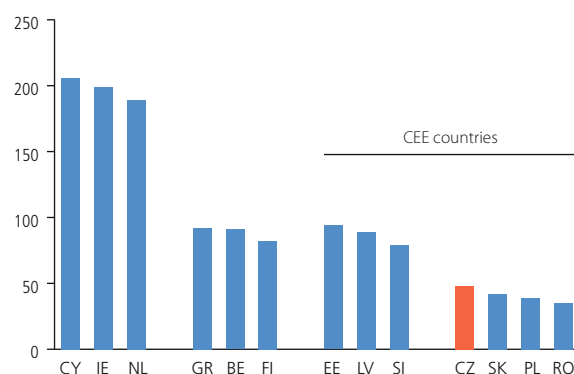
Source: IMF IFS, authors' calculations

Excessive credit growth can threaten macroeconomic stability in many ways. Given that lending supports consumption, growth in private sector loans can over-stimulate aggregate demand beyond the framework of potential output and cause the economy to overheat, with knock-on effects on inflation, the current account deficit, interest rates and the real exchange rate.

At the same time, lending institutions can, in an economic growth phase, have over-optimistic expectations about borrowers' future ability to repay their debts and therefore very often lend to high-risk borrowers. The upshot is that the bulk of "potentially" bad loans arise during upward phases of the credit cycle. In some CEE countries, private loans were provided in foreign currency because foreign interest rates were lower (see Chart 3). This further increases the risks for the banking sector, because if the domestic currency depreciates, the volume of credit expressed in the domestic currency rises, debt servicing costs go up,

and foreign exchange risk turns into credit risk. In many cases, therefore, the aforementioned measures to contain credit growth were targeted primarily at reducing growth in foreign currency loans (Steiner, 2011). Furthermore, if a domestic credit boom is financed from foreign sources, as was the case in several CEE countries (except for the Czech Republic, Slovakia and Poland), the risk of the domestic banking sector having insufficient balance-sheet liquidity (roll-over risk) increases. In economic bad times, domestic banks face a high risk of outflows of short-term foreign funds that cannot be financed by the sale of liquid assets (Hilbers et al., 2005).[3]

CHART 3

SHARES OF FOREIGN CURRENCY BANK LOANS
(as of end-2009; as % of total loans to given sector)
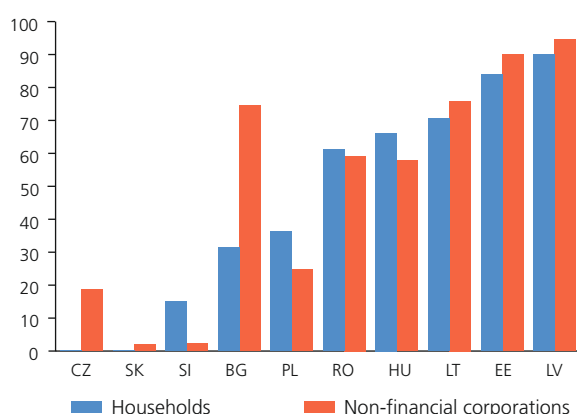
Source: ECB
Note: SK and SI were already members of the euro area in 2009, so their
        foreign currency loans comprise currencies other than EUR.

A bursting of the credit bubble and negative macroeconomic developments, leading to external financing constraints and growth in non-performing loans, can therefore cause the banking sector serious difficulties. IMF (2004) estimates that more than 75% of credit booms were followed by banking or currency crises. This fear is consistent with existing studies in the field of early warning signals, according to which excessive credit growth can be considered one of the most reliable indicators of future problems in the banking sector (Borio and Lowe, 2002; Borio and Drehmann, 2009; Jimenez and Saurina, 2006; Saurina et al., 2008).

As part of the preparation of the new Basel III regulatory framework for banks, the Basel Committee (BCBS, 2010) has proposed several tools for reducing the procyclical behaviour of the banking sector.[4] One of the key tools is a proposal for banks to create countercyclical capital buffers during credit booms.[5] Such buffers, expressed as a percentage of risk-weighted assets (RWA) and covered by high quality capital (Tier 1, or even core Tier 1), would be set by the regulator within the range of 0% to 2.5%. As a guide for the setting of the buffer, the Basel Committee is proposing to use and regularly publish the difference between the current private credit ratio as a percentage of GDP and its trend value estimated using the HP filter (the "credit-to-GDP gap"). However, regulators may also use other methods to calculate the trend and other variables, such as the prices of various relevant assets and credit conditions. In bad times, this capital buffer would be "released" in order to slow any fall in the credit supply and thereby reduce the procyclicality of the financial system.

The Basel Committee document itself (BCBS, 2010b) proposes to use the aforementioned guide as follows. The capital buffer would start to be created when the credit-to-GDP gap exceeded two percentage points. If the gap reached 10 percentage points or more, the buffer would reach the aforementioned maximum of 2.5% of RWA. For gaps of between 2 and 10 percentage points, the buffer would vary linearly between 0% and 2.5%. For example, for a gap of six percentage points the buffer would be 1.25% of risk RWA (see Chart 4). For cross-border exposures, the buffer set by the regulator in the foreign jurisdiction would apply. For cross-border banking groups, the capital buffer would be applied on both a solo and consolidated basis.

It became clear during the discussion phase within the Basel Committee that a simple filtering technique would in many cases not necessarily lead to reliable estimates of excessive credit, so the final version of Basel III (BCBS, 2010b) gives regulators considerable discretion to set the buffer. The primary aim of the buffer, however, is not to restrict credit growth, but to create a capital reserve to give the banking sector greater protection from sudden changes in the credit cycle. At the same time, the Basel Committee documents emphasise the complementarity of this buffer with other macroprudential tools (BCBS, 2010b, p. 5), such as

---

3   In this regard, the Czech Republic has a very favourable deposit-to-loan ratio. For a comparison with other EU countries, see CNB (2010, section 1.3.1).
4   The issue of procyclicality of the financial system and its sources and potential consequences was discussed in a thematic article in last year's *Financial Stability Report 2009/2010* (Geršl and Jakubík, 2010).
5   With regard to the objective of reducing the procyclicality of the financial system, the Basel Committee stated explicitly in its December 2009 consultative document (BCBS, 2009) that the aim of this buffer was to "achieve the broader macroprudential goal of protecting the banking sector from periods of excess credit growth".

CHART **4**

COUNTERCYCLICAL CAPITAL BUFFER
(% of RWA as function of credit-to-GDP gap in p.p.)
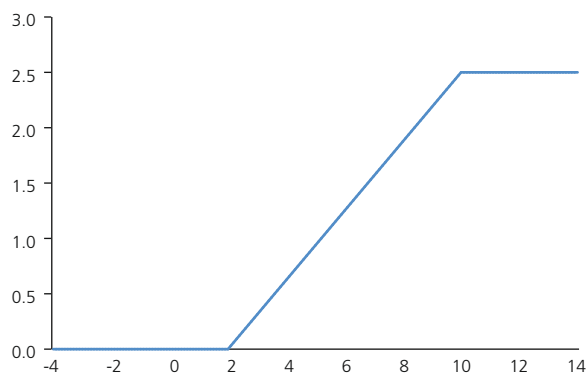
Source: CNB

various limits on key indicators of borrowers' ability to repay loans (the loan-to-collateral and loan-to-income ratios).

3. METHODS FOR ESTIMATING THE EQUILIBRIUM CREDIT LEVEL

A major problem in constructing an excessive credit growth indicator is determining what level of credit is excessive and might pose a threat to the financial sector. One traditional method is to apply the statistical Hodrick-Prescott (HP) filter, which obtains the trend from a time series. By comparing the actual credit-to-GDP ratio with its long-term trend obtained using the HP filter we can then estimate whether or not the credit level is excessive. This method is used quite routinely in the literature (Borio and Lowe, 2002; Borio and Drehmann, 2009). Hilbers et al. (2005), for example, consider a credit-to-GDP gap of greater than five percentage points to be an indicator of excessive credit in the economy.

Although the HP filter method is used quite often to determine trends in macroeconomic variables, it does have its drawbacks. A time series trend is dependent to a significant extent on the length of the chosen time series and the calculation is very sensitive to the smoothing parameter (lambda). A big problem as regards practical application in macroprudential policy is "end-point bias", which generates a highly unreliable estimate of the trend at the end of the data period.[6] Macroprudential policy,

which, by contrast, requires assessment of the trend on the basis of current (i.e. end-of-period) data, would therefore be reliant on indicators subject to a high degree of uncertainty. In the case of some CEE countries with relatively short time series, credit growth is incorporated directly into the trend itself by the HP filter (Cottarelli et al., 2005). Another relevant question is whether the credit ratio should take into account other denominators besides GDP, such as financial assets or total assets of the private sector. Although GDP is correlated to a significant extent with private sector income and therefore serves as an indicator of the ability to repay a given amount of loans, holdings of financial assets (deposits and securities investments) and non-financial assets (e.g. real estate) are also relevant to the evaluation of excessive credit.

Chart 5 presents credit gaps with alternative denominators (GDP and financial assets and total assets of the private sector) calculated using the HP filter on data for bank loans in the Czech Republic with a high lambda (400,000) as proposed in Basel III. The filter is applied to quarterly data for the period 1998–2010, which, however, is regarded as relatively short from the international perspective (Basel III recommends at least a 20-year period). The estimates indicate that the current level of bank loans is below the long-term trend. However, the trend estimate is subject to a range of problems related to the short time series and above all to extraordinary factors linked with a fall in credit volume in 1998–2002 caused by a banking crisis in the 1990s and the clean-up of bank balance sheets ahead of the privatisation of large banks.

As regards simulating possible macroprudential policy in the past, it makes more sense to apply the HP filter recursively, i.e. in each past period using only the data that were available in that period (at the end of 2005, for example, the trend value and therefore also the gap between the observed credit level and the trend is calculated on 1998–2005 data). This simulates the situation that the macroprudential policy-maker would hypothetically have found itself in had it been required to decide whether excessive credit growth was emerging. The calculated credit gaps expressed as a percentage of GDP indicate that the Czech Republic would have found itself in a situation of excessive credit as early as 2004 (see Chart 5). However, the aforementioned drawbacks of the HP filter play an even greater role in the calculated gap, as the problem period of 1998–2002 influences the trend.

---

6 One way of dealing with end-point bias is to extend the time series into the future by means of prediction. This, however, can introduce further uncertainty into the estimate linked with the quality of the prediction.

CHART 5

CREDIT GAPS IN THE CZECH REPUBLIC WITH ALTERNATIVE DENOMINATORS
(in %)

— Credit-to-GDP gap
— Credit-to-GDP gap (actual period estimation)
— Credit-to-financial-assets gap
— Credit-to-assets gap

Source: CNB, authors' calculations

CHART 6

CREDIT-TO-GDP RATIOS FOR A SIMILAR LEVEL OF ECONOMIC DEVELOPMENT
(in %; GDP per capita in 2005 prices = USD 17,000 approx.)
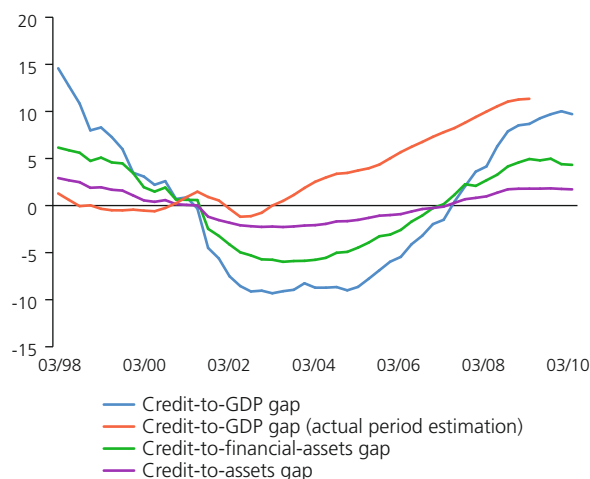
Source: IMF IFS, authors' calculations

The main criticism of the HP filter technique, however, is that this method does not take into account economic fundamentals that affect the equilibrium stock of loans. An alternative method is to estimate the equilibrium private credit level in relation to key economic variables (such as the level of development of the economy measured in terms of real GDP per capita). In a nutshell, this method says that if GDP per capita – as a proxy for the standard of living – is the main and only economic fundamental, all countries with the same level of development should have a similar equilibrium credit level. Poorer countries should have a lower equilibrium credit level than wealthier countries. A comparison of bank loans as a percentage of GDP for the Czech Republic in 2009 and selected euro area countries in years when they were at a similar level of economic development indicates, in contrast to the HP filter findings, that the credit ratio in the Czech Republic is below the level consistent with its economic level (see Chart 6).[7]

Given that the CEE countries started from very low private credit levels, however, the estimation of a suitable econometric model on data for these countries would capture the rapid growth caused by convergence towards the average level of the advanced nations. As Égert et al. (2006, p. 14) point out, such estimated elasticities of the relationships between fundamentals and credit would be overstated. At the same time, the estimates would reflect not the equilibrium level, but only the present relationship between economic fundamentals and private credit.

For this reason, the existing literature suggests using out-of-sample (OOS) panel estimation, i.e. estimating the model on a different sample of countries and applying the elasticities so obtained to the data for the countries for which the equilibrium credit level is being estimated. This approach assumes a priori that the stock of credit in OOS countries is on average at equilibrium, which is quite a significant assumption. Therefore, one needs to choose suitable OOS countries that best meet the need to estimate the correct equilibrium relationships between economic fundamentals and private credit. The existing studies on this topic therefore normally use the developed countries of the EU or OECD as an appropriate OOS comparison (Kiss et al., 2006; Égert et al., 2006). For this study, the advanced EU countries were used as OOS countries. Owing to the current debate regarding the excessive debt of the PIIGS[8] countries, these countries were omitted from the calculation of the equilibrium credit level.[9]

---

7   This comparison of the level of economic development is based on average GDP per capita expressed in real USD and can be interpreted as the same volume of goods that could be bought in the USA with the average GDP of the given country in the given year.

A variety of econometric methods can be used for OOS estimation. Given the properties of the variables used, however, traditional panel methods run into the problem of nonstationary time series, regression of which can lead to spurious results. The traditional solution to the problem of nonstationarity of variables involves differentiating them. This step allows us to obtain the short-run relationship between the variables by regression, but the longer-run relationship is lost due to the differentiation. The long-run relationship between nonstationary variables can be better estimated if the variables are cointegrated. This fact is used by the ECM (error correction model) method, which estimates not only the long-run relationship between the cointegrated variables, but also the potential short-run deviations from this long-run relationship.

We use the PMG (pooled mean group) estimation method, introduced for panel estimates by Pesaran et al. (1999). It, too, is based on this principle of short-run deviations from the long-run trend. This method can be used to estimate the long-run relationship between the credit-to-GDP ratio and other variables, which is identical for all countries, whereas the short-run deviations from this relationship can differ across countries. The PMG model therefore allows heterogeneity of the estimates for individual countries in the short run. However, the long-run relationship of the cointegrated variables is common to all the countries in the sample.

The data used for the OOS method were obtained from the International Monetary Fund's IFS (International Financial Statistics) database, which provides the required macroeconomic data with a sufficient history (which is vital for estimating long-run relationships). For this reason, we used data for a 30-year period (1980–2010). The available statistics on bank loans to the private sector were used as the credit indicator. These statistics slightly underestimate the total credit of the private sector, as they do not include non-bank financial intermediaries (e.g. leasing) and cross-border loans. Data on aggregate household consumption, government debt, short-term interest rates, unemployment, inflation measured by the GDP deflator, and GDP per capita in dollar terms were also used.

A long-run cointegration relationship between the credit-to-GDP ratio, the household consumption-to-GDP ratio and GDP per capita in USD was identified for the OOS set of countries. The GDP per capita variable in the long-run relationship captures the different degree of wealth of the economy, which therefore also influences the equilibrium private credit level (Terrones and Mendoza, 2004).

The following equation gives estimates of the coefficients of the long-run relationship between the cointegrated variables and the values of the coefficients in the short run, which are given as the mean of all the estimates for the relevant countries.

$$\Delta (credit/gdp)_t = -0.035(credit/gdp_{t-1} - 0.7cons/gdp_t - 0.13\ gdp/pop_t\ ) + \quad \} \text{ long-run relationship}$$
$$\qquad (**) \qquad\qquad (***) \qquad\qquad (***)$$

$$+\ 0.87\Delta\ (cons/gdp)_{t-1} - 0.07inf_{t-1} +\ 0.014 \qquad\qquad \} \text{ short-run deviations}$$
$$\quad (**) \qquad\qquad\qquad (*) \qquad\quad (***)$$

Note: *, ** and *** denote significance of the estimated coefficients at the 10, 5 and 1% levels respectively.

8   Portugal, Italy, Ireland, Greece and Spain.
9   However, nations that are structurally quite different from the CEE countries, such as the United Kingdom, remain in the sample of control countries. This may skew the results of the analysis towards higher equilibrium credit values for a given set of economic fundamentals.
10 For this reason, we would expect a negative relationship between the government debt ratio and loans to the private sector. The fact that a less indebted government sector would be able to provide more significant support if the banking sector ran into serious problems is relevant for assessing whether the current private sector credit level is excessive with regard to financial stability.

Credit/gdp represents the ratio of private sector credit to GDP, *cons/gdp* denotes the ratio of household consumption to GDP, *gdp/pop* is GDP per capita in dollar terms and *inf* is the change in the price level, expressed as the year-on-year change in the GDP deflator.

Besides the aforementioned variables, other factors that might affect the explained *credit/gdp* ratio were included in the model. For example, the government debt-to-GDP ratio might capture any crowding out of bank lending to the private sector.[10] Also, the real interest rate, or changes therein, should, as the cost of financing, be in a negative relationship with the explained variable. However, as the final specification of the model indicates, these variables were not significant even at the 15% level. On the basis of the model, short-run deviations from the long-run trend are given as a function of the change in the consumption-to-GDP ratio and as a function of inflation. Based on the estimated coefficients, we can conclude that in the long-run relationship the credit-to-GDP ratio increases with increasing wealth of the economy and with an increasing consumption-to-GDP ratio. This

factor then positively affects the explained variable in the short-run relationship as well, while inflation acts in the opposite direction. These conclusions are in accordance with intuition as regards the effects of the variables used on the credit-to-GDP ratio.

The estimated parameters of the model were applied to data for the CEE countries to obtain values of the "equilibrium" credit ratio. The OOS calculations may in some cases imply significantly different conclusions regarding excessive credit compared to the calculations using the HP filter (see Chart 7). According to the HP filter, the credit-to-GDP gap indicates excessive credit in the recent period not only for the Czech Republic, but also, for example, for Slovakia, Lithuania, Romania and Poland, whereas the econometric estimate does not confirm this excessive credit level (values in the positive part of the chart indicate excessive private credit-to-GDP ratios). By contrast, Bulgaria, Estonia, Latvia and Slovenia now have excessive credit-to-GDP ratios according to the OOS method. It is clear, therefore, that the two calculation methods used give contradictory results in some cases.

CHART 7

COMPARISON OF CREDIT-TO-GDP RATIOS FOR VARIOUS CALCULATION METHODS
(in p.p.)

HP gap — OOS gap — Source: CNB, authors' calculations
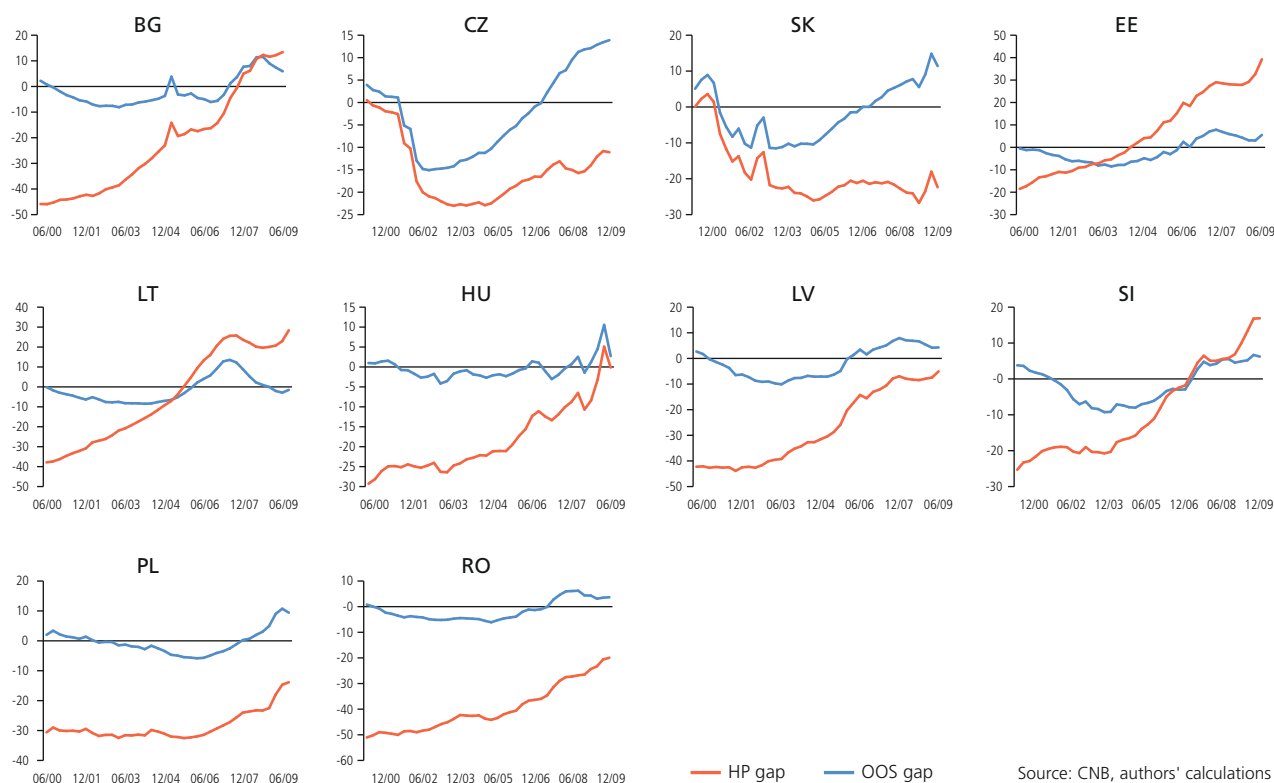
4. SIMULATION OF THE SIZE OF THE CAPITAL BUFFER

One of the questions associated with the new Basel III rules is whether the requirement to create a countercyclical capital buffer would contribute to the creation of capital reserves in those CEE countries which experienced significant problems in their banking sectors during the global financial crisis. In the following simulation, the size of the capital buffer is calculated for individual CEE countries using the two aforementioned methods, i.e. the HP filter method and the econometric OOS method. As the crisis did not manifest itself fully in the CEE countries until late 2008 and (in particular) 2009, i.e. after the collapse of Lehman Brothers in September 2008, we set mid-2008 as the starting point for the buffer calculation.

TABLE 1

SIMULATION OF COUNTERCYCLICAL BUFFER CALCULATION
(data as of 2008 Q2)

	Credit-to-GDP gap (%)		Countercyclical capital buffer (% of RWA)	
	HP filter	Out-of-sample	HP filter	Out-of-sample
BG	11.4	10.8	2.5	2.5
CZ	9.5	-15.0	2.4	0.0
EE	5.3	27.9	1.0	2.5
LT	6.9	-8.3	1.5	0.0
LV	1.0	19.6	0.0	2.5
HU	-1.4	-10.7	0.0	0.0
PL	3.0	-23.3	0.3	0.0
RO	6.1	-27.3	1.3	0.0
SK	6.1	-22.8	1.3	0.0
SI	5.4	5.5	1.1	1.1

Source: Authors' calculations

The results of this simple simulation indicate that only four countries needed a countercyclical capital buffer according to the OOS method (Bulgaria, Estonia and Latvia needed the maximum possible 2.5% of RWA, while Slovenia needed 1.1% of RWA).

It is then relevant to ask whether the banking sectors of these countries had a sufficient capital reserves in 2008 and whether these really were the countries hit hardest

CHART 8

CREDIT-TO-GDP GAP VIA OUT-OF-SAMPLE AND TIER 1 RATIO IN 2008
(gap in p.p.; Tier 1 capital ratio in 2008)
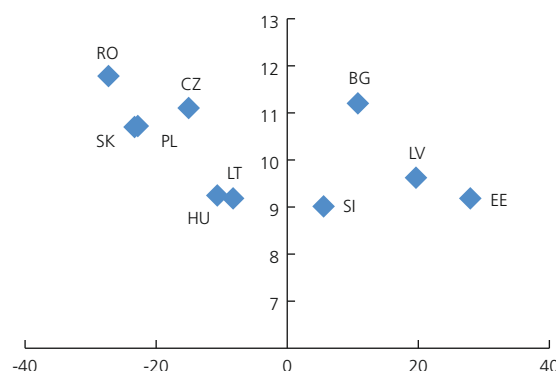
Source: IMF, authors' calculations

by the crisis. Chart 8 indicates that with the exception of Bulgaria, the countries identified by the OOS method as having excessive credit ratios (i.e. Estonia, Latvia and Slovenia) had relatively low Tier 1 capital ratios.[11]

Several indicators can be used to compare the impacts of the crisis on the banking sectors of individual countries. These indicators include, for example, the size of the increase in credit risk in the economy as measured by growth in the NPL ratio between 2008 and 2009, the fall in banking sector profits between 2008 and 2009 (in p.p. of return on equity) and the size of public capital injections and other bank-support measures implemented by the government (e.g. bond guarantees). A simple graphical analysis reveals that the countries identified by the OOS method as having excessive credit ratios had the highest growth in NPLs on average (see Chart 9) and recorded large losses in their banking sectors in 2009, usually due to negative RoE in 2009 (see Chart 10). Likewise, the greatest public support was implemented in 2009 in countries identified by the OOS method as having excessive credit ratios, i.e. in Latvia and Slovenia (see Chart 11). It is worth mentioning that the HP method would not have identified the problems building up in the Latvian and Estonian economies, which were hit hard by the crisis and, especially in the case of Latvia, suffered very high real costs.

---

11 In the case of some Baltic countries where foreign (primarily Swedish) banks have branches, the capital buffer would have been created at parent level (e.g. in Sweden).

CHART 9

CREDIT-TO-GDP GAP VIA OUT-OF-SAMPLE AND NPL CHANGE IN 2009
(gap in p.p.; change in NPL ratio in p.p.)
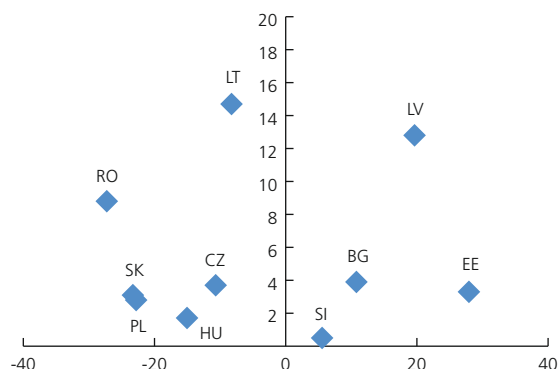
Source: IMF, authors' calculations

CHART 10

CREDIT-TO-GDP GAP VIA OUT-OF-SAMPLE AND CHANGE IN RoE
(gap in p.p.; change in RoE of banking sector in p.p.)
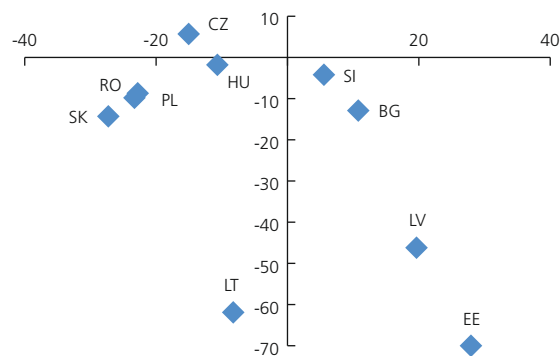
Source: IMF, authors' calculations

CHART 11

CREDIT-TO-GDP GAP VIA OUT-OF-SAMPLE AND PUBLIC SUPPORT IN 2009
(gap in p.p.; public support as % of GDP)
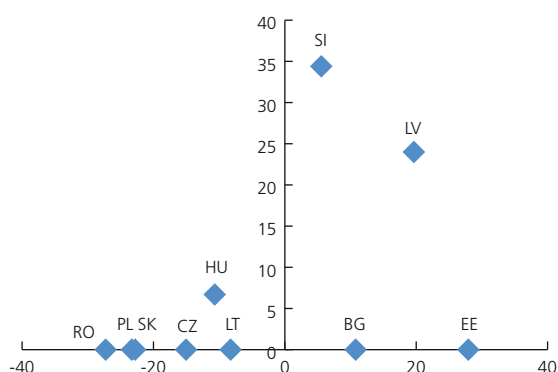
Source: European Commission, authors' calculations

5. CONCLUSION

This article discusses methods for calculating excessive private sector credit in the Central and Eastern European region and their suitability as regards the creation of the countercyclical capital buffer introduced by the Basel Committee on Banking Supervision (BCBS, 2010). The BCBS has recommended the use of an excessive credit indicator based on the Hodrick-Prescott (HP) filter technique as a guide for setting this buffer.

The article shows that the HP filter-based calculation of the excessive credit indicator is not necessarily appropriate in certain cases. For the CEE countries in particular, rapid credit expansion may simply mean convergence to values typical of the advanced nations, and not excessive borrowing. As an alternative, the article suggests considering excessive credit calculation methods that better reflect the evolution of a country's economic fundamentals. One such method is an out-of-sample technique based on estimates for advanced EU countries which are subsequently used to calculate the equilibrium credit levels of the CEE countries.

Although statistical filtering techniques such as the HP filter do have a role to play in the analysis as a first step in the interpretation of the available data, a broader set of indicators and methods should be employed to determine a country's position in the credit cycle. Our chosen method, based on economic fundamentals, would have better identified the problem of excessive credit in those CE countries whose banking sectors recorded serious problems during the crisis. Although this calculation technique has its limitations, it can be considered as a complementary indicator of excessive credit, especially for small converging economies.

REFERENCES

BACCHETTA, P., GERLACH, S. (1997): *Consumption and Credit Constraints: International Evidence*, Journal of Monetary Economics 40(2), Monetary Policy and Financial Markets, pp. 207–238.

BACKÉ, P., ZUMER, T. (2005): *Developments in Credit to the Private Sector in Central and Eastern European EU Member States: Emerging from Financial Repression, Comparative Overview*, in: Focus on European Economic Integration, Vienna: Oesterreichische Nationalbank, February.

BCBS (2009): *Strengthening the Resilience of the Banking Sector*, December 2009.

BCBS (2010a): *Consultative Document: Countercyclical Capital Buffer Proposal*, July 2010.

BCBS (2010b): *Guidance for National Authorities Operating the Countercyclical Capital Buffer*, December 2010.

BLACKBURNE, E. F., FRANK, M. W. (2007): *Estimation of Nonstationary Heterogeneous Panels,* The Stata Journal 7(2), pp. 197–208.

BOISSAY, F., CALVO-GONZALES, O., KOZLUK, T. (2006): *Is Lending in Central and Eastern Europe Developing too Fast?* Finance and Consumption Workshop presentation.

BORIO, C., LOWE, P. (2002): *Assessing the Risk of Banking Crises*, BIS Quarterly Review, December, pp. 43–54.

BORIO, C., DREHMANN, M. (2009): *Assessing the Risk of Banking Crises – Revisited*, BIS Quarterly Review, March, pp. 29–46.

BRZOZA-BRZEZINA, M. (2005): *Lending Booms in European Periphery: South-Western Lessons for Central Eastern Members*, EconWPA, February.

CALZA, A., GARTNER, C., SOUSA, J. (2003): *Modelling the Demand for Loans to the Private Sector in the Euro Area*, Applied Economics 35(1), pp. 107–117.

CNB (2010): *Analyses of the Czech Republic's Current Economic Alignment with the Euro Area*, Czech National Bank.

COTTARELLI, C., GIOVANNI, D., VLADKOVA-HOLLAR, I. (2005): *Early Birds, Late Risers, and Sleeping Beauties: Bank Credit Growth to the Private Sector in Central and Eastern Europe and in the Balkans*, Journal of Banking & Finance 29(1), pp. 83–104.

DRAGULIN, I. (2008): *Coping with Credit Growth: The Romanian Experience*, presentation at the IMF-BSC Workshop on Credit Growth in Central and Eastern Europe, Vienna, January 2008.

ÉGERT, B., BACKÉ, P., ZUMER, T. (2006): *Credit Growth in Central and Eastern Europe – New (Over)shooting Stars?* European Central Bank Working Paper No. 687.

ELLER, M., FRÖMMEL, M., SRZENTIC, N. (2010): *Private Sector Credit in CESEE: Long-Run Relationships and Short-Run Dynamics*, Focus on European Economic Integration, No. 2.

ENOCH, C., ÖTKER-ROBE, I. (2007): *Rapid Credit Growth in Central and Eastern Europe: Endless Boom or Early Warning?* International Monetary Fund, Palgrave Macmillan Ltd., ISBN 978-0-2305-2151-3, p. 373.

GERALI, A., NERI, S., SESSA, L., SIGNORETTI, F. (2010): *Credit and Banking in a DSGE Model of the Euro Area*, Working Paper No. 740, Bank of Italy, Economic Research Department.

GERŠL, A., JAKUBÍK, P. (2010): *Procyclicality of the Financial System and Simulation of the Feedback Effect*, Financial Stability Report 2009/2010, Czech National Bank, pp. 88–96.

HERZBERG, V. (2008): *The Role of Macro Prudential Measures in Containing Credit Expansions: A Short Overview*, presentation at the IMF-BSC Workshop on Credit Growth in Central and Eastern Europe, Vienna, January 2008.

HILBERS, P., OTKER-ROBE, I., PAZARBASIOGLU, C., JOHNSEN, G. (2005): *Assessing and Managing Rapid Credit Growth and the Role of Supervisory and Prudential Policies*, IMF Working Paper WP/05/151.

HOFMANN, B. (2001): *The Determinants of Private Sector Credit in Industrialized Countries: Do Property Prices Matter?* BIS Working Paper 108.

IMF (2004): *Are Credit Booms in Emerging markets a Concern?* World Economic Outlook, April 2004, Chapter 4.

JIMENEZ, G., SAURINA, J. (2006): *Credit Cycles, Credit Risk, and Prudential Regulation*, International Journal of Central Banking 2(2), pp. 65–98.

KISS, G., NAGY, M., VONNÁK, B. (2006): *Credit Growth in Central and Eastern Europe: Convergence or Boom?* MNB Working Papers 2006/10, Magyar Nemzeti Bank (The Central Bank of Hungary).

KRAFT, E., JANKOV, L. (2005): *Does Speed Kill? Lending Booms and Their Consequences in Croatia*, Journal of Banking and Finance 29(1), pp. 105–121.

PESARAN, M. H., SHIN, Y., SMITH, R. P. (1999): *Pooled Mean Group Estimation of Dynamic Heterogeneous Panels*, Journal of the American Statistical Association 94, pp. 621–634.

SAURINA, J., LIS, S. F., PAGÉS, J. M. (2000): *Credit Growth, Problem Loans and Credit Risk Provisioning in Spain*, Bank of Spain Working Paper No. 0018.

SAURINA, J., GABRIEL, J., ONGENA, S., PEYDRÓ, J. (2008): *Hazardous Times for Monetary Policy: What Do 23 Million Bank Loans Say about the Effects of Monetary Policy on Credit Risk?* Discussion Paper No. 75, Center for Economic Research, Tilburg University.

STEINER, K. (2011): *Households' Exposure to Foreign Currency Loans in CESEE EU Member States and Croatia*, Focus on European Economic Integration Q1/11, pp. 6–24.

Terrones, M., Mendoza, E. (2004): *Are Credit Booms in Emerging Markets a Concern?* IMF, World Economic Outlook, pp. 147–166.

AN ANALYSIS OF PROGRESS WITH THE SALE OF RESIDENTIAL DEVELOPMENTS

Michal Hlaváček, Zita Prostějovská and Luboš Komárek

This article analyses residential developments using a database of individual projects for the years 2006–2010. Changes in the supply structure towards smaller apartments in recent years were identified in this unique database. These changes were probably a reaction to higher demand for smaller apartments, which also recorded the strongest fall in prices. The main part of the article contains estimates of so-called "sales progress S-curves". These estimates reveal quite a sharp deterioration in progress with the sale of apartments in 2009 and 2010. A model of the determinants of deviations of progress with the sale of individual projects from the estimated S-curve suggests the existence of unobserved factors that probably have an opposite relationship to apartment prices than expected. The other significant variables were apartment size, number of garage spaces per apartment and balcony area per apartment.

1. INTRODUCTION – MOTIVATION FOR THE RESEARCH

This article analyses residential developments in apartment blocks in Prague. The property development sector[1] has boomed in recent decades, driving forward apartment construction in the Czech Republic and especially in Prague (apartment construction has been more than twice as intensive in Prague and adjacent districts than in the rest of the Czech Republic owing to developers' ability to achieve higher selling prices for apartments in Prague). Back in 1997, commercial apartment construction in apartment blocks accounted for 43.3%

of all apartment completions in Prague (the remainder consisting mainly of apartment construction in family houses and municipal apartment construction), whereas in 2007–2010 the figure was almost twice as high (85.8%). Apartment construction in family houses meanwhile remains stable, while municipal apartment construction has practically disappeared (see Chart 1). The recent surge in apartment construction (the average number of apartment completions in the Czech Republic was more than three times higher in 2007–2010 than in the mid-1990s) can therefore be attributed to commercial apartment block developments.

CONTRIBUTIONS OF COMMERCIAL DEVELOPMENTS TO NUMBER OF APARTMENT COMPLETIONS IN PRAGUE
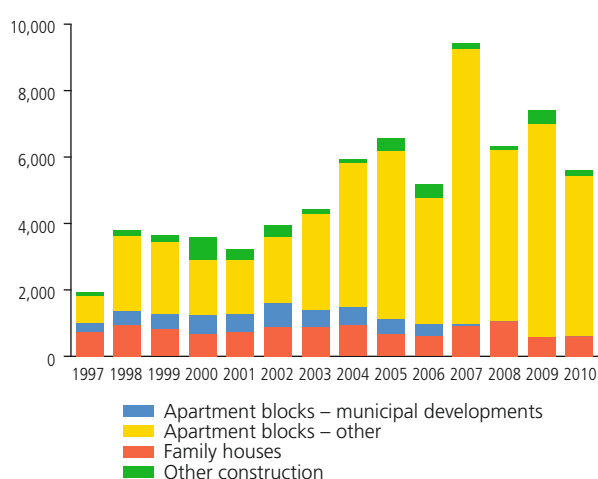
Source: CZSO, Prague City Hall

CREDIT GROWTH: REAL ESTATE COMPANIES VERSUS NON-FINANCIAL CORPORATIONS
(y-o-y changes on left-hand scale, loan shares on right-hand scale)
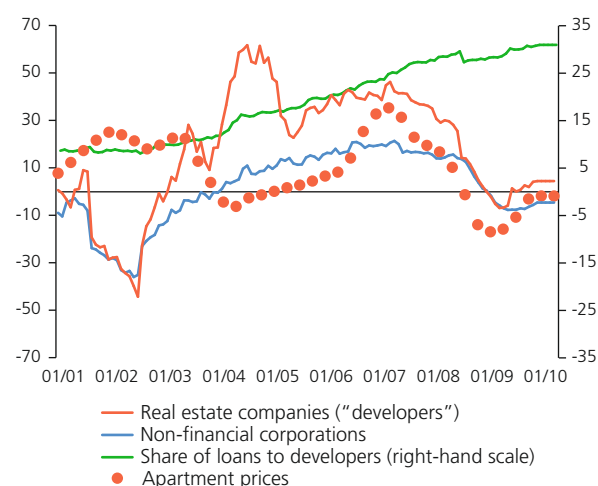
Source: CNB, CZSO

---

1   For the purposes of this article, a developer is any business that invests in residential developments with the intention of selling them on or renting them out. Developers are often companies linked to financial institutions or property management companies. Building societies also often have a development aspect to their activities.

However, the expansion of the real estate sector entails numerous risks both for the financial sector and for the household sector. These risks are often associated with new channels of transmission of property prices to credit risk: a fall in property prices can now affect the banking system via developer default. Part of developers' credit risk is borne by households that have paid for apartments but do not yet own them.[2] Developers and other real estate companies have meanwhile become major clients of banks and can significantly affect the overall credit risk of the banking portfolio of non-financial corporations. The share of loans to real estate companies[3] in total loans to non-financial corporations has risen from around 9% at the end of 2002 to a current level of approximately 32% (see Chart 2). Recently, moreover, the link between growth in loans to developers and property price growth has been relatively strong. A similar link exists for the non-performing loan ratio. Real estate companies also have a higher proportion of foreign currency loans than other non-financial corporations (24.6% versus 18.4%), which may also indicate increased exchange rate and credit risk among such clients.[4] Banks have reacted to the potential deterioration in the financial condition of developers during the crisis by tightening their credit conditions. For example, minimum down payments have risen from around 10% in 2007 to a current level of 30–40% and projects are required to have high advance sales. The tighter lending conditions may exacerbate developers' situation.

One of the key factors of success of a development project is the rate at which individual apartments in the development are sold. If the sale of apartments falls significantly behind schedule, the developer receives its revenues later and the project financing costs go up. This, in turn, can increase the risk of the developer defaulting on loans to banks or being forced to postpone construction, which, however, will transfer part of the costs to clients who have already invested in the project.

To determine sales progress curves, the empirical part of this article uses a unique database[5] containing information on progress with the sale of residential developments in Prague. This database has been compiled over the last five years by co-authors from the Czech Technical University (CTU) in Prague. The article is structured as follows. Section 2 describes the database and the stylised facts that ensue from this description. Section 3 describes the method used to estimate the sales progress curves. Section 4 analyses the determinants of deviations of individual projects from the estimated sales progress curves. The final section concludes.

2. DESCRIPTION OF THE SOURCE DATABASE AND STYLISED FACTS ABOUT THE PROPERTY DEVELOPMENT MARKET

The analyses conducted in this article are based on a database of property development projects compiled by co-authors from CTU (see Čápová, 2005, or Prostějovská, 2010). The data in this database are sourced mainly from websites on which individual developers post information about their projects. The database covers residential projects in apartment blocks in Prague. It only contains projects with 10 or more apartments for which all the necessary data are available. It does not include family house developments and purely commercial (office, retail and industrial) developments. The database has been collected for several years now, always in the middle of the year, and covers the period 2006–2010. As Table 1 shows, the number of apartments in the database each year fluctuates between 3,500 and 9,000, accounting for 30–75% of all apartments under construction in apartment blocks in Prague. The database is therefore fairly representative. For the entire period, the database featured a total of 139 projects with 15,489 apartments (some projects appear in the database in more than one year[6]). The total value of all the apartments in the database

---

2 The property price channel through the property development sector can be illustrated by the slump that occurred in prices of developers' shares traded on the stock exchange in 2009 in response to falling apartment prices. Of course, developers' activities are not limited to residential projects. However, it is simpler to analyse residential projects, partly because the final product is more homogeneous and partly because the number of transactions is much higher than in the case of commercial projects.

3 However, developers are just one group within this CZ-NACE category. Others include estate agents, housing cooperatives and owners' associations. At the same time, not all loans to developers are earmarked for residential projects; a large proportion are used for commercial (office, industrial and retail) developments.

4 The higher proportion of foreign currency loans is probably linked mainly with developers' commercial projects, where transactions are mostly denominated in foreign currencies.

5 To the best of our knowledge, the only comparable database is that of property development company Ekospol (for a description, see Korec, 2010). However, the analyses published by Ekospol are only partially comparable with ours (for example, they cover projects with 50 or more apartments, whereas our database selects projects with 10 or more).

6 In all, 56 projects appeared in the database only once, 53 projects in two years, 20 projects in three years, 8 projects in four years, and 3 projects in all five years.

TABLE 1

BASIC DESCRIPTION OF DATABASE

		2006	2007	2008	2009	2010
No. of projects		72	55	32	56	47
No. of apartments		9,865	6,820	3,518	5,837	4,491
Apartments under construction (CZSO)		12,704	10,806	11,980	13,814	13,814
Representativeness of sample		77.7	63.1	29.4	42.3	41.8
Value of apartments (CZK bn)		33.0	24.0	16.5	24.8	16.9
Shares of apartment types in %	one-room	11.1	12.5	9.6	11.7	12.5
	two-room	33.9	30.5	28.9	30.9	32.3
	three-room	38.3	38.7	41.0	40.1	40.4
	four-room	13.2	15.9	18.6	15.5	14.4
	> four-room	3.4	2.4	1.9	1.8	0.5

CHART 3

SOLD, RESERVED AND UNSOLD APARTMENTS IN 2010 BY APARTMENT TYPE
(in %)

Unsold   Reserved   Sold

Note: The number of rooms given does not include kitchen, hallway, bathroom and toilet. The apartment type structure is calculated using the total floor area in square metres.

varied between CZK 16.5 billion and CZK 33 billion in individual years (and was CZK 54 billion for the period as a whole, again treating duplicate data).

The database contains basic project identification data, i.e. the project name, the address, the website from which the data were sourced, the name of the developer and the name of the financing bank. Other important pieces of information include the scheduled project completion date, the number of garage spaces and the proportion of commercial space. The project structure according to the number of rooms per apartment (not including kitchen, hallway, bathroom and toilet) is also given for each development. For each of these categories the following information is presented: the number of sold, reserved[7] and unsold apartments, the average apartment size in square metres, the supply (i.e. asking) prices of unsold apartments, balcony area, etc. As Table 1 shows, the shares of the individual apartment types in projects have changed relatively little. Between 2006 and 2008 the proportion of one-room and two-room apartments decreased and the proportion of larger apartments increased. In 2009 this trend reversed, and in 2010, for example, there

were hardly any apartments with five rooms or more in the database. Chart 3 shows that in 2010 there was quite a strong negative correlation between the number of rooms per apartment and the percentage of apartments sold, so the decline in the share of large apartments may reflect some reaction of the apartment supply structure to changes in demand. It is clear from the chart that the apartment size structure of property development projects can be a significant factor of sales success.

Another important characteristic of the projects in the database is their price. Generally, a higher price should ceteris paribus increase the developer's revenues and profit, but on the other hand it reduces demand for projects and therefore increases the time to sell. Chart 4 shows that the supply prices of new apartments in the database in individual years were 23.4% higher on average than the supply prices of older apartments, 33.8% higher than the actual transaction prices of older apartments and more than double the "cost" prices of apartments in apartment blocks (referred to by the Czech Statistical Office as the "acquisition value per dwelling").[8] The dynamics of apartment prices in the database are broadly in line

---

7   Developers often overstate the numbers of reserved apartments as a marketing trick, so in the end we did not use the data on the number of reserved apartments and instead treated them as unsold apartments.

8   However, the fact that the supply prices of property development projects were roughly twice as high as the cost ("acquisition") prices does not mean that developers had 50% profit margins. The "acquisition value per dwelling" comprises the investment costs of building a new apartment and de facto reflects purely construction costs only. It does not include the price of land or any other additional costs (design, administration, marketing). The profit margins achieved in reality are therefore lower. According to information from developers themselves (published at the start of 2011), margins were squeezed to a minimum. This information, however, is difficult to verify.

COMPARISON OF AVERAGE APARTMENT PRICE IN DATABASE WITH OTHER DATA SOURCES
(average price in CZK thous./m² on left-hand scale; year-on-year growth in average price in % on right-hand scale)

Database
CZSO – supply prices
CZSO – transfer prices
CZSO – cost prices
y-o-y database
y-o-y CZSO supply prices
y-o-y CZSO transfer prices
y-o-y CZSO cost prices

Source: CZSO, CTU

AVERAGE APARTMENT PRICE IN DATABASE IN CZK THOUSANDS PER SQUARE METRE BY APARTMENT SIZE

2006
2007
2008
2009
2010

Source: CTU

with those of market prices of older apartments. Prices of used apartments fell faster in 2009 (i.e. developers were unwilling to respond to the reduced demand by cutting their prices), whereas prices of new apartments fell faster in 2010. In our analysis, we compared the prices of individual projects with supply prices of older apartments[9] in the same locality and used this "relative" price as an explanatory variable. This should filter out the heterogeneity of prices across different administrative districts in Prague. The fact that growth in cost prices was higher than growth in supply prices of new apartments in 2009 also suggests cost pressure on developers' profits.

Chart 5 shows the link between the aforementioned apartment size structure and apartment prices. For most of the period smaller apartments were cheaper than larger ones (although this did not apply in 2008–2009, when prices per square metre were similar across all types of apartments). The hypothesis that there is a U-shaped relationship between the price per square metre and apartment size is not really confirmed here. According to this hypothesis, the unit price of a small apartment should more strongly reflect the fixed costs (main entrance, bathroom, kitchen, etc.), which are similar for all apartments regardless of their size, while very

large apartments are more luxurious and more expensive. The chart also shows that prices of small apartments reacted far more strongly than those of larger apartments during the 2009–2010 financial crisis (one-room apartments fell in price by more than 30%, four-room apartments by 9.5% and five-room apartments by 6.6%). This indicates stronger price elasticity of demand in this segment of the market and also helps to explain the better sales rate recorded for small apartments (see Chart 3).

3. SALES PROGRESS S-CURVE ESTIMATES

To follow progress with sales we estimated so-called "sales progress S-curves". S-curves are used in a whole range of fields to track the evolution of various processes or projects over time. They have been applied, for example, in hydrology (Brutsaert, 2005). In economics they have been used in project management (Forster, 1986; Barraza et al., 2004) and in the study of innovation cycles and R&D (Brown, 1992; Mann, 1999). To the best of our knowledge, however, they have never before been used to analyse the property market.[10] The meaning of the S-curves is illustrated in Chart 6, which plots the developer's cash flow over time

---

9   These apartment supply prices in the individual districts of Prague were sourced from data published regularly by Václav Dolanský in the weekly Realit (see Dolanský, 2011). These data are also the primary source for the apartment supply prices published by the CZSO.

10   For the purposes of this article, the S-curves were estimated using the normal cumulative distribution curve; however, we obtained similar results for other curves of similar shape (for example the logistic distribution).

in relation to the shape of the aforementioned S-curves (excluding project financing costs). *"T"* in Chart 6 denotes the time of completion of apartments in the development. The costs/revenues per apartment, which, for the sake of simplicity, are normalised to the cost prices per apartment (the "apartment acquisition price"), are shown on the vertical axis. The developer's costs also take the form of an S-curve (plotted in blue in Chart 6), although this curve is to the left of the sales progress S-curve. This is because the bulk of the costs are associated with actual apartment construction and the developer's post-completion costs (consisting de facto solely of necessary maintenance and marketing costs) are marginal. Moreover, the developer incurs a large proportion of its costs before starting the construction and sale of the apartments (land purchase, project costs, administrative costs associated with obtaining building permits, etc.). At each moment in time, the project revenues (the red curve) are given by the product of the chosen value on the S-curve and the corresponding progress with sales (denoted in Chart 6 as $S(t;p)$; the value – ranging between 0 and 100% – corresponds to the ratio of the number of apartments sold to the total number of apartments in the development) and the normalised apartment price. For high t (t tending to infinity), the value of revenues is given by the price per apartment p. The developers' revenues must be higher than its costs (thanks to normalisation the latter are equal to 1 for high t), i.e. the normalised apartment price must be higher than 1; otherwise the project cannot

be profitable and will never be implemented. As the revenue curve for low t lies below (or to the right of) the cost curve, the project generates negative cash flow in its initial phases, which needs to be financed (either from the developer's own funds or, for example, by a bank loan). The total financing need is given by the grey area in Chart 6. If the sales progress S-curve shifts to the right (the revenue curve for this case is plotted in green in Chart 6), the financing need increases. This, in turn, increases the costs of the development (either the direct financial costs in the case of bank loan financing or the opportunity costs in the case of financing from the developer's own funds).

The developer can react to the negative situation by cutting the cost to p_1. This would shift the sales progress S-curve to the left towards its original shape and would in all probability reduce the financing need. On the other hand, however, the revenue curve for high t would be shifted downwards (indicated in Chart 6 by the purple curve). This would reduce the developer's profit. If the project is at the early stages of construction, the developer can also try to react by postponing completion of the project, which could shift the cost S-curve to the right (not shown in Chart 6). This will reduce the financing need, but on the other hand it transfers the financial costs to the developer's clients who have already purchased apartments in the project. This, in turn, could reduce the developer's credibility and negatively affect progress with sales in the future.

CHART 6

APARTMENT SALE S-CURVES AND FINANCING NEED OF PROPERTY DEVELOPMENT PROJECTS
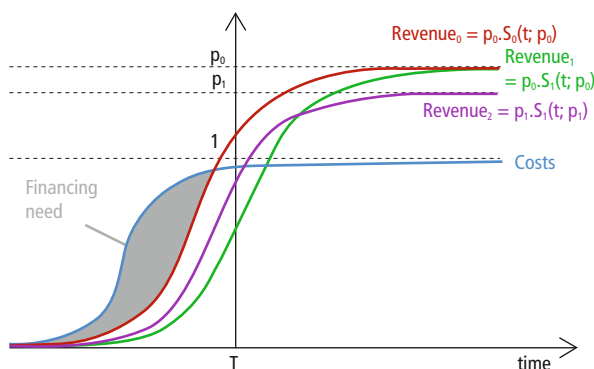
CHART 7

ILLUSTRATION OF S-CURVE ESTIMATION METHOD
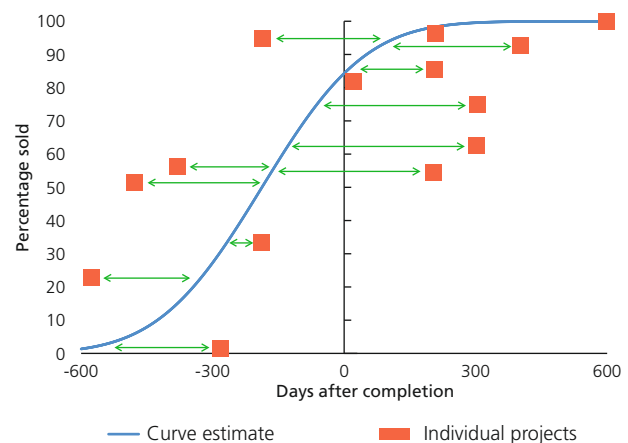
AN ANALYSIS OF PROGRESS WITH
THE SALE OF RESIDENTIAL DEVELOPMENTS

The method used to estimate the sales progress S-curves is illustrated in Chart 7. For each project in each year, we first of all calculate the number of days after project completion as the difference between the current date and the scheduled project completion date.[11] Similarly, we compute the percentage of apartments sold in the given project in the given year, and the combination of the two values is then plotted on the chart for each project (the individual projects are represented in the chart by red points). The sales progress S-curve is then fitted to the resulting points in such a way as to minimise the sum of the squares of the horizontal distances of the individual points from the curve (the green arrows in Chart 7).[12] In the cumulative normal distribution case used, the optimisation parameters are the mean and the standard deviation. In this way it is possible to estimate the sales progress S-curves both for the entire period of 2006–2010 and for the individual years. Unfortunately, however, owing to the limited number of realisations for individual projects, it is impossible to meaningfully fit sales progress S-curves for individual projects (see footnote 3) – the estimates would make sense for only 11 out of the total of 139 projects.

The estimated S-curves for the individual years and for the entire period of 2006–2010 are presented together with their parameters in Chart 8 and in Table 2. These estimated curves allow us to quickly assess the residential development market situation in each year. The residential development market situation is better for S-curves that are further to the left, i.e. that have a lower estimated mean (this indicates when the most apartments in the project have been sold; for the projects in the database the estimated mean was negative, i.e. most of the development was sold before project completion). A similar indicator is the percentage of apartments sold before project completion (the intersection of the estimated S-curve with the y-axis). Developers prefer the sales progress S-curve with the highest such percentage. Consequently (given the negative mean), sales curves with a lower standard deviation are preferred – with a higher standard deviation the percentage of apartments sold well before project completion is higher, but fewer apartments have been sold as of the project completion date. The normalised deviation of the actual value from the estimated S-curve (the last row of Table 2) shows the average distance of the individual project points from the S-curve and therefore reflects the representativeness of the estimated S-curve in the given year.

CHART 8

ESTIMATED S-CURVES
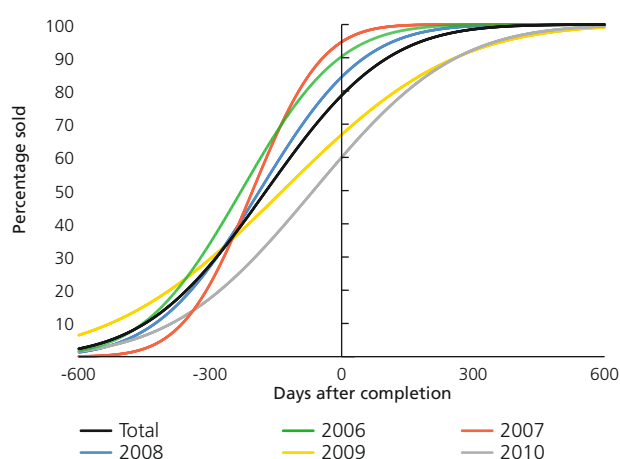
TABLE 2

PARAMETERS OF ESTIMATED S-CURVES

	2006	2007	2008	2009	2010	Whole period 2006–2010
Sold before completion (in %)	90.4	94.8	84.3	66.9	60.1	78.7
Mean of distribution (days)	-229	-203	-188	-134	-65	-172
Std. dev. of distribution (days)	176	125	186	307	253	216
No. of projects	59	49	29	45	40	222
Normalised deviation of actual situation from estimated curve (days)	29.4	33.6	72.9	44.5	64.4	21.7

---

11 In cases where the project completion date was shifted to a later date between two observations, we used the original scheduled project completion date.
12 We therefore minimise the sum of the squares of the difference between the monitored number of days until apartment completion and the "projected" number of days until project completion. The tracked sales percentage is inserted into the inverse function of the cumulative normal distribution (the value of the inverse function of the normal distribution here shows the phase the project would be in if it was going exactly according to the estimated curve). This calculation method, however, means that observations with zero or 100% sales, for which the inverse function is not defined, have to be excluded. The alternative would be to fit the S-curve by minimising the vertical distances from the S-curve (as was done, for example in CNB, 2010, p. 54), but this is more difficult to interpret economically.

The favourable property market situation in 2007 was reflected in a rise in the estimated percentage of apartments sold at project completion to almost 95%. However, in 2008, when supply prices of older apartments were still rising, most of the parameters of the estimated S-curve worsened. In 2009 and 2010, by which time the financial crisis was being reflected in falling prices of apartments, the S-curve parameters deteriorated further. In 2010, the majority of the S-curve parameters were at their worst levels since 2006 – the mean of the distribution, at -65 days, was less than one-third of the 2006 value in absolute terms, the standard deviation, at 253.4 days, was the second-highest after 2009, and the proportion of apartments sold before project completion was the lowest since 2006 (60% compared to a peak of 95%). The high deviation of projects actually implemented from the estimated curve indicates quite significant differentiation across projects, with the deterioration in the parameters of the estimated S-curve being driven by several projects that are not progressing as well as the rest.

4. DETERMINANTS OF PROGRESS WITH THE SALE OF APARTMENTS

Given that the deviations of individual projects from the sales progress S-curves are quite large (see Table 2), one can ask whether the relative success rates of individual products can be explained by their fundamentals. This section tries to identify such determinants using simple econometric methods.

As the dependent variable we consider the number of days a given project is "in front of" or "behind" the estimated S-curve. For points (projects) to the left of the estimated S-curve (see Chart 7), the dependent variable is therefore positive and corresponds to the horizontal distance from the S-curve, whereas for points to the right of this curve its value is negative. Hence, the higher the dependent variable, the more successful the project. As we are seeking the determinants of the "relative quality" of property development projects for the entire period of 2006–2010, the dependent variable is given by the horizontal distance of the point of a given project from the "Total" curve in

Chart 8. Alternatively, we could construct the dependent variable on the basis of the deviation of the project from the S-curve estimated for each year and then estimate the five regression equations for each year separately and compare their estimated coefficients.

The explanatory variables considered for the individual projects (see Table 3) include the *relative price*, expressed as the ratio of the price asked per square metre in the project to the supply price of older apartments in the same locality (for a demand curve of the standard shape, a higher relative price should lead to slower progress with sales and its coefficient should be negative). The supply prices of older apartments should reflect the specific conditions in the locality ("more expensive city centre versus cheaper suburb"). By normalising the price of a given project to the price of older apartments, we should therefore at least partially adjust the price of the project for such effects. Given the result in Chart 3, we can expect a negative coefficient on *apartment size* in square metres of floor area, i.e. projects with a higher proportion of larger apartments should be harder to sell. Given the aforementioned U-shaped relationship between the price per square metre and the apartment size, the square of apartment size was also included in the regression analysis. The other explanatory variables include indicators of the development's amenities outside the apartments themselves, such as the number of *garage spaces per apartment*, the *average balcony area* and the *proportion of commercial space in the project*. A positive dependence is predicted for all these variables. Only for the proportion of commercial space was its square included (with the expected negative sign). Non-linear dependence of sales progress on the proportion of commercial space might be given by the fact that while a small proportion of commercial space can enhance residents' quality of living, an excessively large proportion can make it worse. The variables that are correlated with *apartment size* include the *shares of individual apartment types in the total floor area* of the development (one-room apartments, two-room apartments, three-room apartments and apartments with more than three rooms). The final set of variables consisted of *dummy variables for individual years*, which allow us, among other things, to observe the specific demand situation in individual years.[13]

---

13 Alternatively, we could have included macroeconomic and demographic variables that influence the demand for dwellings (see, for example, Hlaváček and Komárek, 2010, or Hlaváček and Komárek, 2011, who examine the determinants of prices of used apartments). However, the outcome of the analysis is no better than for the simple inclusion of dummy variables. The factors underlying the low dummy variables for 2009 and 2010 are linked with the financial crisis and are given primarily by lower wage growth, higher unemployment, fewer vacancies and lower population growth (both natural growth and growth due to migration).

TABLE 3

ANALYSIS OF DEVIATIONS OF INDIVIDUAL PROJECTS FROM ESTIMATED SALES PROGRESS S-CURVE

	Regression A		Regression B		Regression C		Stepwise regression	
	Coefficient	P-stat	Coefficient	P-stat	Coefficient	P-stat	Coefficient	P-stat
Relative price	1.404	0.04	1.150	0.10	1.284	0.05	1.344	0.01
Apartment size (m²)	1.628	0.65	-	-	-0.582	0.80	-	-
Size squared	-0.0356	0.14	-	-	-0.0218	0.14	-0.02482	0.00
Garage spaces per apartment	89.9	0.08	46.0	0.30	83.2	0.06	89.2	0.04
Percentage commercial space	-0.913	0.52	-1.969	0.21	-0.955	0.53	-1.077	0.03
Commercial space squared	-0.00071	0.89	0.00301	0.63	-0.00083	0.89	-	-
Area of balcony	6.68	0.07	4.29	0.11	6.85	0.01	6.52	0.01
Share of one-room apartments	-0.996	0.58	1.779	0.22	-	-	-	-
Share of two-room apartments	-1.882	0.28	-0.07358	0.96	-	-	-1.232	0.27
Share of three-room apartments	-1.859	0.30	-2.125	0.22	-	-	-1.118	0.43
Dummy 2006	-3.61	0.98	-121.4	0.34	-53.70	0.65	-	-
Dummy 2007	40.9	0.72	-79.8	0.52	-4.6	0.97	38.7	0.46
Dummy 2008	5.69	0.96	-139.5	0.29	-44.68	0.71	-	-
Dummy 2009	-144.9	0.22	-265.9	0.04	-190.6	0.11	-144.5	0.01
Dummy 2010	-200.8	0.11	-302.1	0.02	-249.4	0.04	-200.0	0.00
R-squared	0.20		0.13		0.19		0.19	
Adjusted R²	0.14		0.08		0.15		0.16	
S.E. of regression	300.0		310.9		298.9		296.8	
Durbin-Watson statistic	1.65		1.54		1.64		1.65	

Note: Variables significant at least at 15% level are highlighted in yellow.

Although the microeconomic nature of the underlying database might entice us to use panel regression methods, the nature of the underlying data (the low number of realisations for individual projects) unfortunately prevents us from using such methods. For our analysis, therefore, we used very simple OLS regression. Given the relatively strong correlation between apartment size and the shares of individual apartment types, the regression analysis was estimated in four variants. First, a wide spectrum of explanatory variables was included in the regression (Regression A in Table 3). Subsequently, variables related to apartment size (Regression B) and variables related to apartment type (Regression C) were excluded. The fourth variant was "Stepwise regression", where variables with low significance were automatically excluded from the list of variables.

The overall regression results are less than convincing ($R^2 < 0.2$; the lowest quality regression was Regression B, which excluded apartment size). The relative success of property development projects evidently depends on factors that do not figure among our chosen explanatory variables. These might include, for example, the layout of the development, the quality of the materials used, the effectiveness of marketing campaigns, the proportion of parkland in the locality, neighbouring properties and noise

levels. These factors may also explain why the sign on the relative price is opposite than expected and statistically significant.[14] The developer is probably aware of the worse measurable quality of its development and is reflecting this in the prices of apartments, hence the apartment price at least partially allows these unobserved factors to be captured.

Of the variables linked with apartment size (the apartment size itself, the square thereof, and the apartment type structure), the square of apartment size turned out to be statistically significant with the expected sign. However, the hypothesis of a U-shaped relationship was not confirmed. The shares of apartments broken down into various sizes were not significant. The number of garage spaces per apartment and the balcony area per apartment proved to be significant with the expected signs.

Of the dummy variables, those for 2009 and 2010 were significant and their signs confirmed the preliminary results of Chart 8 and Table 2 regarding a significant deterioration in progress with sales in these years. The question is whether this deterioration reflects a shift towards the internationally more common practice whereby apartments are not usually sold until after completion and whether, therefore, the situation in previous years was unusually favourable for developers. However, the authors are not aware of any comparable studies in other countries. In addition, it is important to take into account different institutional conditions. In Germany and Austria, for example, municipalities are much more active in housing development, whereas in the Czech Republic such development goes on almost exclusively on a purely commercial basis (see Prostějovská, 2010).

5. CONCLUSION

This article analysed progress with the sale of property developments in Prague. The property development sector has become significant in recent years thanks to its contribution to the renewal of apartment construction and to its increasing share in total bank loans. It has thus become another channel of transmission of property prices to credit risk.

The article uses a unique database of property development projects available for the years 2006–2010. Between 2006 and 2008, the proportion of one-room and two-room apartments in this database decreased, but since 2009 the share of small apartments has been rising. This is probably connected with the negative link between apartment size and saleability. The decline in the share of larger apartments may be a reaction by developers to changes in the structure of demand. It is also interesting to note that for most of the period smaller apartments were cheaper than larger ones and that during the 2009–2010 financial crisis prices of these apartments fell faster than those of larger apartments. This suggests stronger price elasticity of demand in this segment of the market.

Overall, the supply prices of new apartments in the database were 23.4% higher on average than the supply prices of older apartments, 33.8% higher than the actual transaction prices of older apartments and more than double the "cost" prices of apartments. The dynamics of apartment prices in the database are broadly in line with those of market prices of older apartments. By comparison with used apartments, the decline in prices of new apartments was smaller in 2009 and larger in 2010, suggesting some stickiness in the price reaction of developers.

A large part of the article was devoted to estimating sales progress S-curves using the cumulative normal distribution. The estimated curves indicate a relatively good situation in 2006 and 2007 (high percentages of apartments sold at project completion, and a low mean and standard deviation of the distribution). In 2008, however, most of the parameters of the estimated S-curves deteriorated sharply. In 2010, the majority of these parameters were at their worst levels since 2006 – the mean of the distribution, at -65 days, was less than one-third of the 2006 value in absolute terms, the standard deviation, at 253.4 days, was the second-highest after 2009, and the proportion of apartments sold before project completion was the lowest since 2006 (60% compared to a peak of 95%). The high deviation of the actual projects from the estimated curve indicates quite significant differentiation across projects.

---

14 As mentioned earlier, the relative price should be at least partially adjusted for the specifics of the locality, as it is calculated as the ratio of the project price to the supply price of existing apartments in the same locality. The supply prices of older apartments, however, are available broken down by main city districts or land registry districts only, and the quality of dwellings can differ considerably across such districts.

In the final section, we estimated an econometric model of the determinants of deviations of progress with the sale of individual projects from the estimated S-curve for the entire period of 2006–2010. The overall regression results are less than impressive, indicating that the relative success of property development projects evidently depends on factors that do not figure among our explanatory variables. The exclusion of these often difficult-to-measure variables probably explains why the relative price of the project was statistically significant with the opposite sign than expected. This may be due to the fact that the supply price at least partially reflects these hidden factors. This result may also explain the unwillingness of developers to react to reduced demand by cutting their prices. A price cut would do little to improve sales (at least according to the results of our model). What is more, for individual developers it might have a stigmatising effect and further worsen their situation.

Of the other project-related variables included, the apartment size, the number of garage spaces per apartment and the balcony area per apartment turned out to be statistically significant, in all cases with the expected signs. The coefficients on the dummy variables reflecting the specific situation in individual years confirms the results regarding a significant deterioration in progress with sales in 2009 and 2010.

Overall, our analysis revealed a sharp deterioration in the situation of developers in 2009–2010, due mainly to a sharp fall in demand. Developers' ability to respond in this situation was very limited and, in addition to the aforementioned relatively sharp cuts in prices of existing projects, included a significant reduction of new projects and a change in the supply structure in favour of smaller apartments. Sales of apartments in already completed developments will probably get a one-off boost over the next two years by a planned increase in VAT on new apartments[15] (households will try to speed up apartment purchases so that they pay the lower rate). However, sales will fall again once the higher VAT rate has been introduced. In the longer term, progress with sales will be determined by factors other than changes to VAT (the macroeconomic situation, demographic trends, etc.).

REFERENCES

BARRAZA, G. A., BACK, W. E., MATA, F. (2004): *Probabilistic Forecasting of Project Performance Using Stochastic S Curves*, Journal of Construction Engineering and Management 130(25), pp. 25–32.

BROWN, R. (1992): *Managing the "S" Curves of Innovation*, Journal of Business & Industrial Marketing 7(3), pp. 41–52.

BRUTSAERT, W. (2005): *Hydrology*, Cambridge University Press, New York.

ČÁPOVÁ, D. (2005): *Realitní bubliny v Praze (pohled z opačné strany)*, Stavebnictví a interiér 11/2005, pp. 10–11.

CNB (2010): *Financial Stability Report 2009/2010*, Czech National Bank.

DOLANSKÝ, V. (2011): *Indexy cen bytů v pražské aglomeraci*, Realit 18, 1–2/2011.

FORSTER, R. N. (1986): *Innovation: The Attacker's Advantage*, Summit Books, New York.

HLAVÁČEK, M., KOMÁREK, L. (2010): *Housing Price Bubbles and Their Determinants in the Czech Republic and its Regions*, CNB Working Paper 12/2009.

HLAVÁČEK, M., KOMÁREK, L. (2011): *Regional Analysis of Housing Price Bubbles and their Determinants in the Czech Republic*, Czech Journal of Economics and Finance 61, pp. 1–2.

KOREC, E. (2010): *Realitní statistiky: jediný objektivní nástroj mapování trhu*, presentation given at a meeting of the magazine Stavební fórum on 7 October 2010, http://www.stavebni-forum.cz/.

MANN, D. (1999): *Using S-curves and Trends of Evolution in R&D Strategy Planning*, TRIZ Journal, July 1999.

PROSTĚJOVSKÁ, Z. (2010): *Specifika trhu s novými byty v hl. m. Praze*, CTU Prague, Habilitační přednášky 22/2010.

---

15 The lower VAT rate is currently expected to go up gradually from the current 10% to 17.5%.

RETAIL CREDIT PREMIUMS AND MACROECONOMIC DEVELOPMENTS

Jan Brůha[♦]

This article sets out to contribute to the understanding of the dynamics of retail credit premiums (i.e. the difference between reference interest rates and rates on retail loans with comparable maturities) in the Czech economy. The text documents the history of the credit premium. A model that investigates the relationship between this premium and the business cycle is then proposed, and it is shown that the current premium level can be explained to a large extent by the cyclical position of the economy. This model can be used not only as a tool for explaining the observed premium, but also to forecast the future premium, as it is linked to the variables used in the CNB's core forecasting model.

1. MOTIVATION

Money market interest rates started to fall at the start of 2009, while retail rates on loans provided by banks to households and non-financial corporations were either flat or falling more slowly than money market rates. This sparked interest in the analysis of the retail credit premium, i.e. the difference between reference interest rates (money market interest rates for the purposes of this text, and IRS rates for longer horizons) and rates on retail loans with comparable maturities. There are numerous reasons for paying attention to credit premiums.

First, the credit premium is an important part of the monetary policy transmission mechanism, which can be characterised as follows: monetary policy rate → money market rates → retail rates.[1] As the credit premium has been growing since 2009, questions are being asked about how sensitive the second link in the transmission mechanism, i.e. from money market rates to retail rates, is to the current business cycle.

Second, the retail credit premium is connected to financial stability for several reasons. The size of the client premium, for example, affects bank profits, and modelling bank profits is a key element of stress testing. Consequently, it is vital to understand the dynamics of the retail credit premium, i.e. whether it reflects changes in loan risk over the business cycle or one-off factors such as a frozen credit channel or institutional rigidities. These different explanations can have different implications for the estimation of investment risk and bank profits.[2]

Third, in both the academic literature and central banking practice, attention is devoted to whether financial variables (interest rates and their spreads, and aggregate statistics on financial variables such as NPLs or corporate financial indicators) have non-trivial predictive power for macroeconomic aggregates (economic activity and inflation). If they do, the toolkit used in central banks for short-term forecasting can be expanded.

However, the empirical relationship between macroeconomic and financial variables also has implications for macroeconomic models with a financial sector. This is because the different theoretical mechanisms describing the interaction between macroeconomic dynamics and the financial sector generally have different empirical implications regarding the forecastability of macroeconomic aggregates using financial variables. As macroeconomic models with a financial sector are starting to become very popular in central banks and economic policy-making institutions, it is important to have a tool for assessing these competing mechanisms. These competing mechanisms can have different implications for the desirable monetary policy settings, which should take into account interactions between the real economy and the financial sector, and for financial stability.

That there is (currently) no consensus on how to model macro-financial mechanisms correctly can be illustrated by the fact that different authors attach different levels of importance to different mechanisms in the interaction between macroeconomic dynamics and the financial system. One section of the literature concentrates on

1 This is because most economic agents (households and firms) do not come into direct contact with the interest rates of the monetary authority or with the money market, but do come into contact with the interest rates of commercial banks.
2 Gambacorta (2009) argues that a low interest rate environment can cause an increase in investors' risk-taking for the following possible reasons: money illusion of the part of investors, the use of nominal returns in management decision-making, or increasing collateral values.

the "demand" side, whereas Adrian et al. (2010), for example, argue in favour of "supply-side" effects. The uncertainty regarding the correct modelling of these interactions can also be illustrated by the evolution of the work of individual authors; for example, in a series of articles Woodford and Curdia (2009a,b; 2010) investigate the spreads between deposit and loan rates. This series of articles demonstrates the evolution of their model, with its different empirical implications and therefore also different economic policy implications. This implies that further knowledge in this field will be vital for normative assessment of monetary and macroprudential policy, especially at times of economic and financial instability.

Fourth, attention must be devoted not only to the question of whether financial variables can contribute to macroeconomic forecasting, but also to the related question of whether macroeconomic developments can contribute to the forecasting of selected aggregate financial variables. In this article, attention will be focused on non-performing loans (NPLs). If it turns out that macroeconomic developments can predict future NPL dynamics, this will have a clear significance for financial stability, as it may facilitate more accurate construction of stress tests scenarios.

This article contributes to the debate by explaining the factors underlying the retail credit premium on the basis of macroeconomic dynamics. It also examines whether the premium can contribute to the forecasting of macroeconomic variables (economic activity and inflation) or variables relevant to financial stability (e.g. NPLs).

The retail credit premium is investigated for the following types of loans: loans to households for house purchase, loans to non-financial corporations of up to CZK 30 million ("small corporate loans") and loans to non-financial corporations of over CZK 30 million ("large corporate loans"). Consumer credit is not analysed, as its credit premium is far higher than those for the aforementioned three types of loan and displays low sensitivity to the business cycle. It can also be argued that consumer credit does not play such an important role in economic activity as loans to non-financial corporations and loans for house purchase (consumer loans account for around one-fifth of all loans to households).

The article is structured as follows. Section 2 defines the theoretical framework of the analysis. Section 3 describes the data and the econometric model used to analyse the relationship between macroeconomic dynamics and credit premiums. The final section concludes.

2. THEORETICAL FRAMEWORK

The theoretical framework of the credit premium model is characterised by the following three properties.

First, the model compares interest rates of comparable maturities and therefore allows us to derive the retail credit premium directly. This contrasts with some earlier studies, whether applied to the Czech Republic or applied to other countries, which compare interest rates on retail loans with a rate fixation of more than one year with money market rates. Such studies therefore implicitly confuse retail credit premiums with changes in the slope of the yield curve. This means, however, that when the financial market is expecting long-term interest rates to fall (rise), such studies overstate (understate) the retail credit premium.[3] Second, the empirical model used is derived directly from asset pricing theory, which means that the results are easy to interpret structurally. Third, the model is formulated in stock form, which allows us, among other things, to conduct a historical decomposition of shocks, to make an estimate that is robust to high-frequency noise, and to formulate (conditional) forecasts.

Finally, another important factor is the existence of risk. The risks of the money market and IRS market are very low compared to those of retail loans and often have the character of operational risks, which are not closely linked to the business cycle. In the case of retail loans, by contrast, the risk is higher and its cycle can be expected to

---

3 This is the case with Horváth and Podpiera (2009), who analyse the pass-through from money market interest rates to bank interest rates using Czech data. However, there are also studies which work explicitly with the time structure of interest rates. For example, an interesting study by Banerjee et al. (2010) examines the effect of money market rates on retail rates in a theoretical model in which financial intermediaries incur fixed menu costs if they change the retail rate. This implies that there will be occasional changes in the retail rate and the timing of these changes will depend not only on the current difference between the retail rate and the reference rate, but also on expectations about future changes in the reference rate. The authors then use this theoretical model to construct an error correction model and show that pass-through is underestimated if expected future money market rates are neglected.

be closely linked to the business cycle. Consequently, it is not unreasonable to assume that the dynamics of the client premium can be explained by the change in the risk level of loans over the business cycle. Unfortunately, few studies have analysed this relationship in any detail.

In this article, the relationship between the retail credit premium and macroeconomic risk is analysed using the arbitrage theory of asset pricing. Let us formally describe the implications of this theory. Let y_t^k be the retail rate at time t with maturity (or fixation) k. The theory then implies (see, for example, Cochrane, 2001) that if there are no arbitrage opportunities in the markets:

$$y_t^k = -k^{-1} \log E_t \, [exp(m_t^{t+k}) \, / \, exp(\pi_t)] \qquad (1)$$

where E_t is the mean conditional on the information at time t, m_t^{t+k} is the rate of intertemporal substitution of a representative investor, and π_t is the objective level of risk of a financial contract. The risk-free interest rate is given (if we set $\pi_t = 0$) by: $i_t^k = -k^{-1} \log E_t \, [exp(m_t^{t+k})]$. If we adopt the usual assumption that the rate of intertemporal substitution is log-normally distributed and if we make the same assumption about the risk π_t, the retail credit premium can be written in the form:

$$y_t^k - i_t^k = k^{-1} \left[\left(E_t \pi_t + \frac{1}{2} V_t \pi_t \right) + COV_t(\pi_t, m_t^{t+k}) \right]. \qquad (2)$$

where V_t and COV_t are, respectively, the conditional variance and conditional covariance between the risk and the rate of intertemporal substitution. This equation has a clear interpretation: it says that the credit premium can be split into two parts, the first part measuring the objective risk and its variance, and the second pricing that risk. Given that in a typical market economy both the risk and the rate of intertemporal substitution are countercyclical (e.g. Cochrane and Piazzesi, 2005), we can expect the covariance between the risk and the rate

of substitution to be positive. This means that at times of recession the market demands a higher premium for risky instruments.

There are several ways of applying the aforementioned relation for data analysis. One way is to derive an assumption about the dynamics of intertemporal substitution and risk. One can then derive the yield curve for risk-free instruments as well as for risky retail loans. This approach is theoretically advantageous, since it allows us to test both the yield curve and the retail credit premium model.

From the empirical perspective, however, this approach is less advantageous, since an erroneous yield curve model can render analysis of the retail credit premium worthless.[4] In this article, therefore, we use a model in which the credit premium is tested separately for different instruments and maturities/rate fixations. The empirical model derived from the aforementioned relation is presented in section 3.2. This model will then be used to analyse the retail credit premium.

3. DATA AND ECONOMETRIC MODEL

3.1 Data

Data from the ARAD time series database are used to formulate and estimate the model. This database contains, among other things, retail interest rates on new business at monthly frequency from January 2004 to the present, which are used in the analysis. This determines the time frame of the analysis. The following retail rates are investigated in the model: loans for house purchase (with a rate fixation of up to 1 year, 1–5 years and 5–10 years) and loans to corporations (small loans of up to CZK 30 million and large loans of over CZK 30 million) with similar maturities.

---

4   This is important given that there is no generally accepted yield curve model for macroeconomic analyses. For example, the model proposed in Ang and Piazzesi (2003) is convincingly criticised by Atkeson and Kehoe (2008). Similarly, the Nelson-Siegel (1987) model, popular among financial market practitioners, has the unfortunate property that arbitrage cannot be excluded.

FIGURE 1

RETAIL CREDIT PREMIUM FOR LOANS WITH A RATE FIXATION OF LESS THAN 1 YEAR

a) Interest rates
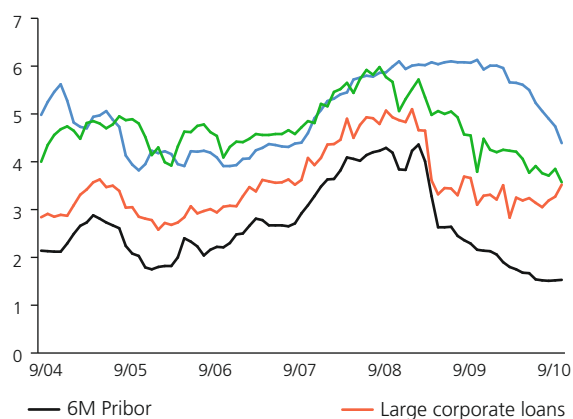
b) Spreads vis-à-vis 6M Pribor

Source: ARAD
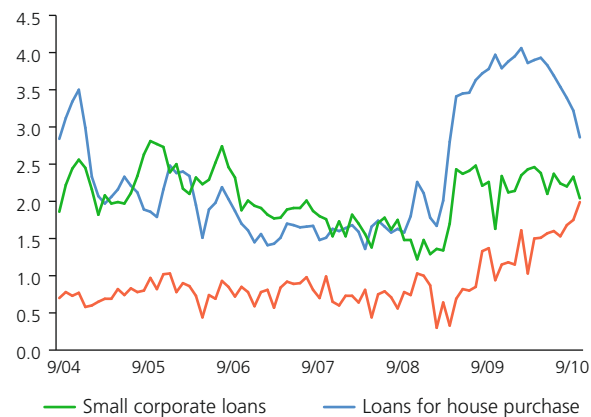
The figure shows that the retail credit premium for loans for house purchase reached a historical high of four percentage points in the second half of 2009. This is a rather higher value than in 2004, when it reached 3.5 p.p. Since the start of 2010, however, this premium has been falling. Since 2008, the premium for small corporate loans has been below the historical highs recorded in 2005 and 2006. In mid-2009, the premium for large corporate loans exceeded 1 p.p., which is higher than in pre-2009 period, when it was below 1 p.p.

FIGURE 2

RETAIL CREDIT PREMIUM FOR LOANS WITH A RATE FIXATION OF 1–5 YEARS

a) Interest rates
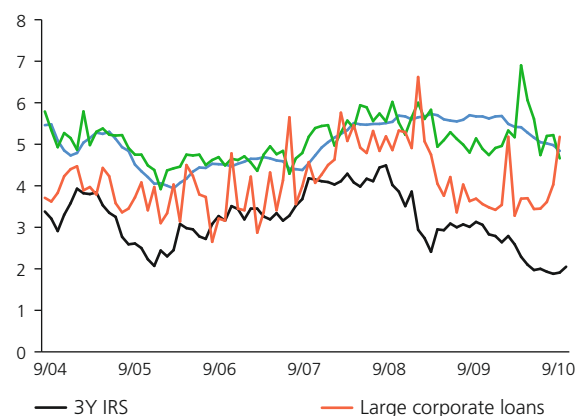
b) Spreads vis-à-vis 6M Pribor
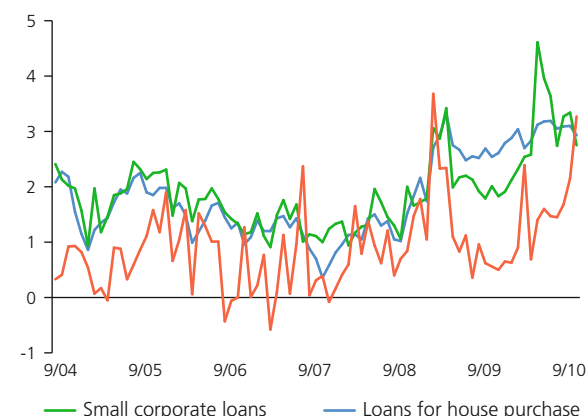
Source: ARAD

RETAIL CREDIT PREMIUM FOR LOANS WITH A RATE FIXATION OF MORE THAN 5 YEARS

a) Interest rates
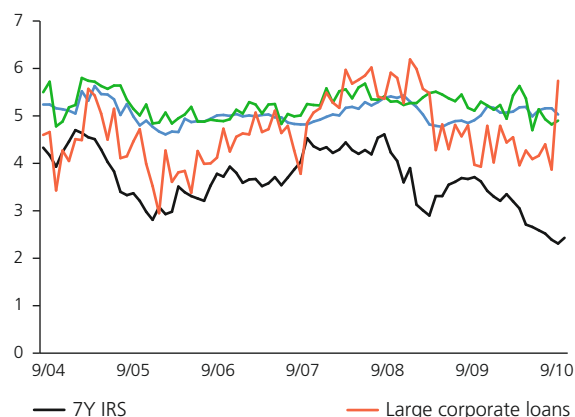
b) Spreads vis-à-vis 6M Pribor
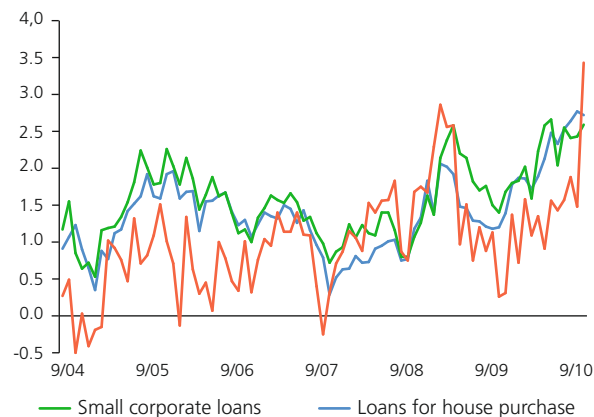
Source: ARAD

The retail credit premium for loans with a rate fixation of 1–5 years reached historical highs during the financial crisis in the cases of loans for house purchase and small corporate loans. In the case of large corporate loans, it did not show unusual values; it reached its historical maximum (above 3 p.p.) at the end of 2008 and fell back to its usual values of around 1 p.p. in the first half of 2009.

The retail credit premium for loans with a rate fixation of more than 5 years showed a similar pattern at the start of the crisis as that for loans with a rate fixation of 1–5 years. The premium increased in late 2008 and fell in the first half of 2009. In the case of large corporate loans, this premium then returned to its usual values, whereas for the remaining two types of loans it started to rise at the end of 2009 and is currently at historical highs.

As the economic crisis also implies a higher loan default risk, I focus on explaining this premium by means of growth in the risk level of loans in relation to the macroeconomic cycle. To do so, I use the following data: macroeconomic series (inflation, unemployment and industrial production) and the non-performing loan (NPL) ratio. These time series are available from the ARAD database.

It is difficult to find a suitable variable that reliably reflects the level of risk of the individual loan types. The NPL ratio is not an optimal risk measure itself, because it is backward-looking, whereas it is reasonable to assume that financial intermediaries will tend to consider present or future risk when setting credit premiums. For this reason, the following variable π_{it} is derived from the NPLs using the methodology proposed in Geršl and Seidler (2010):

$$\pi_{i,t+1} = NPL_{i,t+1} - (1 - a)NPL_{it} \qquad (3)$$

where a is an NPL outflow parameter. This parameter is set at 0.15 as recommended in Geršl and Seidler (2010).

3.2 Econometric model

The theoretical model is used to construct a model in a stock form for explaining the retail credit premium. The retail credit premium is explained by means of risk, which depends on the macroeconomic dynamics. The model has the following structural form:

$$i_{t+1} = \rho_i i_t + \Lambda_i X_t + e_t^i \qquad (4)$$

$$\alpha_{t+1} = \rho_a \alpha_t + [\lambda_1 \pi_t + \lambda_2 s_t] + e_t^a \qquad (5)$$

$$\pi_{t+1} = \rho_\pi \pi_t + \Lambda_\pi X_t + e_t^\pi \qquad (6)$$

The interpretation of the equations is the following. The first stock equation says that the reference interest rate i_t depends on the macroeconomic variables X_t (matrix Λ_i transmits shocks from macroeconomic dynamics to the interest rate, so this equation can be regarded as an approximation of the monetary policy rule[5]). The second equation says that the retail credit premium α_t depends on the risk π_t and on an index of economic sentiment s_t; economic sentiment is used as a forward-looking indicator of the risk level,[6] so in other words $[\lambda_1\pi_t + \lambda_2 s_t]$ models the future level of risk. The client interest rate is then given[7] by $i_t + \alpha_t$. The third equation[8] models the pass-through of the macroeconomic variables to the risk using matrix Λ_π. All three variables also depend on their lagged values through the autoregressive terms ρ_i, ρ_α and ρ_π. These terms model the slow transmission of structural shocks to endogenous variables owing, for example, to adjustment costs, bounded rationality or the slow process of aggregating information. e_t^i, e_t^a, e_t^π are random errors with the usual assumptions of regression analysis. The macroeconomic dynamics of vector X_t are modelled using a reduced *VAR* model.

Vector X_t contains unemployment, the household economic sentiment index and inflation for the models with loans for house purchase, and industrial production, the general economic sentiment index and inflation for the models with loans to corporations. This difference is motivated by the fact that unemployment is probably a more significant risk factor for households than is industrial production.[9] We measure inflation using the consumer price index, as it is this inflation which enters equation (4), which approximates the monetary policy rule.

The aforementioned equations, together with the VAR model for the vector of macroeconomic variables X_t, are converted into a stock model with measurement noise and this model is estimated using the maximum likelihood method on the aforementioned data for nine types of retail loans at monthly frequency starting in 2004.

The model specified and estimated in this way can be used to determine the extent to which the dynamics of the retail credit premium can be explained by the business cycle.

TABLE 1

SIMULATION RESULTS

Type of loan	Rate fixation	Reference rate	Equilibrium premium (in p.p.)	Credit premium volatility (standard deviation)	Percentage of volatility explained by macro risk
Loans to households for house purchase	< 1 year	6M Pribor	2.36	0.86	88.1
	1–5 years	3Y IRS	1.80	0.74	76.0
	5–10 years	7Y IRS	1.11	0.46	49.9
Corporate loans up to CZK 30 million	< 1 year	6M Pribor	2.05	0.38	57.9
	1–5 years	3Y IRS	1.88	0.70	43.6
	5+ years	7Y IRS	1.55	0.50	30.2
Corporate loans over CZK 30 million	< 1 year	6M Pribor	0.87	0.29	13.6
	1–5 years	3Y IRS	0.33	0.54	51.7
	5+ years	7Y IRS	0.40	0.76	45.7

Source: ARAD

5   Strictly speaking, in an inflation-targeting economy, interest rates should depend on the expected values of macroeconomic variables, most notably inflation. However, equation (4) is not a structural relationship describing the monetary policy mechanism, but should be regarded as a reduced form of the monetary rule, hence the given formulation is statistically admissible.
6   The rationale for this is that the economic sentiment index is a leading indicator of NPLs, with a lead of around 12–15 months (depending on loan types). In reality, the correlation between the economic sentiment index and the NPL index lagged by 12 months is approximately 0.5 for loans to non-financial corporations and 0.9 for loans for house purchase, whereas the correlation of the present values is virtually zero for all types of loans.
7   Note that the retail credit premium depends on the other variables solely through the risk. It would be possible to formulate this equation in such a way that other macroeconomic variables also enter it, but in such case the model could not be used for the experiment described below
8   What is the difference between the equation in the description of the model (6) and equation (3) in the preceding section? Equation (3) defines the risk index (and so is not being estimated), whereas equation (6) is a behavioural relation and its parameters are being estimated.
9   We also estimated models in which matrix X_t contained all the aforementioned variables, but the empirical results were very similar to the models whose results are presented in the following text. As a result, preference was given to the more parsimonious models.

The following experiment was therefore performed. Structural shocks to the model described above were filtered out using the Kalman filter. The model was then simulated using these shocks with the exception of shocks to the client premium, which were set equal to zero. In other words, we simulated what retail credit premium the model would generate purely on the basis of macroeconomic risk.

The following table shows the results of the simulation. The table presents the equilibrium premium (i.e. the premium that would exist if the macroeconomic variables were at a steady state corresponding to their long-term averages), the premium volatility observed in the data, and the percentage of the volatility explained by the macroeconomic variables from the aforementioned experiment.

The model best explains the credit premium dynamics in the case of loans for house purchase. It shows the worst results for corporate loans of over CZK 30 million, which is the segment with the lowest equilibrium premium level. It is also clear from Charts 1–3 above that rates on large corporate loans are highly volatile and display low sensitivity to the business cycle. In fact, the premium for this type of loan (at least for a rate fixation of more than one year) did not record sustained growth during the crisis: interest rates rose at the end of 2008 and then fell back in the first half of 2009.

This result is probably due to this segment's market structure and smaller number of contracts, which means, among other things, that (1) the time series are more susceptible to outliers, and (2) banks do not want to lose major clients and so their rates display lower elasticity to current conditions. Both these factors mean intuitively that the premium will be less sensitive than for other loans and therefore less explainable by the business cycle.

3.3 Does the credit premium have forecasting potential?

As it is possible to link the macroeconomic series used in the model to the variables used in the forecasting process, it is also possible to use the model to forecast future credit premiums. However, it is also possible to ask a related question, namely whether the observed credit premiums can help us forecast the other variables in the model, i.e. the macroeconomic variables or the NPL ratio.

A whole range of studies, based on various methodologies, deal with the question of whether financial variables have predictive power for the future evolution of the economy. Probably the most cited study on the empirical side (i.e. among studies based more on statistical analysis and less on economic theory) is Stock and Watson (2003).[10] On the theoretical side we should mention Ang et al. (2006), who predict future GDP growth using a yield curve model. It is interesting that empirically oriented studies find (in the best case) a limited improvement in the predictive power of financial variables for macroeconomic dynamics, whereas the more theoretical studies find a non-trivial improvement in the forecasts. This is probably linked with the fact that restrictions based on economic theory increase the soundness and robustness of the estimates.

We conducted a comparison of the predictions of the presented model with a VAR model containing macroeconomic data only. The comparison generated interesting results. First, the presented model is relatively successful in predicting economic activity indicators (unemployment and industrial production). Second, the model has worse predictive power for inflation than the basic VAR model. This confirms the results of previous studies that interest rates can be a good variable for forecasting economic activity, but not inflation (e.g. Kotlán 1999a, 1999b).

Third, the model with the retail credit premium is able to satisfactorily predict the NPL ratio, which is used to define risk using equation (3). It turned out that compared to the simple VAR model, the credit premium model has a 20% smaller root mean square error (RMSE) of the prediction of the ratio of NPLs to house purchase loans for the 1–3 month horizon, whereas for the longer horizon (6–12 months) the RMSE is about 50% lower. The improvement in predictive power is not as great for the NPLs of non-financial corporations: 20% for the shorter horizon (1–5 months) and 30% for the longer horizon (6–12 months).

10 Havránek et al. (2010) conducted a similar analysis on Czech data.

4. CONCLUSION

This article presented a retail credit premium model that explains this premium on the basis of macroeconomic risk. The model turns out to be capable of explaining a large proportion of the premium – especially that on loans for house purchase – on the basis of the chosen risk level, as proxied by the NPL ratio. Based on the results of the analysis, we can also say that studies which do not take into account the time structure of interest rates or risk correlated with the business cycle will necessarily overstate the significance of retail credit premiums.

The article also investigated whether retail credit premiums can enhance short-term forecasts. The results reveal that the model with the retail credit premium can improve the forecasts of both real economic activity and the NPL ratio. For house purchase loans in particular, the predictive power of the model is considerably better than that of the VAR model for the 6–12 month horizon. This conclusion may be useful for stress testing and financial stability modelling.

REFERENCES

ADRIAN, T., MOENCH, E., SHIN, H. (2010): *Macro Risk Premiums and Intermediary Balance Sheet Quantities*, Federal Reserve Bank of New York Staff Report No. 428.

ANG, A., PIAZZESI, M. (2003): *A No-Arbitrage Vector Autoregression of Term Structure Dynamics with Macroeconomic and Latent Variables*, Journal of Monetary Economics, 50(4), pp. 745–787.

ANG, A., PIAZZESI, M., WEI, M. (2006): *What Does the Yield Curve Tell Us About GDP Growth?* Journal of Econometrics, 131(1–2), pp. 359–403.

ATKESON, A., KEHOE, P. J. (2008): *On the Need for a New Approach to Analyzing Monetary Policy*, NBER Working Papers, No. 14260.

BANERJEE, A., BYSTROV, V., MIZEN, P. (2010): *The Response of Retail Interest Rates to Factor Forecasts of Money Market Rates in Major European Economies*, COMISEF Working Paper WPS-025 27/01/2010.

COCHRANE, J. (2001): *Asset Pricing*, Princeton University Press.

COCHRANE, J., PIAZZESI M. (2005): *Bond Risk Premia*, American Economic Review, 95(1), pp. 138–160.

GAMBACORTA, L. (2009): *Monetary Policy and the Risk-Taking Channel*, BIS Quarterly Review, December, pp. 43–53.

GERŠL, A., SEIDLER, J. (2010): *Stress Test Verification as Part of an Advanced Stress-testing Framework*, Financial Stability Report 2009/2010, Czech National Bank, pp. 88–96.

HAVRÁNEK, T., HORVÁTH, R., MATĚJŮ, J. (2010): *Monetary Transmission and the Financial Sector in the Czech Republic*, forthcoming as CNB Working Paper 6/2010.

HORVÁTH, R., PODPIERA, A. (2009): *Heterogeneity in Bank Pricing Policies: The Czech Evidence*, CNB Working Paper 8/2009.

KOTLÁN, V. (1999a): *The Term Structure of Interest Rates and Future Inflation*, Eastern European Economics, 37(5), pp. 36–51.

KOTLÁN, V. (1999b): *Are Financial Indicators Capable of Predicting Economic Activity?* Politická ekonomie, 1999(5).

NELSON, C. R., SIEGEL, A. F. (1987): *Parsimonious Modeling of Yield Curves*, Journal of Business 60(4), pp. 473–489.

SANDER, H., KLEIMEIER, S. (2004): *Convergence in Euro-zone Retail Banking? What Interest Rate Pass-through Tells Us About Monetary Policy Transmission, Competition and Integration*, Journal of International Money and Finance, 23(3), pp. 461–492.

STOCK, J., WATSON, M. W. (2003): *Forecasting Output and Inflation: The Role of Asset Prices*, Journal of Economic Literature, 41(3), pp. 788–829.

WOODFORD, M., CÚRDIA, V. (2009a): *Conventional and Unconventional Monetary Policy*, CEPR Discussion Papers 7514.

WOODFORD, M., CÚRDIA, V. (2009b): *Credit Spreads and Monetary Policy*, NBER Working Papers 15289, National Bureau of Economic Research, Inc.

WOODFORD, M., CÚRDIA, V. (2010): *Credit Spreads and Monetary Policy*, Journal of Money, Credit and Banking, 42(S1), pp. 3–35.

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.

Net international investment position
The surplus of financial assets over financial liabilities of residents vis-à-vis non-residents.

Balance-sheet liquidity
The ability of an institution to meet its obligations in a corresponding volume and term structure. The term funding liquidity is also used, meaning the ease with which economic agents can obtain external finance.

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.

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. As of 1 March 2011, the CERTIS comprised 47 direct participants and 6 third parties – for example, card payment clearing houses and securities clearing and settlement institutions.

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.
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.
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.

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.

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 m2) 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 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 supply prices
Property sale supply prices in estate agencies. Supply prices should be higher than transfer prices. Property supply 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 transfer prices.

Property transfer prices (aka "Property realisation prices")
Prices based on Ministry of Finance statistics from property transfer tax returns and published by the CZSO. These prices are the closest to actual market prices in terms of methodology, but are published with a time delay. See also Property supply 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 supply price of the apartment. It is the inverse of the price-to-rent indicator.

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.

ABBREVIATIONS

BCBS	Basel Committee on Banking Supervision
b.p.	basis point
BIS	Bank for International Settlements
CAR	capital adequacy ratio
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
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
DJStoxx50	Dow Jones EURO STOXX 50, the main European stock index, comprising 50 corporations
DJ UBS	Dow Jones commodity index
EA	euro area
EBA	European Banking Authority
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
EC	European Commission
ECB	European Central Bank
ECM	Error Correction Model
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)
ESCB	European System of Central Banks
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
EWS	Early Warning Systems
FASB	Financial Accounting Standards Board
FDI	foreign direct investment
Fed	Federal Reserve System
FRA	forward rate agreement
FSB	Financial Stability Board
FSR	Financial Stability Report
GARCH	Generalised Autoregressive Conditional Heteroscedasticity
GBP	pound sterling
GDI	gross disposable income
GDP	gross domestic product
GSCI	Goldman Sachs Commodity Index (S&P commodity index)
G-SIFIs	global SIFIs
HI	Herfindahl index
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
IP	investment position
IMF	International Monetary Fund
IMF IFS	IMF International Financial Statistics
IRB	Internal Rating Based Approach, a Basel II bank capital adequacy approach
IRI	Institute for Regional Information
IRS	interest rate swap
JPY	Japanese yen
LCR	liquidity coverage ratio
LFS	Labour Force Survey
LGD	loss given default
LIBOR	London InterBank Offered Rate (reference interest rate on the interbank market)
LTD	loan-to-deposit
LTV	loan-to-value
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)
MWp	megawatt peak (unit of output of a solar panel at its maximum output in standard conditions)
NACE	General Industrial Classification of Economic Activities
NFCELs	non-bank financial corporations engaged in lending
Nikkei	stock market index (Tokyo)
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-ended mutual fund
OOS	out-of-sample method
OR	operational risk
OTC	over-the-counter (outside regulated markets)
p.a.	per annum
p.p.	percentage point
PBTDA	Profit Before Taxes, Depreciation and Amortization
PD	probability of default
P/E	price-to-earnings ratio
PIIGS	Portugal, Italy, Ireland, Greece and Spain
PLN	Polish zloty
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
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
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
SEK	Swedish krona
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	IS	Iceland
AU	Australia	IT	Italy
BE	Belgium	JP	Japan
BG	Bulgaria	KO	Korea
BR	Brazil	LT	Lithuania
CA	Canada	LU	Luxembourg
CH	Switzerland	LV	Latvia
CN	China	ME	Mexico
CY	Cyprus	MT	Malta
CZ	Czech Republic	NL	Netherlands
DE	Germany	NO	Norway
DK	Denmark	NZ	New Zealand
EE	Estonia	PL	Poland
ES	Spain	PT	Portugal
FI	Finland	RO	Romania
FR	France	RU	Russia
GR	Greece	SE	Sweden
HR	Croatia	SI	Slovenia
HU	Hungary	SK	Slovakia
IE	Ireland	UK	United Kingdom
IN	India	US	United States

Financial stability indicators – part 1

	2005	2006	2007	2008	2009	2010	2011 Jan.	Feb.	Mar.	Apr.
Macroeconomic environment										
Real GDP growth (year on year, %)	6.3	6.8	6.0	3.2	-4.1	2.3				
Consumer price inflation (end of period, %)	2.2	1.7	5.4	3.6	1.0	2.3	1.7	1.8	1.7	1.6
Public finance deficit/surplus / GDP (%)	-3.6	-2.6	-0.7	-2.7	-5.8	-5.1				
Public debt / GDP (%)	29.7	29.4	29.0	30.0	35.3	38.5				
Trade balance / GDP (%)	2.0	2.0	3.3	2.8	4.1	3.4				
External debt in % of banking sector external assets	116.3	121.7	128.4	127.0	135.4	139.1				
Balance of payments current account / GDP (%)	-1.3	-2.4	-3.2	-0.6	-1.0	3.8				
Monetary policy 2W repo rate (end of period, %)	2.00	2.50	3.50	2.25	1.00	0.75	0.75	0.75	0.75	0.75
Non-financial corporations										
Return on equity (%)	9.2	10.2	11.2	9.4	8.0	9.0				
Debt (% of total liabilities)	44.7	45.7	47.1	47.3	46.8	47.8				
Debt (% of GDP)	44.0	43.2	42.2	46.1	45.8	46.6				
– loans from Czech banks (% of GDP)	16.3	19.1	20.6	22.5	21.6	21.3				
– loans from Czech non-bank financial corporations (% of GDP)	4.8	4.7	4.9	5.2	4.7	5.0				
– other (including financing from abroad, % of GDP)	22.9	19.5	16.7	18.3	19.5	20.3				
Interest expense coverage (profit/interest paid, %)	11.8	14.5	12.6	11.4	10.2	12.9				
12M default rate (%)	1.5	1.7	2.1	3.2	4.6	4.7			4.3	
Households (including sole traders, except 12M default)										
Debt / gross disposable income (%)	34.6	40.4	47.3	51.0	54.5	56.1				
Debt / financial assets (%)	22.9	26.3	30.6	33.4	33.6	33.4				
Net financial assets (total financial assets – total liabilities, % of GDP)	56.7	54.6	53.0	51.4	54.9	56.8				
Debt / GDP (%)	17.6	20.4	24.5	27.5	29.7	30.6				
– loans from Czech banks to households (% of GDP)	10.7	15.3	18.9	21.9	24.8	26.5				
– loans from Czech non-bank financial corporations to households (% of GDP)	3.1	3.1	3.7	3.8	3.1	1.8				
– loans from Czech banks to sole traders (% of GDP)	0.9	1.1	1.1	1.2	1.2	1.1				
– loans from Czech non-bank financial corporations to sole traders (% of GDP)	0.4	0.4	0.5	0.4	0.4	0.4				
– other (including financing from abroad, % of GDP)	2.5	0.4	0.3	0.2	0.3	0.8				
Interest expenses / gross disposable income (%)	1.1	1.3	1.4	1.5	0.9	0.7				
12M default rate (%)	…	…	…	3.3	4.8	4.7			4.7	
Financial markets										
3M PRIBOR (average for period, %)	2.0	2.3	3.0	4.0	2.2	1.3	1.2	1.2	1.2	1.2
1Y PRIBOR ((average for period, %)	2.1	2.7	3.4	4.2	2.6	1.9	1.8	1.8	1.8	1.8
10Y government bond yield (average for period, %)	3.6	3.8	4.3	4.7	4.9	3.9	4.0	4.1	4.1	4.1
CZK/EUR exchange rate (average for period)	29.8	28.3	27.8	25.0	26.4	25.3	24.4	24.3	24.4	24.3
Change in PX stock index (% year on year, end of period)	42.7	7.7	14.2	-52.7	30.2	9.6	5.1	9.3	5.1	-1.2
Real estate market										
Total change in residential property prices (transfer prices, % year on year)	5.9	10.5	18.3	8.9	-8.0	2.5*				
Change in apartment prices (supply prices according to CZSO, % year on year)	0.2	13.4	23.2	19.6	-8.8	-3.0			-3.5	
Apartment price / average annual wage	3.9	4.2	5.1	5.2	4.3	4.1				
Apartment price / rent (according to IRI)	15.4	17.3	22.9	23.8	22.9	21.9			22.1	

* estimate for 2010 H1; only for family houses and apartments (around 74.4% of index)

Financial stability indicators – part 2	2005	2006	2007	2008	2009	2010	2011			
							Jan.	Feb.	Mar.	Apr.
Financial sector										
Assets / GDP (%)	133.5	133.0	142.1	145.5	150.9	156.0				
Bank assets / GDP (%)	98.9	97.5	105.4	109.2	112.9	114.3				
Banking sector										
Share in financial sector assets (%)	74.1	73.3	74.2	75.0	77.2	77.3				
Client loans / bank assets (%)	39.5	45.2	48.1	50.4	50.0	50.3	50.3	50.1	49.9	
Client loans / client deposits (%)	60.8	67.7	74.6	80.2	78.0	77.8	77.1	76.3	78.0	
Sectoral breakdown of total loans (%)										
– non-financial corporations	44.6	44.9	41.7	40.9	37.2	35.9	36.3	36.4	36.3	
– households	32.2	35.0	37.5	38.9	42.7	44.2	44.3	44.3	44.3	
– sole traders	2.8	2.5	2.2	2.1	2.0	1.9	1.8	1.8	1.8	
– others (including non-residents)	20.4	17.5	18.7	18.1	18.0	18.1	17.6	17.5	17.5	
Growth in loans (%, end of period, year on year):										
total	16.7	19.9	26.4	16.4	1.3	3.5	3.8	3.8	4.4	
non-financial corporations	14.3	20.8	17.2	14.1	-7.8	-0.3	0.5	1.5	4.1	
– real estate activity (NACE L)	34.2	39.5	41.1	25.5	-5.9	6.0	6.1	7.7	7.6	
households	34.0	30.4	35.1	20.9	11.1	7.0	6.8	6.6	6.6	
– loans for house purchase	34.1	32.5	37.6	20.1	11.5	6.4	6.8	6.7	5.8	
– consumer credit	36.8	26.5	26.1	22.8	9.8	7.3	7.4	7.0	6.5	
sole traders	16.9	7.7	8.7	10.4	-1.4	-5.4	-5.2	-5.4	-5.3	
Non-performing loans / total loans (%):										
total	4.1	3.6	2.7	3.2	5.2	6.2	6.3	6.3	6.4	
non-financial corporations	5.1	4.4	3.1	4.2	7.9	8.9	8.9	8.8	8.8	
households	3.3	2.9	2.7	2.7	3.8	5.0	5.2	5.2	5.2	
– loans for house purchase	1.7	1.6	1.5	1.6	2.5	3.2	3.3	3.3	3.3	
– consumer credit	8.3	7.2	7.4	6.7	8.4	11.7	12.1	12.3	12.2	
sole traders	10.7	9.2	7.2	8.2	10.8	12.4	12.5	12.6	12.6	
Coverage of non-performing loans by provisions (%)	55.6	53.6	60.0	58.1	50.1	48.1	48.1	49.0	48.3	
Aggregate LTV for housing mortgages	53.4	42.6	44.7	43.3	56.4**	56.3			56.4	
Capital adequacy (%)	11.9	11.5	11.6	12.3	14.1	15.5	15.4	15.5	15.6	
Tier 1 capital adequacy (%)	11.4	10.1	10.4	11.7	12.7	14.1	14.0	14.1	14.1	
Leverage (leverage ratio, assets as a multiple of equity)	12.3	12.4	13.5	12.0	11.4	10.9	10.9	10.8	10.8	
Return on assets (%)	1.4	1.2	1.3	1.2	1.5	1.3	1.6	1.5	1.4	
Return on Tier I (%)	25.3	22.5	24.4	21.7	25.8	21.8	25.9	23.3	22.4	
Quick assets / total assets (%)	32.8	30.4	24.0	23.1	25.3	26.1	27.1	27.8	28.1	
Quick assets / client deposits (%)	50.5	45.5	36.6	35.9	38.0	38.8	40.1	41.3	42.0	
Net open position in foreign exchange / capital (%)	0.1	0.3	0.0	0.1	0.2	2.4	2.2	2.2	2.2	
Banking sector external debt / banking sector total assets (%)	13.9	12.5	15.1	15.2	12.0	12.2	10.6	11.3	11.4	
Non-bank financial corporations										
Share in financial sector assets (%)	25.9	26.7	25.8	25.0	22.8	22.7				
Insurance companies										
Premiums written / GDP (%)	3.9	3.8	3.8	3.8	4.0	4.3				
Solvency of insurance companies: life insurance (%)	325	314	285	249	295	…				
Solvency of insurance companies: non-life insurance (%)	339	368	394	460	449	…				
Change in financial investment of insurance companies (%)	8.9	2.3	4.3	6.6	5.1	3.1				
Return on equity of insurance companies (%)	13.5	25.9	21.8	14.8	20.8	26.0				
Claim settlement costs / net technical provisions (life, %)	12.1	11.9	14.8	17.2	17.4	17.1				
Claim settlement costs / net technical provisions (non-life, %)	69.4	71.1	61.3	60.4	63.9	70.0				
Pension funds										
Change in assets managed by pension funds (%)	20.9	18.2	14.6	14.7	12.6	7.7				
Nominal change in value of assets of pension funds***	…	-0.6	-3.3	0.3	4.5	-0.8				
Collective investment funds										
Growth in net assets (= equity; year on year, %)	…	…	…	…	-0.6	13.1				
Non-bank financial corporations engaged in lending										
Growth in loans from non-bank financial corporations engaged in lending (%):										
total	…	7.3	20.8	8.4	-17.1	-10.2				
households	…	9.3	29.8	3.5	-18.8	-35.2				
non-financial corporations	…	5.8	14.7	12.8	-15.5	9.5				
Composite indicators**										
Banking stability index (end of period)	0.62	0.32	0.10	0.11	0.19	0.21				
Creditworthiness index for non-financial corporations (end of year)	0.971	0.973	0.972	0.972	0.971	0.972				
Market liquidity index (average for period)	0.2	0.3	0.1	-0.4	-0.8	-0.3	-0.2	-0.2	-0.1	-0.1

** the definition of mortgages was changed in 2009
*** change in the assets of pension funds adjusted for contributions and benefits
**** see previous FSRs for the methodology and interpretation of the composite indicators