FINANCIAL STABILITY REPORT

2007

CNB CZECH NATIONAL BANK

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

Article 2

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

.....

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

The CNB defines financial stability as a situation where the financial system operates with no serious failures or undesirable impacts on the present and future development of the economy as a whole, while showing a high degree of resilience to shocks.

The CNB's definition is based on the fact that financial stability may be disturbed both by processes inside the financial sector leading to the emergence of weak spots, and by strong shocks, which may arise from the external environment, domestic macroeconomic developments, large debtors and creditors, economic policies or changes in the institutional environment.

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.

LIST OF ALTERNATIVE SCENARIOS

From the financial stability point of view, the development of the Czech economy in 2007 can be assessed as very successful, notwithstanding the shocks emanating from foreign financial markets. Despite a predicted moderation in economic growth, the current outlook for the next two years creates good conditions for maintaining the degree of financial stability already achieved. The main risks include a further deepening of the credit crisis in the advanced economies, a more pronounced slowdown in economic growth abroad and a continued very strong exchange rate of the koruna. These risks could slow net export growth, weaken domestic economic activity and, in turn, worsen the performance of the financial sector. In the context of the credit crisis abroad and the global increase in the risk aversion of financial institutions, some tightening of the lending conditions can also be expected in the Czech financial system, fostering slower credit growth. However, these effects can be viewed as a desirable stabilising reaction of the system, which in the previous two years developed very dynamically and was affected by optimistic expectations typical of the peak of the business cycle.

The world economy recorded rapid economic growth, but this will weaken considerably over the next two years owing to the credit crisis in some advanced countries

The successful development of the world economy continued into 2007. However, risks that had built up in the financial sector over the previous ten years started to manifest themselves strongly in the USA and some other advanced countries. They showed up initially in the US subprime mortgage crisis, which gradually spilled over into other financial market segments and turned into credit crisis in the first few months of 2008. This has led to a considerable downward revision of the outlook for global economic growth for the coming two years. In addition to the US economy, which is highly likely to fall into recession, economic activity is likely to slow sharply in Japan and the UK. A downturn can also be expected in the euro area. Yield curve slopes indicate substantial scepticism regarding a quick recovery of these economies.

Owing to banks' losses, countries hit by the crisis will experience a sharp slowdown in growth in lending to the private sector

The credit crisis poses substantial downside risks to economic growth and financial system stability in countries directly hit by the crisis, with potential knock-on effects on other economies. One of biggest risks over the next two years is a potential credit contraction in some advanced countries as problems with mortgage loans and related securities spread to other segments of the credit market. The major losses of some banks will lead to a decrease in the overall capital adequacy of banking sectors. The subsequent recapitalisation of banks will negatively affect growth in lending to the private sector and economic growth.

The turn in the credit cycle prompted mixed reactions from central banks

The turn in the credit cycle strongly affected the monetary policies of the key central banks. The most striking response came from the US Federal Reserve System, which between September 2007 and April 2008 lowered its monetary policy rate by 3.25 percentage points to 2%. The monetary policy tightening in the euro area came to a halt, with the ECB holding its key rate at 4% over the entire period of turbulence. CNB monetary policy responded to rising inflationary pressures. The CNB increased its monetary policy rate four times during 2007 and once again in February 2008 – each time by 0.25 percentage point. The CNB's May 2008 macroeconomic forecast expects the one-off inflationary factors to start unwinding in 2008, with inflation gradually returning to the target. Accordingly, the interest rate environment in the Czech Republic should be stable over the next two years.

The Czech koruna appreciated strongly in response to the financial turbulence

The downward revision of the outlook for interest rates of the main world currencies led to renewed interest in investing in stable emerging markets' assets. Given the perception of the Czech koruna as a "safe haven", the risk of renewed appreciation pressures on the koruna materialised. The koruna appreciated dramatically in the initial phase of the financial turbulence, probably due to the liquidation of carry trades for which the koruna was used as the financing currency, in an environment of growing risk aversion. The increasing appreciation trend in the period that followed was driven both by a shift in foreign investment away from the

depreciating dollar and towards appreciating currencies such as the Czech koruna, and by domestic exporters, who in an environment of faster appreciation of the koruna started hedging on a mass scale by selling euros. The excessively fast appreciation of the koruna combined with falling external demand as a result of the economic slowdown in the euro area could have a negative effect on the domestic economy, primarily through a deterioration in net export growth. Given this risk, the CNB signed an agreement with the Czech Government in April 2008 on measures to prevent public sector operations from having undesirable impacts on the foreign exchange market and subsequently on macroeconomic stability.

The domestic economy started to be affected significantly by the fiscal reform

The domestic macroeconomic situation and financial sector were affected by the approved reform of public finances, whose expected impacts started affecting the behaviour of economic agents as early as 2007. The fiscal measures adopted are having conflicting impacts on the disposable income of households and corporations. The changes in the fiscal impulse and the impacts of the expected changes on the behaviour of economic agents will cause some volatility in aggregate demand. Efforts to buy real estate still at the lower VAT rate gave rise to increased demand for loans for house purchase and also affected the construction industry's performance. The opposite effect can be expected in the coming years, probably compounded by a review of the real estate market risks by banks in response to the problems of this market in advanced economies.

Czech GDP growth will slow over the next two years

At the end of 2007, despite the continued robust growth of the domestic economy, clear signals of a future slowdown were observable, mainly as a result of slower growth in real disposable income due to higher inflation, subdued investment activity and slowing net exports. The CNB's May 2008 macroeconomic forecast expects real GDP growth to slow to 4.7% in 2008 and 4.0% in 2009. The slowing economic growth and declining growth of real disposable income may have some impacts on the ability of households and corporations to repay loans taken out in previous years. On the other hand, it may help to eliminate the excessively optimistic expectations which emerged at the peak of the cycle and supported a rapid rise in the indebtedness of households and some segments of the non-financial corporations sector.

Macroeconomic sustainability indicators recorded a noticeable improvement

The traditional macroeconomic sustainability indicators recorded strongly positive developments in 2007. The public budget deficit under ESA95 methodology fell to 1.6% of GDP and the ratio of public debt to GDP decreased to 28.7%. The current account deficit declined to 2.5% of GDP, while the surplus on the output balance increased.

The good financial condition of corporations fostered low credit risk

Non-financial corporations posted good financial results in 2007, as evidenced by improved profitability indicators, liquidity, value added per employee and inventory ratios. Although the corporate debt ratio continued rising in 2007, the growth rate of loans granted to non-financial corporations decreased. This may indicate a future downswing in corporate sector performance associated with the expected weakening of economic activity. The credit risk of the corporate sector as measured by the 12-month default rate remained below the 3% level during 2007. However, given the expected economic slowdown, the macroeconomic credit risk model assumes a rise in this indicator of 1–2 percentage points during 2008. A slight increase in the corporate sector's credit risk in 2008 is also indicated by the new creditworthiness indicator.

The sharp appreciation of the koruna will be reflected in a rise in the default rate of export-oriented corporations

The economic condition of non-financial corporations started to be affected significantly in the second half of 2007 by the sharp appreciation of the koruna. Although the first-quarter data on the real economy in 2008 suggested that export-oriented corporations were able to cope with this exchange rate shock, some negative effect can be expected to emerge gradually. This will probably be reflected in an increase in the sector's credit risk, as indicated by an analysis of monthly data

on the repayment of loans provided by banks to the largest exporters in the Czech Republic. The analysis revealed that the 12-month default rate is more volatile for exporters than for the economy as a whole, so it can be expected to deviate upwards at a time of strong appreciation. The analysis also revealed that for part of exporting corporations borrowing in foreign currency is a significant way of reducing their sensitivity to appreciation of the koruna.

Despite rapid credit growth, household debt is still low by international comparison

Household debt increased considerably in 2007. As in previous years, the overall debt of households to financial corporations increased by roughly one-third, breaking through the CZK 800 billion level. Loans to households reached CZK 680 billion in banking institutions and CZK 150 billion in non-banking institutions at the close of the year. The growing debt was supported mainly by loans for house purchase, as a result of demand for owner-occupied housing bolstered by the one-off effect of advance financing of construction work owing to a change in the lower VAT rate from 5% to 9% with effect from 1 January 2008. The increasing level of debt is being accompanied by a decreasing gross saving rate of households (5.1% in 2007), which fell to a ten-year low. However, despite the rapid credit growth, the overall Czech household debt level is still low by comparison with the Western European countries and, according to foreign analyses, is at a safe level. In 2008, the rate of growth of household debt should start decreasing, as confirmed by the first-quarter growth in new loans for house purchase.

In the event of adverse macroeconomic developments, overindebted households – particularly those from low-income groups – will get into difficulties

Although Czech households as a whole cannot currently be regarded as overleveraged, some risk of growth in their default rate exists if the less favourable macroeconomic scenarios materialise. One potential source of overindebtedness is growth in mortgage repayments, associated with the purchase of ever more expensive property. Owners of loans for house purchase whose income has been rising nowhere near as fast as property prices are particularly exposed to this risk. This overindebtedness may come out into the open with a lag, for example as a result of a rise in interest rates during the refixation of a mortgage loan. Consumer credit is another possible source of overindebtedness, particularly for low-income households. A sharp rise in the number of executions ordered suggests that this risk is growing over time.

Czech financial markets were affected only slightly by the external shocks

The shocks on the advanced financial markets manifested themselves in declining prices of a whole range of risky assets and rising volatility on equity, bond and foreign exchange markets. However, the domestic interbank money market remained fully operational and interest rates there were affected mostly by expected changes in CNB monetary policy. The Czech financial markets responded to developments in global financial markets similarly as during corrections in previous years. Share prices went down in line with the falls in foreign stock markets, while bond yields initially declined slightly and then stabilised. Nevertheless, it cannot be said that the global financial crisis had no major effect on the Czech financial markets. During 2008 Q1, market signals indicated increased sales of Czech government bonds by foreign investors, fostering growth in the risk premium of the Czech koruna and the euro government debt. The interbank market also recorded a very modest increase in the credit risk premium and a decline in market liquidity. The Czech banking sector responded to the rise in global risk aversion only with a very moderate tightening of the interest rate conditions for loans for house purchase and some riskier segments of the credit market.

Property prices continued rising rapidly in 2007, while rent returns fell further

The property market trends identified as risky in the 2006 Financial Stability Report continued into 2007. Property prices in the Czech Republic rose relatively fast in 2007 despite the problems on real estate markets in many advanced economies. Prices of flats and building land recorded high growth, while prices of family houses rose more slowly. Although the property market growth still cannot be regarded as

a bubble and the rise in prices as manifestly unbalanced, there are some indications that the market is overheating. For example, the ratio of property prices to household income is rising over time. This indicator identifies Prague as the riskiest region. A large rise in supply prices of flats together with considerably lower increases in supply rents led to a further fall in the rent return, which for most large cities in the Czech Republic is below the level of long-term bond yields and the level of interest rates on new loans for house purchase. Speculative property purchases financed by mortgage loans thus become less profitable and more risky.

The risk of default by real estate businesses depends to a large extent on the future evolution of property prices

The share of property developers in total loans to the corporate sector increased to more than 25% in 2007, compared to less than 10% in 2001, against a background of rising prices of both residential and commercial property. Loans provided to real estate companies showed record growth of 50% in 2007. The developments in 2007 confirmed that developers tend to react with a lag to growth in property prices. Before the Czech Republic joined the EU, strong growth in property prices in 2002–2004 gave rise to overly optimistic expectations, which led to higher investment activity by developers. The subsequent sharp slowdown in property prices then brought about a rise in the rate of default by developers in 2005–2006. The property development sector responded with increased activity to the property price growth in 2006 and 2007 again with a lag, so it is highly likely that a negative shock would be reflected in a significant rise in the previously relatively low default rate in this sector.

In response to property market developments, the banking sector tightened its credit standards vis-à-vis the property development sector

The number of housing completions increased by an exceptional 38% year on year in 2007. It cannot be ruled out that the market for new flats will become saturated and that the rise in prices will slow down or stop as a result of the rising supply. An increase in the difference between supply prices and the prices of final transactions may be a signal of decreasing market liquidity or rising property market risk. A cooling of the property market represents quite a sizeable risk for the banking sector. According to stress tests, the banking sector is resilient to this risk at present. In response to the property market problems in some advanced countries, domestic banks considerably tightened their credit standards vis-à-vis the property development sector in early 2008. This can be viewed as an appropriate response to the evolution of the risks in the sector.

The financial infrastructure continued running reliably in 2007, but the further development of the Czech capital market is being hampered by the absence of a central depository

The financial infrastructure continued running reliably in 2007. The CERTIS interbank payment system and the SKD short-term bond settlement system recorded no irregular situations in the period of turbulence in global financial markets. Smooth and stable interbank settlement was aided by a gradual rise in the use of intraday credit by CERTIS participants. The fact that domestic banks did not need to use intraday credit any more often than in the past, despite the liquidity problems on foreign financial markets, is meanwhile evidence that the financial crisis had very small direct impacts on the Czech financial sector. One of the infrastructural shortcomings of the Czech capital market is the absence of a central depository.

The depth of financial intermediation increased significantly, unlike in the previous year

In 2007, as in previous years, the Czech financial sector experienced mostly positive developments. Banks and insurance companies achieved high returns on assets and equity. Provided that a reasonable proportion of the profit remains in financial institutions in the form of equity capital, this lays the groundwork for maintaining a high level of financial stability in the years to come. The depth of financial intermediation in the Czech Republic, as measured by the ratio of financial sector assets to GDP, increased by just under 10 percentage points to 142%. This relatively large increase reflects a rise of almost 18% in financial institutions' assets, due mainly to growth in bank loans of more than 26%.

The characteristics of the Czech housing loan market minimise the risk of a crisis similar to the one that hit the US subprime mortgage segment

The available analyses indicate that the Czech banking sector is not exposed to the risk of a crisis similar to the one that hit the US subprime mortgage segment. This

is due to higher required debtor creditworthiness, the traditional method of interest rate fixation, less use of external mortgage underwriters, the absence of credit securitisation and, in particular, good collateralisation of mortgage loans with property. Mortgage loans, i.e. loans that are fully secured by property, account for 65% of total loans for house purchase. The mortgage loan to property value ratio (the LTV ratio), which for mortgage loans to households was 56% on average at the end of 2007, can be still regarded as conservative. For the same reasons, the ratio of loans in default to mortgage loans was only 1.2% at the end of 2007. The ratio of loans in default to total loans stood at 2.7%, falling by almost 1 percentage point year on year. Given the favourable phase of the business cycle and the high credit growth in 2007, the loan default rate still probably undervalues the magnitude of the banking portfolio credit risk to some degree.

The large volume of client deposits provides domestic banks with protection against any drying up of market liquidity and ensures stable and low-cost sources of financing for credit expansion

Client deposits remain the biggest source of financing for bank loans. At the end of 2007, they were 1.3 times higher than client loans, which, in turn, is more than two times the average in the original EU member countries. The large volume of client deposits provides domestic banks with protection against any rapid drying up of market liquidity and at the same time ensures stable and relatively low-cost funds compared to other forms of external financing. However, deposit growth has been lower than credit growth in the Czech Republic for several years and this trend is likely to continue. As a result, the share of deposits in bank funds will decrease in the future and banks will have to respond with changes in balance-sheet liquidity management. Tests of banks' balance-sheet liquidity indicate that the banking sector is resilient enough to deposit outflows and some other hypothetical changes in the financial market. However, for the extreme variant of pressures on balance-sheet liquidity, only institutions with a strong deposit base are naturally resilient.

Owing to the gradual changeover to Basel II, capital adequacy increased slightly … but an expected rise in household and corporate default rates will lead to an increase in the regulatory capital requirements

The preparations for the implementation of Basel II and the actual changeover to the new prudential rules in several banks on 1 July 2007 were a significant challenge for the banking sector. The remainder of the sector took this step in January 2008. Owing to the switch to Basel II, there was a slight decline in the regulatory capital requirements. The CNB's analyses predict a slight rise in default rates for corporations and households in 2008. This would imply some increase in the regulatory capital requirements in the period ahead.

The insurance and pension scheme industries continued growing in 2007, although higher asset price volatility and growth in the costs of intermediating new contracts are creating risks for pension funds in particular

In the insurance and pension scheme industries, the previous years' trends continued into 2007. Premiums written grew at an increased rate of 9% year on year, mainly due to growth in life insurance. Insurance companies met the solvency criteria – the aggregate available solvency margin under the current legislation was 3.0 times the required solvency margin on the life insurance market and 3.3 times that on the non-life insurance market. Contributions from pension planholders increased by more than 14% in 2007. Insurance companies and pension funds saw marked growth in the costs of intermediating new contracts. The growth in these costs may encumber the private pension system in particular. Growing volatility on the asset market and potential asset revaluation losses in particular may have an adverse effect on the funds' assets and performance, particularly in the event of higher and faster payments of benefits. Commensurate capital increases by funds' shareholders would be desirable as protection against the existing risks.

According to stress tests, the financial sector seems to be resilient to a wide range of risks. Only an extreme macroeconomic scenario would necessitate capital injections to maintain sufficient capitalisation

According to stress tests, the financial sector is currently resilient to the market, credit and some specific risks to which it is exposed. However, an extreme macroeconomic scenario with significant adverse impacts on interest rates, the exchange rate and GDP growth would necessitate capital injections to ensure compliance with the regulatory limits and maintain sufficient capital adequacy in financial institutions. The aggregate banking sector stability indicator confirms a continuing process of capital optimisation in the banking sector, with unchanged resilience to the main risks.

PART I

1 INTRODUCTION

The Czech National Bank is pleased to present to the public its fourth Financial Stability Report, this time for 2007. This Report analyses the risks to the financial stability of the Czech Republic in the near future on the basis of previous and expected developments in the real and financial sectors. The turbulence on global financial markets that emerged in summer 2007 highlights the relevance of these analyses, especially as regards the potential impacts of external developments on the Czech financial system.

Starting with this Report, the work with the risks to financial stability is shifting towards a more detailed analysis of selected risks and quantification of their impacts on the stability of the financial system. This shift allows us to enhance the consistency of the analyses and raise the Report's level towards the highest international standards. This year's Report profits from a gradually constructed modelling and analytical framework for the financial stability area based on advanced stress testing and accompanying economic models. Three alternative scenarios of adverse developments were constructed on the basis of an analysis of trends and weak spots in the domestic and external economy and financial sector, and their impact on the financial sector was tested. The alternative scenarios take into account the current turbulence on global financial markets, developments in the Czech property market and the risks of a potential cooling of economic activity abroad. The baseline scenario from the CNB's official February 2008 macroeconomic forecast is used for comparison. The alternative scenarios – entitled "safe haven", "property market crisis" and "loss of confidence" are presented in the Report in the form of boxes in the sections that analyse the main components of the individual scenarios. A new subsection 4.2 *Assessment of the financial sector's resilience* contains a discussion of the impacts of all the scenarios.

Our efforts to strengthen the quantitative aspects of the Report necessitated a review of the interactions and transmission channels for the spread of instability across individual economic sectors. These linkages are quantified using sub-models, expert estimates and other analytical techniques. The basic analytical tool for analysing the spread of instability and assessing the impacts of shocks to financial system stability is stress testing, which the CNB has been developing for several years now. The development of the stress-testing methodology and the results derived from the various scenarios for development have been regularly disclosed by the CNB in the form of annexes and thematic articles in previous Reports. The stress tests quantify the impact of changes in key macroeconomic and financial indicators on the solvency of the most important financial institutions, i.e. banks, insurance companies and pension funds. These tests are complemented by several quantitative indicators of the stability of the financial system, such as the banking sector stability indicator presented as a thematic article in last year's Report and the non-financial corporation creditworthiness indicator described in a thematic article in this Report.

This Report is similar in structure to last year's. The section entitled *The real economy* 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 and the financial infrastructure* analyses the financial markets, the property market and the financial infrastructure. The last section, *The financial sector*, covers developments in the financial sector and newly also the aforementioned section assessing the Czech financial market's resilience to shocks from the three alternative scenarios. The Report ends with a table of key indicators relevant from the point of view of financial stability.

Like last year, the Report includes four thematic articles. *The Role of Ratings in Financial Sector Stability Assessment* discusses the ratings of financial market

participants as one of the indicators of financial stability. *Scoring as an Indicator of Financial Stability* deals with the construction of an indicator of the creditworthiness of non-financial corporations using a scoring model and is based on a microeconomic study of Czech corporations. *Competition and Efficiency in the Czech Banking Sector* offers empirical evidence on the evolution of competition in the Czech banking sector and its relationship to the cost efficiency of banks in the Czech Republic. The last article, *Operational Risk and its Impacts on Financial Stability*, describes the nature and significance of operational risk with regard to financial stability and identifies the impacts of the newly introduced capital regulation of operational risk.

This Financial Stability Report was approved by the Bank Board of the Czech National Bank on 15 May 2008. It is available in electronic form at http://www.cnb.cz/.

2 THE REAL ECONOMY

2.1 THE MACROECONOMIC ENVIRONMENT

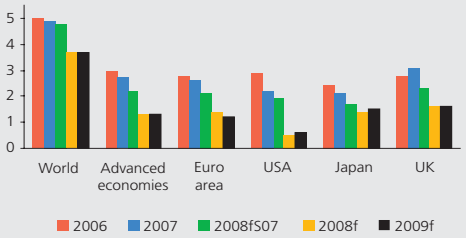
External and domestic macroeconomic developments remained favourable in 2007. However, risks that had built up in the foreign financial system over the previous ten years started to manifest themselves strongly in the second half of the year. The financial turbulence, which was seen first in the USA in August, spilled over into some other advanced economies and turned into credit crisis in the first few months of 2008. These events started a sharp turn in the credit cycle, giving rise to the risk of a credit contraction in countries directly hit by the crisis and a subsequent downturn in economic activity. The turn in the credit cycle is also manifesting itself in considerable volatility in asset prices, interest rates and exchange rates. This situation poses substantial downside risks to economic growth and financial system stability in some advanced economies. At the same time it is generating a high level of uncertainty, fundamentally hampering the forecasting of future macroeconomic developments. The next two years can therefore be regarded as a period of large risks.

The Czech Republic has not been hit directly by the financial crisis so far, and the domestic financial sector is showing a high degree of resilience. A major side effect of the financial turbulence is a sharply appreciating koruna. Although the first-quarter data from the real economy indicated that corporations were able to cope with this exchange rate shock, some negative effect on exporters can be expected to emerge gradually. Despite the expected slowdown in economic growth, the current outlook for the Czech economy for the next two years can be regarded as positive, albeit with sizeable risks originating particularly from abroad. A further deepening of the credit crisis in the advanced economies and a continued strong or even stronger exchange rate of the koruna would have an adverse effect on the domestic economy, in particular through deteriorating net export growth.

The successful development of the world economy, which, according to IMF methodology, grew by 5% as a whole (the same as in 2006), continued into 2007. However, the record-high economic activity will weaken over the next two years, mainly as a result of falling economic growth in the advanced countries[1] (see Chart II.1). Risks that had built up in those countries over the previous ten years started to manifest themselves strongly in 2007 H2. They showed up initially in the US subprime mortgage market crisis (see Box 1) and started to spill over into other economies and various financial market segments.

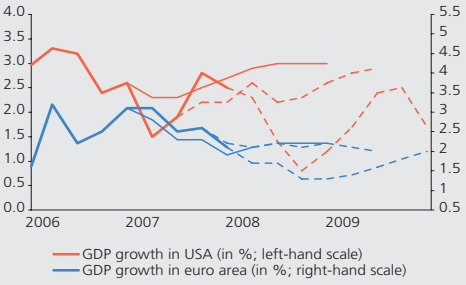
The economic growth outlook was gradually reviewed downwards (see Chart II.2) in response to the deepening problems in financial systems. In addition to the US economy, which is highly likely to fall into recession, economic activity is likely to slow significantly in Japan and the UK (see Chart II.1). A downturn can also be expected in the euro area, although this will not necessarily be as sharp. The uncertainty regarding financial systems going forward meant that the uncertainty regarding expected economic growth increased as well (see Chart II.3).

CHART II.1
Economic growth in advanced economies
(year-on-year growth in %; outturns and September 2007 and April 2008 forecasts)



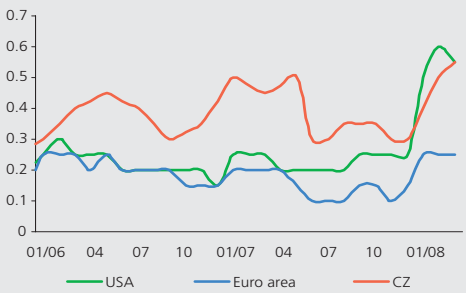
Source: IMF (World Economic Outlook, April 2008)

CHART II.2
Expected and actual economic growth in the USA and the euro area
(quarterly data; year-on-year growth; outturns versus expectations of Consensus Forecast, CF)



Source: Eurostat, US Bureau of Economic Statistics, Consensus Forecast

CHART II.3
Uncertainty regarding expected GDP growth in selected economies
(mean standard deviation of GDP growth estimates for given and next year from Consensus Forecast; in percentage points)



Source: Eurostat, US Bureau of Economic Statistics, Consensus Forecast

1 In its World Economic Outlook (April 2008), the IMF expects weaker growth of the global economy over the next two years, at 3.7%. The IMF's forecast is significantly more pessimistic than the average forecast in Consensus Forecast (a publication presenting the average estimates of a broad representative sample of analysts and forecasters). Chart II.2 also illustrates how sharply the IMF revised its forecasts for 2008 between January 2008 (2008fS07) and April 2008 (2008f).

Box 1: The credit crisis in the USA and its roots[2]

The roots of the current credit crisis in the USA stretch back to the 1980s and 1990s. Economic growth was rising in the context of ongoing globalisation, and nominal interest rates were declining considerably thanks to falling inflation. In this environment, corporate earnings and share prices were rising. The positive sentiment gradually fed through to prices of other types of assets, in particular property prices. Underlying these developments were significant changes in the financial sector, which innovated and increased its profitability and its share in the economy. The dynamic growth was supported by the Fed's accommodative monetary policy, which at times of heightened risks responded by easing the monetary conditions (particularly after 11 September 2001). The favourable environment for the development of financial activities was also supported by a rising supply of free savings from the emerging economies on international financial markets. This resulted in an extraordinary increase in free liquidity available to a wide range of investors at a low price. At the same time, a "shadow" (parallel) banking system started to develop vigorously, within which credit creation was supported by a network made up of structured investment vehicles (SIVs, conduits), investment banks, investment funds, hedge funds and monoline insurers. The shadow banking sector partially reduced the importance of traditional banking intermediation (de-intermediation) and fostered a marked increase in leveraging in the financial and non-financial sectors.[3] This started happening in particular at the end of the 1990s, when, in addition to federal agencies, new private players providing subprime mortgages to "problem" debtors with higher probabilities of default started entering the market. Subsequently, loans structured into various risk segments by means of complex financial instruments began to be provided. These segments (tranches) were then sold separately to investors.[4] The development of such instruments enabled the increased risk associated with the new products and the growing leveraging to be diversified, to a certain extent masked and partially transferred to insufficiently informed investors.

The expansion of the shadow banking system was driven by securitisation, which facilitated the development of an "originate-and-distribute" model. By means of securitisation, banks transferred the loans they had provided outside their balance sheets, thanks to which they were able to increase their regulatory capital much more slowly. Securitisation never involved just transferring assets outside bank balance sheets. For it to work, certain conditions needed to be met. Banks transferring assets outside their balance

2 The specific terms and abbreviations contained in this Box are explained in the glossary.

3 The major global banks saw particularly large increases in leveraging (in some cases reaching 30 or more), i.e. their total assets grew faster than their regulatory capital. This was because their newly generated assets had very low risk weights. At the same time, they recorded a sharp declines in their deposit-to-loan ratios, as it was very easy to acquire sufficient liquidity from the money markets.

4 The lending process changed considerably after assets with BBB or lower ratings started to be transformed into assets with AAA ratings (see section 3.1) through CDOs (collateralised debt obligations; see the glossary). Specifically, subprime mortgages started to be converted into CDOs, within which they were divided into tranches with various risk levels and some acquired an investment rating. Any losses from the set of underlying mortgage loans were to be borne by the holders of the riskier lower-rated tranches. The low risk of the best tranches was conditional on a low default correlation for the underlying subprime mortgages, which, given their similar characteristics and the adverse development of the economic environment, proved to be illusory.

sheets lent to entities that invested in assets generated by securitisation and also to entities that then bought derivatives derived from assets generated by securitisation. The bulk of the risks were diversified in this system (at least theoretically). However, it was necessary to seek final asset holders willing to bear the outstanding risk. This search was largely successful, since the risks were partially hidden by the ratings of rating agencies, which were not well prepared for valuing some products of the shadow financial system.

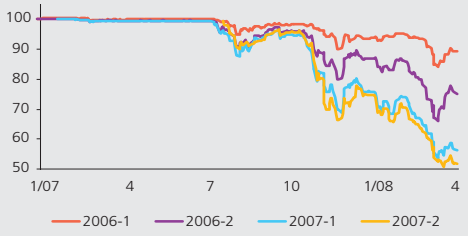
The changes in the nature of the mortgage market were reflected in poor monitoring of lending processes and a substantial relaxation of credit standards. This relaxation took the form of new types of mortgages creating an illusion of easy future repayment (lax or non-existent checking of applicants' creditworthiness, loans for 100% or more of property purchase prices, instalments initially lower than interest, low introductory rates, fixed rates for the first few years and then a switch to floating rates). Many inappropriate incentives permeated the originate-and-distribute model. The entities involved along the entire chain were primarily interested in receiving fees for their share in the transaction and then transferring the risk to another holder. Mortgage brokers were interested in maximising the number and volume of contracts, assessors were interested in revaluing property, mortgage loan originators (banks) transforming mortgages into collateralised securities and banks packaging these securities into structured credit derivatives were interested in maximising the volume of loans and derived securities, and rating agencies were interested in maximising the number of ratings. The advanced securitisation of mortgages into CDO-type products enabled lending to the subprime segment to expand and credit standards to be relaxed. By the middle of the decade, the relaxation of credit standards had acquired extreme dimensions. This contributed to the subsequent failure of subprime-mortgage-backed CDOs. Prices of AAA tranches of mortgage-backed CDOs provided later on (particularly in 2007 H1) declined more and faster than tranches with mortgages dating from 2006, as the underlying mortgages provided later on were defaulting much faster because they had probably been provided to very risky debtors (see Chart II.1 Box).

At the end of this chain, of course, stood investors willing to accept credit risk. This would probably not have worked in a normal yield environment. However, a low-interest-rate environment had prevailed for many years, despite the relatively strong economic activity, and so investors with "surplus" funds seeking higher yields on the markets were accepting highly risky assets. Monetary policy also probably contributed to the build-up of risks in the financial sector. The expansion of the shadow banking system was dependent to some extent on cheap short-term financing, since its mode of operation consists largely in investment in long-term assets financed with short-term funds. And it was low short-term interest rates that, especially between 2001 and 2005, supported the smooth operation of the shadow banking system and the expansion of activities in the corporate sector with high leveraging.[5] The relationship between monetary policy, the shadow banking system and the credit crisis will undoubtedly be a focus of macroeconomic and financial research in the years to come.

CHART II.1 (BOX)

Prices of AAA bonds backed by subprime mortgages issued in individual half-years

(ABX-HE index; prices in % of nominal value of underlying bonds)



Source: JP Morgan Chase

5 The relationship between low short-term interest rates and the rise in leveraging in the US banking sector is commented on by, for example, The Economist of 22 March 2008 in an article entitled "The financial system: What went wrong?".

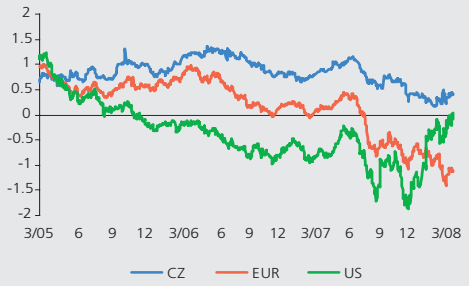
To sum up, owing to the close links between participants in the shadow banking system and banks, the transfer of risks to final investors via securitisation proved to be illusory to some extent. This was fully revealed when the prices of the assets generated in this system started falling. Potential investors dried up, banks were no longer able to provide credit for purchases of securitised assets and the system practically ground to a halt. It has also been confirmed that leveraging is strongly pro-cyclical. When the market went up, debt grew faster than assets. Financial groups were buying securities on credit, and those securities were then being used as collateral for that and other credit. The possibility of borrowing cheaply thus automatically fostered growth in asset prices and vice versa. As soon as the markets turned, the system accelerated again in the opposite direction. In a falling market, financial institutions had to sell their assets in order to repay their obligations. This reduced securities prices, worsened balance sheets and forced further sales. This is how the credit crisis was able to take hold fully.

A major indicator of the size of the risks is the fact that at the end of 2007 long-term interest rates in the USA and the euro area fell below short-term rates and the yield curve thus became inverted at longer maturities (see Chart II.4). The yield curve in the USA has failed to turn significantly positive even after the sharp cuts in monetary policy rates in recent months. This can be regarded as an indicator of a strong lack of confidence in a quick economic recovery. The yield curve in the Czech Republic has also become flatter, but its slope is still normal.

The uncertainty regarding future economic growth in the advanced economies is linked chiefly with uncertainties regarding financial institutions' total losses (see section 4). In its Global Financial Stability Report (April 2008), the IMF estimates that international banks will suffer a loss of up to USD 500 billion, which will lead to a fall in total capital adequacy of 2.5 percentage points in the USA and 1.5 percentage points in Europe. The need to recapitalise banks coupled with the limited functionality of the securitisation process will cause a contraction (or at least a marked slowdown in growth) in loans to the private sector.[6] The IMF predicts that this will cause annual GDP growth in the USA to decline by 0.8–1.4 percentage points. A similar impact can be expected on some European economies, especially those in which property prices had been rising fast in previous years.

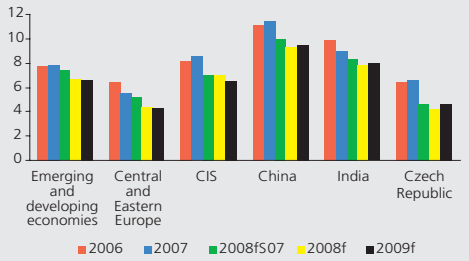
The impact of the potential US recession on global economic activity should be smaller than in similar situations in the past, thanks mainly to the fact that many emerging economies, which export only a relatively small proportion of their output to the USA, are in a phase of recovery or dynamic growth. The bulk of their exports go to other emerging economies or advanced European countries. The current forecasts foresee continuing high growth of Chinese economy and satisfactory growth in the new EU Member States and the CIS countries (see Chart II.5).

CHART II.4
Difference between long-term and short-term rates
(%)



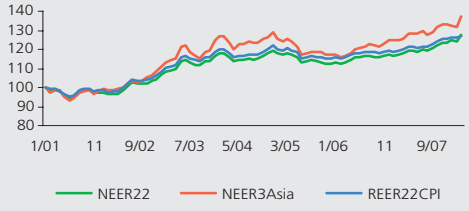
Source: Datastream

CHART II.5
Economic growth in emerging and developing countries
(year-on-year growth in %; outturns and September 2007 and April 2008 forecasts)



Source: IMF (World Economic Outlook, April 2008)

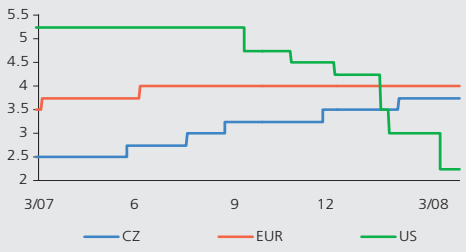
CHART II.6
Effective exchange rates of the euro
(January 2001=100)



Soucе: ECB, CNB calculation
Note: The 22 most important trading partners of the euro area / Japan, China and Korea for 3Asia.

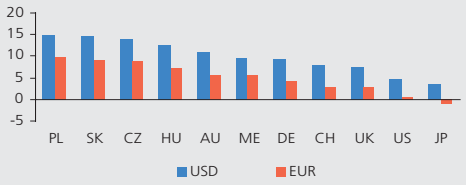
6 At present, the global financial system is in a phase of return to a more traditional structure via processes referred to as de-leveraging and re-intermediation. The first term denotes processes leading to a decline in leveraging in the economy as a whole. They involve a reduction in the availability of credit in the traditional and shadow banking systems, especially for financing riskier clients, and investment projects. The second term describes a re-strengthening of the position of asset-side and liability-side transactions across the entire financial system. The process also involves redirecting some activities from the shadow banking system back to regulated banks. In the initial phase, these interconnected processes may lead to some credit contraction.

Chart II.7
Monetary policy rates from the onset of the financial turbulence to the end of March 2008
(%)



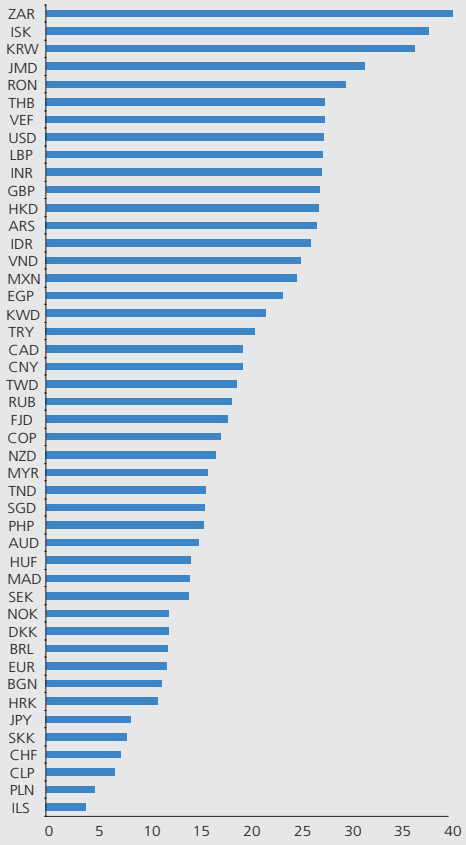
Source: Datastream

Chart II.8
Nominal returns on currencies for foreign investors
(%; 2000–2008 average)



Source: Eurostat, CNB calculation
Note: Approximation of foreign investor's return on government bonds in the relevant currency. The average return is obtained as the sum of the average interest rate on government bonds and the average annual appreciation of the domestic currency's nominal exchange rate against the euro or dollar. 2008=end of March.

Chart II.9
Appreciation of the koruna against traded currencies
(%, from August 2007 to March 2008)



Source: Datastream
Note: from the start of turbulence until mid-March 2008.

The risks in the world economy are also being exacerbated by persisting global imbalances, i.e. different current account developments in the key economies (see Chart II.11). Thanks to the weak dollar, the US deficit is gradually decreasing. Asian countries are also trying to maintain their currencies at relatively weak levels by means of intervention purchases of dollars (over USD 600 billion in 2007) and thereby support their high trade surpluses. Under this pressure, the euro area, which has long been balanced but whose currency has been steadily appreciating in recent years (see Chart II.6), is getting into a slight deficit.

The turn in the credit cycle strongly affected central bank monetary policies (see Chart II.7). After a phase of monetary policy tightening by the Fed, which ended in June 2006 after it raised its monetary policy rate to 5.25%, US interest rates stayed flat until September 2007. In 2007 H2, with the outlook for the US economy worsening, expectations of cuts in monetary policy interest rates in the USA started to dominate. These expectations were subsequently realised by a series of cuts (two of them by as much as 0.75 percentage point). At the end of April 2008, the monetary policy interest rate was 2.0%. Given the persisting inflationary pressures, the future monetary policy steps of the Fed and some other central banks are uncertain.[7]

In the euro area, the ECB raised monetary policy interest rates in two steps by 0.25 percentage point in 2007. Since June 2007, rates have stayed at 4%. Expectations of a halt in growth – or a decrease – in monetary policy interest rates in the euro area started emerging in early 2008, amid a sharper slowdown in economic activity (see section 3.1). However, these expectations were suppressed by persisting relatively high euro-area inflation, which reached 3.5% in March 2008. In the Czech Republic, the monetary policy rate was increased four times during 2007 and once again in February 2008 – each time by 0.25 percentage point – in response to the outlook for inflationary pressures. The CNB's May 2008 macroeconomic forecast assumes that the interest rate environment in the Czech Republic will be relatively stable over the next two years.

The downward revision of the global interest rate outlook led to renewed interest in investing in stable emerging economies' assets. A "search for yield" by investors, seen particularly in the first half of the decade (see the 2006 Financial Stability Report), thus started to re-emerge. In this situation, the risk of renewed appreciation pressures on the koruna materialised. Like the other Central European currencies, the koruna has offered foreign investors relatively high returns in many previous years (see Chart II.8). The perception of the Czech koruna as a "safe haven" is being reinforced by its long-running steady nominal appreciation trend. The koruna started appreciating at the end of summer, probably due to the liquidation of carry trade positions (see section 3.1). In 2008 Q1, the appreciation became exceptionally strong, probably because of the safe-haven effect. Between the onset of the financial turbulence in August 2007 and the start of April 2008, the koruna appreciated by 12% against the euro and by 25% against the dollar. It appreciated against all traded currencies in this period (see Chart II.9[8]).

7 The Fed's dramatic monetary policy measures can be explained by the anti-inflationary potential of any credit contraction and accompanying downswing in economic activity. However, the return of short-term interest rates to a very low level, the supply of liquidity to markets and the weak dollar have fostered growth in prices of commodities, agricultural products and food, which have started to function to some extent as assets. Given the positive impact on inflation and inflation expectations, monetary policy is thus faced with a major dilemma.

8 The meanings of the individual currency codes in Chart II.9 can be found e.g. at www.currencysystem.com/codes/ or fx.sauder.ubc.ca/currency_table.html.

Alternative scenario A: "Safe haven"

Scenario A, whose impacts on the financial sector are tested in section 4.2, assumes a hypothetical significant deepening of the effects of the global financial market turbulence on the real economies of the Czech Republic's euro-area trading partners. The ECB would react to the slowing economic performance of the euro area by lowering interest rates. However, the appreciation of the Czech koruna, driven by the safe-haven motive, would continue. This would result in a decline in annual domestic GDP growth to 2.5% and a slight rise in unemployment. The CNB would react by lowering monetary policy interest rates. The decline in domestic economic growth and the stronger koruna exchange rate would cause a rise in defaults in the non-financial corporation and household sectors, which would be moderated only partially by lower interest rates. Overall credit growth would slow radically and share prices would also fall, while property prices would stagnate.

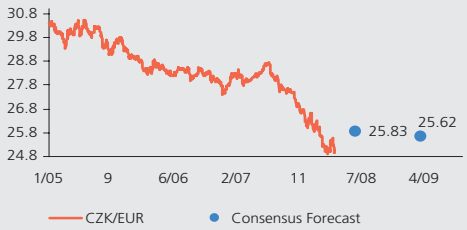
This fast appreciation, which cannot be viewed as being fully fundamental-based, also took financial market participants by surprise. Domestic and foreign analysts and forecasters are therefore forecasting a correction towards weaker values (see Chart II.10). However, there is considerable uncertainty regarding the speed and size of the correction. Given the possible adverse effects of excessively rapid appreciation of the koruna, the CNB signed an agreement with the Czech Government in April 2008 on measures to prevent public sector operations from having undesirable impacts on the foreign exchange market and subsequently on macroeconomic stability.[9] The trade surpluses and industrial output in January and February 2008 indicated that the Czech economy and export performance were resilient to a moderate appreciation of the Czech koruna (see Box 2 in section 2.2), although the adverse impacts of a rapid appreciation usually appear with a lag.

Except for Hungary, the macroeconomic developments in the Central European region in 2007 can be regarded as successful (see Table II.1). The macroeconomic situation in Slovakia and Poland was favourable. Both countries should maintain relatively high economic growth rates amid low inflation and stable external positions. The Central European economies are maintaining financeable current account deficits, although a slight worsening is expected for Poland in 2007 and 2008 (see Chart II.11). Developments in Germany, which has been showing a high degree of resilience so far, are particularly important for the Czech economy. Leading indicators and surveys of German consumer and business sentiment are sending out by turns optimistic and pessimistic signals. Nevertheless, some weakening of the current economic boom in Germany must be expected, partly due to rapid appreciation of the euro against the dollar and Asian currencies. The March Consensus Forecast predicts that the German economy will grow by 1.7% and 1.8% respectively in the next two years, after recording 2.5% growth in 2007.

The domestic macroeconomic environment developed very favourably in 2007. Economic growth, which reached 6.6% in 2007, was positively affected by domestic demand (increased investment activity and household consumption). The

9 Currency conversions of financial flows between the Czech Republic and EU authorities will continue to be effected as far as possible off the foreign exchange market. The Government will ensure that no bodies within its field of competence conduct conversions of funds inflows from the EU directly on the market or conduct any hedging or speculative operations affecting the foreign exchange market. Furthermore, no conversions of privatisation revenues will be conducted on the foreign exchange market. If the Czech Ministry of Finance issues bonds denominated in foreign currency in the coming years, these will be hedged against exchange rate risk.

CHART II.10
Actual and forecasted path of the koruna exchange rate
(year-on-year growth in %, outturns and September 2007 and April 2008 forecasts)



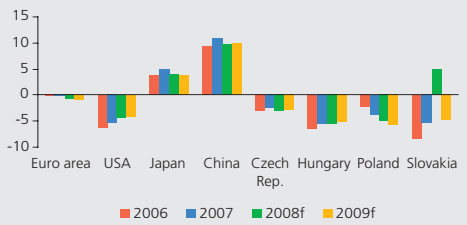
Source: CNB, Foreign Exchange Consensus Forecast 03/2008

TABLE II.1
Macroeconomic indicators for Central European countries
(estimates for 2008 and 2009)

		2006	2007	2008	2009
Hungary	GDP growth (%)	3.9	1.3	1.8/2.2	2.5/3.2
	Inflation (%)	3.9	7.9	5.9/5.9	3.5/3.6
	Fiscal deficit/GDP (%)	-9.3	-6.4	-4.3/4.0	-3.5/-3.2
Poland	GDP growth (%)	6.2	6.5	4.9/5.3	4.5/5.0
	Inflation (%)	1.0	2.5	4.1/4.0	3.8/3.1
	Fiscal deficit/GDP (%)	-3.8	-2.8	-3.2/-3.0	-2.9/-2.8
Slovakia	GDP growth (%)	8.5	10.4	6.6/7.4	5.6/6.3
	Inflation (%)	4.5	2.8	3.6/3.4	3.8/3.1
	Fiscal deficit/GDP (%)	-3.7	-2.6	-2.3/-2.3	-1.8/-1.8

Source: GDP and inflation forecasts: IMF-World Economic Outlook April 2008/Eastern Europe Consensus Forecast 03/2008; fiscal deficit forecasts: OECD Economic Outlook November 2007/current convergence programme

CHART II.11
Current account balances
(% of GDP; outturns and forecasts)

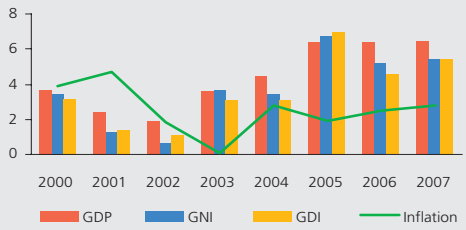


Source: IMF (World Economic Outlook, April 2008)

contribution of net external demand was lower in 2006 than in 2007. According to the March 2008 estimate, GDP growth in 2007 was practically the same as in 2006, not only in terms of overall growth, but also as regards growth of its individual components.

The macroeconomic situation and financial sector were affected by the approved public finance reform as early as in 2007 and this effect will grow in the coming years. Under this reform, a number of fiscal measures have been adopted which are having conflicting impacts on the disposable income of households and corporations.[10] The changes in the fiscal impulse and the impacts of the expected changes on the behaviour of economic agents will cause some volatility in aggregate demand. A rise in the VAT rate on construction work from 5% to 9% strongly affected the property market and related lending. Efforts to buy real estate still at the lower VAT rate gave rise to increased demand for loans for house purchase and also affected the construction industry's performance. The opposite effect can be expected in the coming years, probably compounded by a review of real estate market risks by banks in response to the problems of this market in advanced economies.

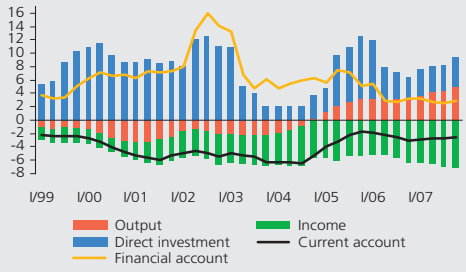
CHART II.12
Inflation and real annual growth in economic activity indicators
(%)



Source: CZSO, CNB

However, at the end of 2007, despite the continued robust economic growth, clear signals of a future slowdown were observable. One of the reasons was rising inflation, which picked up markedly in late 2007 and reached 7.1% year on year in March 2008.[11] This is leading to slower growth in real disposable income, which is negatively affecting household consumption growth. The external developments and the sharp appreciation of the koruna can also be expected to dampen investment activity and net exports in the coming quarters. The CNB's May 2008 macroeconomic forecast expects real GDP growth to slow to 4.7% in 2008 and 4.0% in 2009. The slowing economic growth and declining growth of real disposable income may have some impacts on the ability of households and corporations to repay loans taken out in previous years. On the other hand, it may help to eliminate the excessively optimistic expectations which emerged at the peak of the cycle and supported a rapid rise in the indebtedness of households. It was confirmed in 2007 that the media-monitored data on GDP growth do not correspond exactly to the income situation of households and corporations, owing to a growing outflow of funds abroad. As in previous years (except 2005), gross national income growth and gross disposable income growth were outpaced by GDP growth (see Chart II.12).

CHART II.13
The balance of payments
(% of GDP)



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

The traditional macroeconomic sustainability indicators recorded strongly positive developments in 2007. The public budget deficit under ESA95 methodology fell to 1.6% of GDP. As GDP growth at current prices increased by 10.1% year on year in 2007, the ratio of public debt to GDP fell to 28.7%. From an international point of view, this level is regarded as very safe. The external balance also improved (see Chart II.13). The current account deficit declined to 2.5% of GDP. The robustness of the external position is evidenced in particular by the output balance. This turned into a surplus at the start of 2005 and since then the surplus has been increasing steadily. Accordingly, its ability to cover the income deficit (which reached almost 70% last year) is growing. If the CZK 120 billion in reinvested earnings were deducted from the current account balance, the current account would show a surplus of CZK 31 billion. The ratio of reinvested earnings to FDI further increased to 70%. However, this trend is to a large extent natural and cannot be regarded as a risk from the external balance perspective.

10 A more detailed assessment of the effect of the fiscal reform on the macroeconomy was given in the CNB's October 2007 Inflation Report.

11 The high inflation in 2008 Q1 reflects an extraordinary build-up of one-off factors, namely globally rising commodity, energy and food prices and domestic increases in regulated prices, excise duties and VAT. In the course of 2008, these factors will start to unwind and inflation should return quickly to lower levels.

2.2 NON-FINANCIAL CORPORATIONS

Non-financial corporations posted good economic results in 2007, with many of their key financial indicators exceeding the three-year highs recorded in 2006. Although the sector's debt continued rising, the growth rate of loans granted to non-financial corporations decreased over the course of the year. This may indicate a future downswing in corporate sector performance associated with the expected weakening of economic activity due to global and domestic factors. Although the credit risk of the corporate sector remains stable, it is expected to increase in 2008 in relation to the expected slowdown in economic growth. These conclusions are indicated both by the macroeconomic credit risk model and by a new creditworthiness indicator. Another risk to the non-financial corporations sector is the sharp appreciation of the koruna. Although the first-quarter real economy data suggested that corporations were able to cope with this exchange rate shock, some negative effect on exporters can be expected to emerge gradually. The share of property developers in total loans to the corporate sector has increased rapidly in recent years against a background of rising prices of both residential and commercial property, and currently stands at more than 25%. Given this sector's tendency to react to property price growth with a lag, a potential cooling of the real estate market poses a sizeable risk with potential effects on the banking sector.

Profitability increased in 2007. The inventory and asset turnover ratios declined, while value added per employee and the current, acid-test and cash ratios all increased. The debt ratio grew slightly, as did debt servicing costs owing to the rising interest rates. The personnel cost-output ratio and the ratio of personnel costs to value added rose slightly as well (see Chart II.14). Despite the increase in the corporate debt-to-GDP ratio, this indicator for the Czech Republic is still half that of the EU12 countries and since 2001 has been roughly at the same level as in the USA, where, however, corporations are traditionally financed more through the capital market (see Chart II.15).

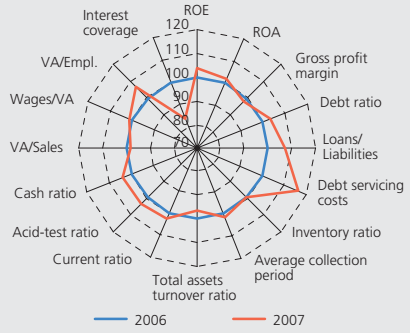
Despite non-financial corporations' relatively positive results, some signs of slowing corporate sector performance are visible. These are associated with the expected economic slowdown due to global and domestic factors. At the end of 2006 bank loans to non-financial corporations had shown record annual growth rates of almost 21%, whereas at the end of 2007 the rate returned to a more restrained figure of just over 17% (see section 4.2). If the CNB's macroeconomic forecast materialises, corporate lending growth should, according to the CNB's internal models, decrease further in 2008, to 13%. Compared to 2006, when the growth in loans had been driven by small and medium-sized enterprises, the growth in 2007 was very heterogeneous. The fastest growth in bank loans was recorded for enterprises with 100–249 employees. Enterprises with 250 employees or more, which can rely more on cheaper sources of financing, such as the capital market or loans from their parent corporations, as usual showed the lowest growth (see Chart II.16).

Despite some signs of slower growth in lending, the credit risk of the corporate sector as measured by the 12-month default rate has yet to rise and remains below the 3% level (see Chart II.17).[12] In line with the expected economic slowdown, we assume, however, on the basis of the macroeconomic credit model, that the 12-month corporate default rate will increase by 1–2 percentage points in 2008.[13]

12 The 12-month default rate is calculated using data from the Central Register of Credits managed by the CNB, which contains information on the bank loans of legal entities.

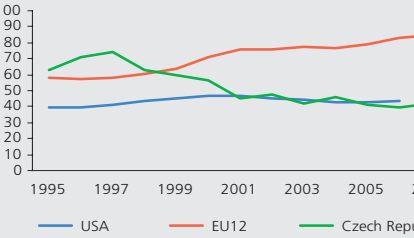
13 According to the estimated model, the aggregate 12-month default rate increases with appreciation of the domestic currency and growth in the debt ratio of the corporate sector and falls with growth in real gross domestic product and higher inflation. A detailed description of the model estimated using the data for 1998–2006 can be found in Jakubík, P., Schmieder, C. (2008): Macroeconomic Credit risk Modelling and Stress Testing. CNB Working Paper, forthcoming.

CHART II.14
Key financial indicators for non-financial corporations
(2006 = 100; index > 100 = improvement; index < 100 = deterioration)



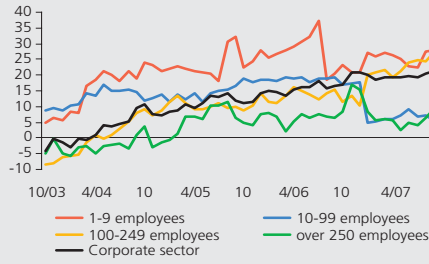
Source: CZSO, CNB calculation

CHART II.15
Debt ratios of non-financial corporations
(% of GDP)



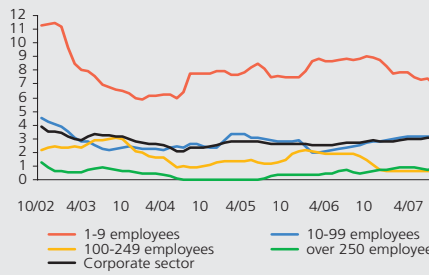
Source: Eurostat, US Bureau of Economic Statistics
Note: The debt ratio is calculated as the ratio of loans received and bonds issued from financial accounts to GDP. The 2007 figures are estimates.

CHART II.16
Credit growth
(monthly data; year-on-year growth in credit to corporations by number of employees in %)



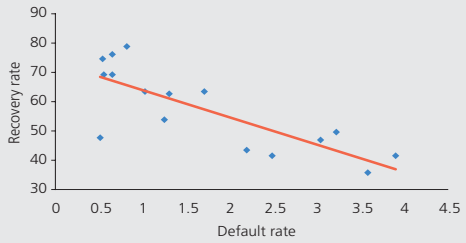
Source: CNB (CRC)

CHART II.17
12-month corporate default rate by number of employees
(%)



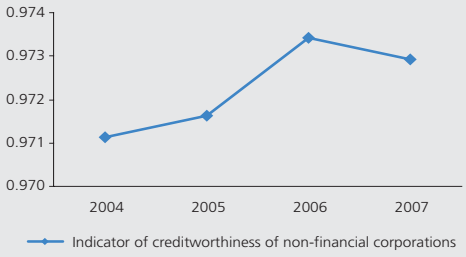
Source: CNB (CRC)

CHART II.18
Recovery rate versus default rate for unsecured world bonds
(%)



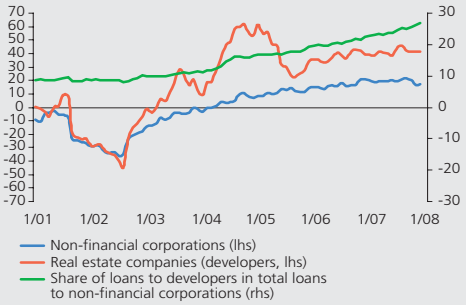
Source: Moody's, CNB calculation

CHART II.19
Indicator of creditworthiness of non-financial corporations



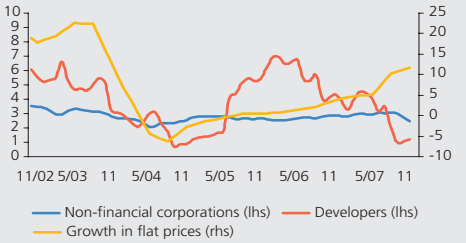
Source: CZSO, CNB calculation
Note: The indicator expresses the outlook one year ahead in the given year

CHART II.20
Credit growth: Real estate companies versus non-financial corporations
(%)



Source: CNB

CHART II.21
Default rate of developers versus default rate of non-financial corporations as a whole and growth in flat prices
(%)



Source: CNB, CZSO

The data confirm that smaller corporations are more risky. At the start of 2007, the 12-month default rate was about 8% for small corporations and 3% for medium-sized corporations, while that for large corporations was less than 1%, which is well below the total aggregate average. In addition to the corporate default rate, the financial sector is affected by the rate of recovery of claims in default, which is correlated with the probability of default and usually decreases as it rises. A low rate of recovery of claims has a negative impact on the financial sector. Based on Moody's data on the default and recovery rates for secured and unsecured world bonds in 1990–2006, an inverse relationship has been estimated between the default rate and the rate of recovery of claims in default for secured and unsecured bonds (see Chart II.18). Assuming that this relationship is valid for the Czech economy, the recovery rate for large enterprises should, based on knowledge of their default rate, be around 66% for secured claims and 52% for unsecured claims.

The hypothesis of an increase in corporate sector risk in 2007 is confirmed by the creditworthiness indicator, which serves as an indicator of the financial stability of the corporate sector.[14] This indicator calculates the outlook for the sector's risk at the one-year forecast horizon based on financial indicators of solvency, profitability, liquidity and activity. The creditworthiness indicator for 2007 is somewhat lower than that for 2006, but is still higher than that for 2005 (see Chart II.19). According to these results, corporate sector risk should show a modest increase in 2008. This expectation is driven chiefly by a higher debt ratio, lower interest coverage and a lower gross profit margin.

Rising prices of residential and commercial property, continued corporate investment demand, the improving income situation of households and the relatively low interest rates all helped to increase the significance of the "real estate activities" sector (CZ-NACE 70). Strong growth in bank loans provided to this segment of non-financial corporations in the last four years has fostered an increase in the share of property developers in total loans to the corporate sector, from 9% at the end of 2001 to more than 25% at the end of 2007 (see Chart II.20). These are mostly property development firms specialising in the construction or renovation of commercial or residential property for renting or selling on.[15]

The high growth of the sector, along with the signs of a possible overheating of the property market (see section 3.2), are raising concerns about whether a cooling of the property market could generate serious problems in the sector. The high exposure of banks to developers could in turn lead to banking sector losses and the problems could spill over via developers from the property market to other segments of the economy (construction, etc). The default rate of developers is generally more volatile than the aggregate default rate and may react with a lag to movements in property prices (see Chart II.21). The strong increase in property prices prior to the Czech Republic's entry to the EU may have generated optimistic expectations in the property development sector, leading to higher investment activity. The subsequent sharp slowdown in property price growth may have contributed to the later rise in the default rate in 2005–2006. The current rise in property prices (see section 3.2) increases the risk of a trend similar to the one observed around the time of EU accession. The current relatively low default rate in this sector could thus increase again.

14 More details on this indicator can be found in the article *Scoring as an Indicator of Financial Stability* in the thematic part of this Report.

15 However, they also include other real estate companies, such as estate agencies, property management companies and owners' associations and housing cooperatives. The last two were not included in the default rate calculation.

Alternative scenario B: "Property market crisis"

Scenario B simulates a domestic property market crisis caused by market saturation. Property prices are assumed to fall by 30%, which would cause problems in the property development sector. The large investments by developers have been driven by over-optimism regarding future demand and rising property prices. If these expectations failed to materialise, loan defaults would increase. Owing to the direct effects on other sectors (construction, etc.), as well as indirect effects, i.e. a rising unwillingness of banks to finance the real sector, domestic economic activity would decrease. Real GDP growth would thus decline radically during 2008, unemployment would rise and inflation would fall slightly.

The CNB would react by lowering rates. The transmission to the economy would, however, be moderated by a rising risk premium on the money market due to uncertainty about the amount and distribution of the losses on loans in default. The exchange rate of the koruna would depreciate slightly, further deepening the problems of developers indebted in foreign currency. This scenario would result in a sharp increase in the default rate, driven primarily by the corporate sector. Growth in lending would also slow and stock prices of developers and other companies would decline.

Foreign currency loans account for around 30% of total loans to developers, which is a higher figure than for non-financial corporations as a whole. If the over-optimistic expectations regarding property price growth fail to materialise and the domestic currency depreciates, this segment of business would be hit hard (see alternative scenario B "property market crisis").

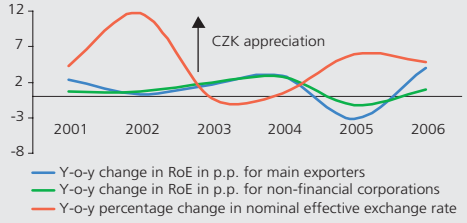
Box 2: Analysis of export-oriented corporations

The sharp appreciation of the koruna in 2007 H2 and early 2008 raises the question of how sensitive the Czech economy is to exchange rate fluctuations. Our analysis used financial indicators for the 611 largest Czech exporters from the Magnus database (Čekia) and data from the CNB's Central Register of Credits. The results show that exporters are more sensitive to the exchange rate than is the economy as a whole. The sensitivity of exporters varies, however, according to import use, firm size, debt ratio and the currency structure of bank loans received.

During the 2001–2002 and 2005–2006 appreciation waves, the profitability of the largest exporters generally decreased faster than that of large non-financial corporations as a whole (see Chart II.2 Box). The impact of the exchange rate on exporters' profitability is generally symmetrical, i.e. this segment is profitable at times of depreciation. Thus, greater profit volatility is a bigger problem than exchange rate appreciation itself. In the case of the Czech economy, however, we are observing a long-term appreciation trend exerting constant pressure on exporters' profitability. The appreciation of the koruna affects the economy not only directly via falling sales and profits of exporters, but also indirectly through the impact on sales of local sub-contractors and service-oriented businesses.

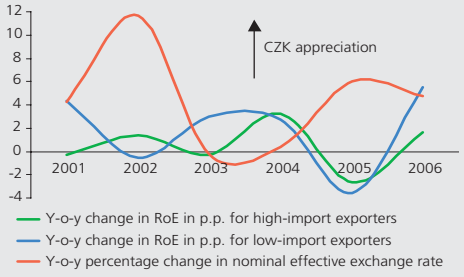
The appreciation of the currency may partly offset the impacts on the sales of those exporters who simultaneously import foreign goods for investment and

CHART II.2 (BOX)
Profitability of exporters versus profitability of non-financial corporations as a whole
(% and percentage points; RoE = return on equity)



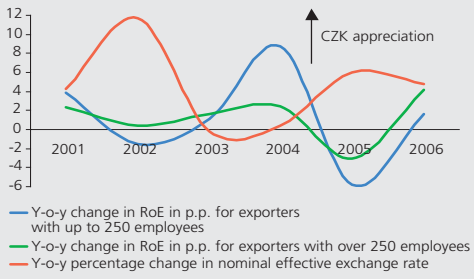
Source: CZSO, Magnus, CNB calculation
Note: Annual data, smoothed curves.

CHART II.3 (BOX)
Profitability of import-hedged exporters versus profitability of other exporters
(% and percentage points; RoE = return on equity)



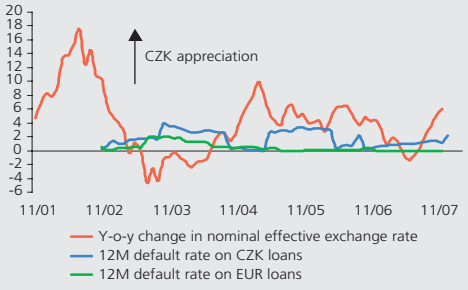
Source: CZSO, Magnus, CNB calculation
Note: Annual data, smoothed curves.

CHART II.4 (BOX)
Profitability of large exporters versus profitability of medium-sized and small exporters
(% and percentage points; RoE = return on equity)



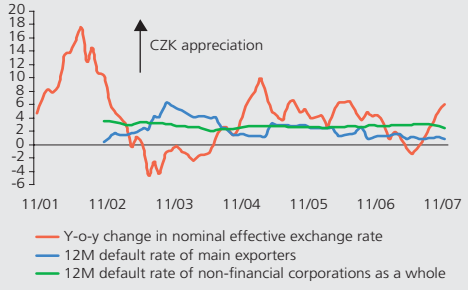
Source: CZSO, Magnus, CNB calculation
Note: Annual data, smoothed curves.

CHART II.5 (BOX)
12M default rate of exporters by loan currency
(%; monthly data)



Source: CNB, CRC, CNB calculation

CHART II.6 (BOX)
12M default rate of exporters versus non-financial corporations and exchange rate developments
(%; monthly data)



Source: CNB, CRC, CNB calculation

intermediate consumption. Many large exporting firms specialise in processing imported intermediate products and re-exporting them. The results of the analysis suggest that the profitability of such enterprises is generally less sensitive to exchange rate fluctuations (see Chart II.3 Box), although these results depend partly on how the individual firms are classified.[16]

Another factor that can affect the sensitivity of profitability to the exchange rate is company size. For large enterprises it can be easier and cheaper to hedge using currency derivatives. Foreign-controlled corporations can also hedge via their parent companies. The results of the analysis confirm that the sensitivity of large export-oriented corporations (with 250 employees or more) to the exchange rate is lower than that of smaller enterprises (see Chart II.4 Box).

The analysis of the currency composition of loans reveals that the exporters drawing mostly on foreign currency (euro) loans are less risky (see Chart II.5 Box). The hedging offered by foreign currency loans may thus be one of the instruments available for reducing the sensitivity of exporting firms to the adverse effects of exchange rate movements. Exporters can also transfer part of the currency risk to their sub-contractors by means of agreements to pay for deliveries in foreign currency. The results of a CNB survey of businesses suggest that the share of foreign currency payments and receipts in total domestic payments and receipts has been increasing gradually since 2003. In 2007, the figures were around 20% for payments and 13% for receipts.

The monthly data on repayments of loans granted to the largest exporters by banks in the Czech Republic show that the 12-month default rate is more volatile for exporters than for the economy as a whole (see Chart II.6 Box).[17] Recently, this indicator has been lower for exporters than for the economy as a whole, but this has not always been the case. As the analysis was conducted for relatively large corporations, values of the 12M default rate equal to or above the whole economy level indicate higher risk. However, dependence of the 12M default rate on exchange rate changes is indicated only in certain periods (particularly after the strong appreciation wave in 2001–2002 and partly also in 2005). This would indirectly confirm the hypothesis that although the sales and profitability of exporters are sensitive to exchange rate changes, their ability to repay loans is less dependent on such changes.

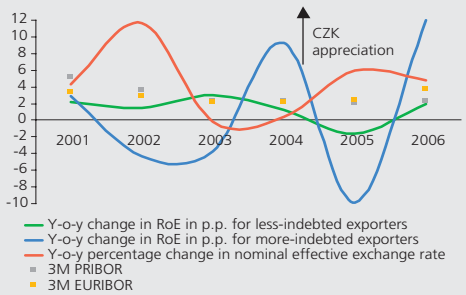
The debt ratio affects the sensitivity of exporters to exchange rate movements. In 2006, the average debt of the largest exporters measured as the ratio of external funds to total liabilities was higher than that of larger non-financial corporations (54% versus 45%). The results show that exporters with a higher debt ratio (over 54%) were far more sensitive to the exchange rate (see Chart II.7 Box). This would mean that exporters' borrowings are mostly

16 No data on specific exports and imports were available for the construction of the sample of import-hedged exporters. Information on the difference in ranking of the largest exporters in the list of exporters and importers was used as a proxy. The set of import-hedged exporters thus included enterprises whose ranking in the list of largest importers was higher or roughly the same as that in the exporters list. For example, a firm ranked thirtieth in the exporters list and better than thirtieth in the importers list would be included in this set.

17 The higher volatility of this indicator for exporters may also be due to the relatively small sample of corporations.

in Czech koruna and not in the export currency (euro in particular). Borrowing in euro would reduce the financial costs expressed in koruna given an appreciation of the domestic currency and thus also reduce the sensitivity of profits to the exchange rate. The evolution of the interest rates of the two currencies in 2001–2006 suggests that the profitability of exporting firms was not driven primarily by interest expenses. An analysis of the data from the banking credit register reveals that the share of euro loans in loans granted to the largest exporters in the last five years is around 25% and is higher than in the economy as a whole (about 17%). In the case of exporters, this share is not rising much over time. The hedging function of this instrument in an environment of a strongly fluctuating exchange rate is probably offset by disadvantages in the form of higher interest rates or other conditions.

CHART II.7 (BOX)
Profitability of indebted exporters versus profitability of non-indebted exporters
(% and percentage points; RoE = return on equity)



Source: CZSO, Magnus, CNB, CNB calculation
Note: Annual data, smoothed curves.

2.3 HOUSEHOLDS

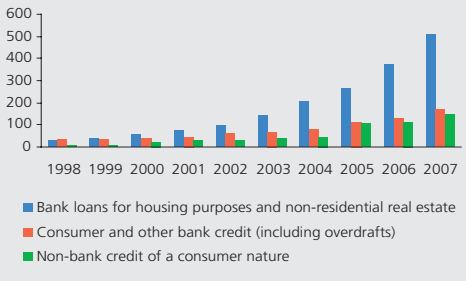
Household debt continued growing, but remained lower than in the advanced Western European EU countries. The overindebtedness of some groups of the population – solving their repayment problems by taking on more debt, often at high interest rates – poses the main risk. Owing to their low creditworthiness, these groups are falling into a debt trap. The non-bank sector is significant in this respect, as its loans account for about 60% of the liabilities of this group of the population and for almost 50% of the entire consumer credit market.

Households[18] create savings and provide funds to non-financial corporations through banks and other financial intermediaries. Their indebtedness has increased significantly in recent years and any problems with loan repayment would hit the whole financial sector. The growing household debt has been accompanied by a decrease in the gross saving rate of households, which fell to a ten-year low in 2007 (5.1%). This trend was due to an expected increase in household incomes connected with the real convergence process, easier access to loans, the low interest rates in recent years, rising real estate prices and population ageing.

Household debt is increasing by roughly one-third every year. In 2007, the debt of Czech households exceeded CZK 800 billion.[19] Bank loans to households amounted to CZK 680 billion at the end of last year, of which loans for house purchase accounted for CZK 510 billion and consumer credit for CZK 170 billion (see section 4.2). In addition, households owe almost CZK 150 billion to non-bank institutions (see Chart II.22). The share of bank loans to households in the total resident loan portfolio increased further during 2007 (to 40% in 2007 from 37% in 2006) and was almost the same as the share of loans to non-financial corporations. This trend was driven by households' continuing interest in buying their own homes and by the one-off effect of advance financing of construction work owing to a change in the lower VAT rate from 5% to 9% with effect from 1 January 2008.

The ratio of debt to gross disposable income of households was 47% at the end of 2007 (compared to 40% at the end of 2006). The debt-to-financial assets ratio also

CHART II.22
Bank and non-bank credit to households
(CZK billions)

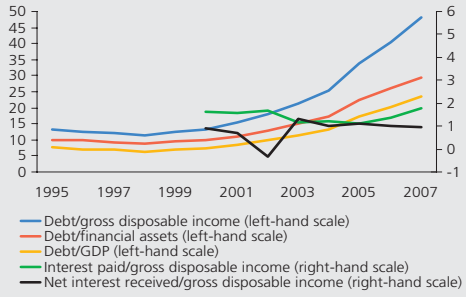


Source: CNB, CLFA

18 Throughout section 2.3, "household sector" refers to private individuals; in the CZSO classification, the term households is used for both individuals and sole traders.

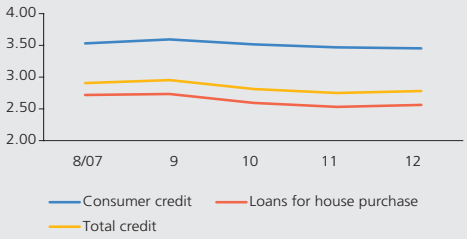
19 Although household debt has been steadily increasing by about one-third every year since 2002, it has grown significantly in absolute terms. Total household debt rose by CZK 214 billion in 2007, which is around five times the growth in 2002 and more than the total volume of household debt that year (CZK 185 billion). The absolute debt volume in 2007 was 4.5 times higher than in 2002.

CHART II.23
Ratio of debt to gross disposable income, financial assets and GDP; ratio of interest paid to households' gross disposable income
(%)



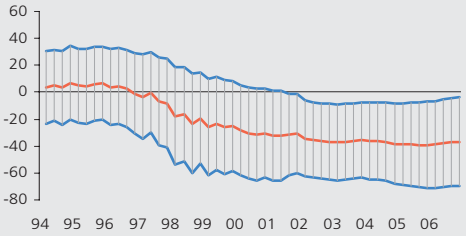
Source: CNB
Note: 2007 refers to Q3.

CHART II.24
12-month default rate of households by credit type
(%)



Source: Czech Credit Bureau, CNB

CHART II.25
Deviation from equilibrium private sector credit-to-GDP ratio
(percentage points; blue curves indicate 95% confidence interval)



Source: Backé, P., Égert, B., Walko, Z. (2007): Credit Growth in Central and Eastern Europe Revisited. OeNB Focus 2/07, pp. 69–77.
Note: Negative values indicate that the current debt ratio is lower than the estimated equilibrium debt level measured as a percentage of GDP.

indicates that the debt burden of households is rising (30% at the end of 2007 versus 26% at the end of 2006). Total household debt as a percentage of GDP continued rising and is now roughly 23%. As in 2006, total interest received from households was higher than interest paid in 2007, but the trend of slightly falling net aggregate interest income continued (see Chart II.23). Despite the rapid growth in Czech households' debt, the total debt level is still low compared to Western European countries, as confirmed by all three indicators mentioned above. For example, the ratio of debt to household disposable income exceeds 170% in the UK, 120% in the USA, 130% in Ireland and 200% in Denmark and the Netherlands. The debt-to-financial assets ratio also confirms the lower debt of Czech households, although the differences here are not so large – Denmark 55%, Spain 47%, Portugal 47%, the Netherlands 39%, Germany 35% and Austria 35%. For some countries this indicator is in fact lower – e.g. Belgium 19%.[20] The generally lower debt of Czech households is also confirmed by the debt-to-GDP ratio, which is about one-third of the euro area average. Hence, Czech households as a whole cannot be regarded as overleveraged yet. If, however, borrowings continue rising at the same pace, the ratio of debt to gross disposable income will reach about 57% at the end of 2008, which is the level reached in the euro area about ten years ago. If the debt continues growing at the same rate thereafter, this indicator will, other trends being unchanged, reach the present euro area average (about 100%) probably at the end of 2011.[21]

Despite the gradually rising household debt, we are not currently observing any growth in the credit risk of households, which is around 3% (see Chart II.24).[22] According to the CNB's internal model, we expect this indicator to stay close to the present level in 2008.[23] Should any of the less favourable scenarios materialise, the degree of risk could increase by about 0.5 percentage point. This applies in particular to low-income groups. These groups may have problems with repaying their obligations as a result of an increase in necessary consumption expenditure in 2008 bolstered by one-off effects of the public finance reform.

The existing studies analysing the equilibrium level of debt of the private sector (as measured, for example, by the ratio of loans to the private sector to GDP) confirm that the rise in debt in the Czech Republic is in line with the country's overall economic growth (see Chart II.25). According to an Austrian central bank study using IMF data, this ratio could be 70% but is about 40% at present. This means that there is no "excessive" growth in lending that might mask certain risks

20 All the above household sector debt indicators are calculated on the basis of aggregated balance sheets. Households may have a large quantity of financial assets on aggregate, but the same need not apply to indebted individuals. The lower values of the debt-to-financial assets ratio in some countries may reflect greater imbalances in wealth distribution. This effect is likely to be more pronounced for an indicator based on financial assets than for an indicator based on disposable income. In countries with several wealthy individuals holding a large proportion of the stocks of large firms, the debt-to-financial assets ratio may be highly biased.

21 These figures are based on relatively pessimistic scenarios regarding income and lending growth (gross disposable income growth of 7% a year and growth in loans of 30% a year). The real situation, however, may be more favourable.

22 The 12-month default rate of households can be calculated using data from the banking register of client information. The time series has been collected under an agreement between the CNB and the Czech Banking Credit Bureau only since August 2007. Historical data are not available in the register, so we cannot yet observe the 12-month history and the figures are estimates.

23 The macroeconomic model of household credit risk estimated for the Czech economy can be found in Jakubík, P. (2007): Credit Risk and Stress Testing of the Banking Sector in the Czech Republic. Financial Stability Report 2006, pp. 61–62. This model estimates credit risk on the basis of real interest rates and unemployment in the economy, which has a direct impact on households' disposable income.

to the future stability of the financial system. This conclusion does not apply generally to all Central and Eastern European countries.[24]

Household borrowing may have different effects on different groups of the population. Low-income households and households with one economically active member are exposed to the highest risk of potential repayment problems in the future. For example, according to CZSO data available for 2006, in 4% of households with mortgages the main economically active person is unemployed (see Chart II.26). The most frequent mortgage recipient in the Czech Republic is a household with two economically active persons and one child. The main breadwinner is a 39-year-old employee with secondary education. His partner is a 33-year-old employee or housewife with secondary or basic education. About 13% of households have mortgage loans (8% of them live in rented apartments, the vast majority of which pay regulated rents). Half of all households have net monthly money income of less than CZK 20,000[25] while the figure for households with mortgages is CZK 27,000. The distribution of households with and without mortgages confirms that mortgage loans tend to be demanded by households with higher net income (see Chart II.27). One factor of future demand for mortgage loans is the proportion of persons living in rented apartments, which was about 23% at the end of 2006. The majority (around 80%) were in apartments with unregulated rents. Rising interest in home ownership can thus be expected going forward.

Box 3: The debt burden on households and loan repayment problems

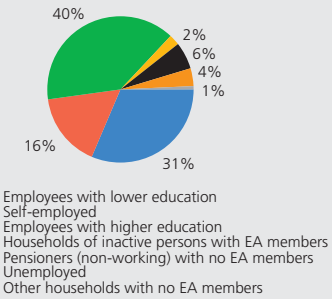
The CZSO survey "Household income and living conditions in 2006" reveals that the share of households using consumer credit remained at 23%, whereas that of households with loans for house purchase increased compared to the previous year to 11%. The percentages of low-income and high-income households obtaining credit were similar, while the share of medium-income groups was much lower (see Charts II.8 and II.9 Box). Lower-income households continued to slightly prefer consumer credit, whereas higher-income households mainly demanded loans for house purchase, but used consumer credit, which is probably partly linked with the furnishing of their new homes. The lower use of loans by medium-income households can be explained primarily by the fact that they largely cover their consumption spending from current income and do not take out loans for house purchase due to budget constraints. Since loans for house purchase represent two-thirds of total loans in terms of volume, high-income households have a larger volume of loans than low-income and medium-income ones.

The debt burden expressed by the ratio of repayment of principal and interest to net money income was about 4% in 2006 and was roughly the same across all income groups of households. Repayment problems were reported by less than 3% of households. These problems were related mainly to consumer credit, which constituted a heavy burden for 6% of households and some burden for 15% (see Charts II.10 and II.11 Box). The biggest increase was recorded in the number of households for which consumer credit repayment represented some burden. Loan repayments constituted a heavy burden for lower-income households (as reported by the two lowest-

24 See Backé, P., Égert, B., Walko, Z. (2007): Credit Growth in Central and Eastern Europe Revisited. Focus on European Integration 2/07, OeNB. The analysis finds that Latvia and Croatia, for example, have elevated debt levels relative to their economic fundamentals.

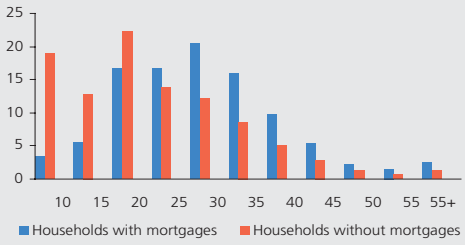
25 Including pensioners, who account for about 15% of households.

Chart II.26
Breakdown of households with mortgages by social group
(%)



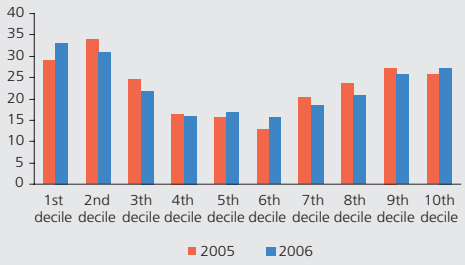
Source: CZSO

Chart II.27
Distribution of net monthly money income of households with and without mortgages
(x-axis: net monthly money income in CZK thousands; y-axis: % of households in given category)



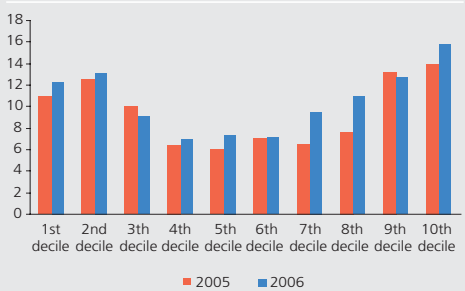
Source: CZSO

Chart II.8 (Box)
Shares of households with consumer credit in individual income groups
(%)



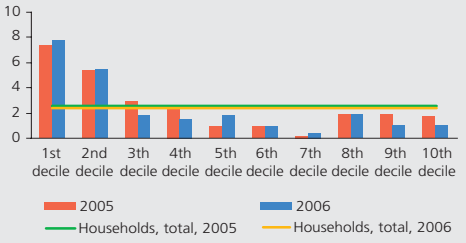
Source: CZSO

Chart II.9 (Box)
Shares of households with loans for house purchase in individual income groups
(%)



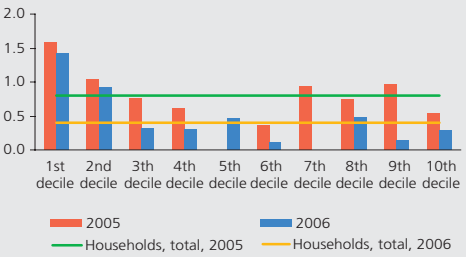
Source: CZSO

Chart II.10 (Box)
Problems making consumer credit repayments in individual income groups
(%)



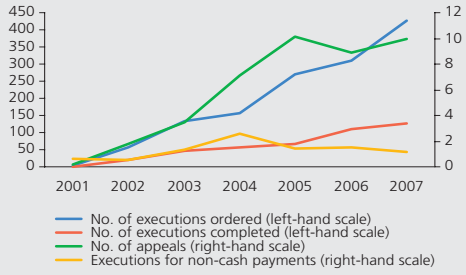
Source: CZSO

Chart II.11 (Box)
Problems making housing loan repayments in individual income groups
(%)



Source: CZSO

Chart II.28
Execution proceedings
(thousands)



Source: Chamber of Executors of the Czech Republic

income groups – 15.8% and 11.8% respectively, although some burden was again found for all income groups).

According to subjective assessments, 68% of households had difficulty making ends meet with their income, which is slightly more than in the previous period. In the three lowest-income groups the figure was 80%–90%, whereas in the highest-income group it was only 30%. However, 41.3% of households could not afford to pay an unexpected expense of CZK 6,000, down by 2.8 percentage points from a year earlier, but the figure for the two lowest-income groups is 60%–78%. These households are moreover dependent on social benefits. In the two lowest-income groups, such benefits accounted for 18% and 7% of net money income, showing a year-on-year decline in the period under review. Overall, the share of households obtaining credit increased in 2006. Loan repayment problems were reported by a relatively small percentage of households. In the two lowest-income groups, however, the figure was above the average for households as a whole.

One of the manifestations of the rising indebtedness is marked growth in the number of executions ordered in 2007. This growth also reflects the fact that this instrument is starting to be used to recover a wider range of claims (see Chart II.28). Most cases involved minor claims associated with more radical recovery by creditors. The overindebtedness of low-income groups of households, along with insufficient financial education, still poses a risk, despite the relatively stable position of the household sector. Many people overestimate what they can afford and are unable to repay their debts. They resolve this situation by borrowing more, often at very high rates due to their low creditworthiness, and so fall into a debt trap. The non-bank sector is significant in this respect. Loans provided by this sector account for about 60% of the liabilities of this group of people. Some 86% of all loans provided to households by non-bank institutions are for consumption (CZK 126 billion at the end of 2007). This represents almost 50% of the consumer credit market (the remainder being bank loans). This market segment is governed primarily by the Consumer Credit Act, which now obliges creditors to inform debtors about their annual percentage rate of charge (APRC). In addition to the poor financial literacy of debtors, this market's problems include unfair business practices by lenders. Further planned measures to improve consumer protection should help mitigate this problem. Legislative measures in the area of loan agreement conditions, e.g. the banning of arbitration clauses, would also be helpful.[26] The planned implementation of financial education into primary and secondary school curricula should also have a positive effect.

People in difficult situations leading to indebtedness can get help from several non-profit institutions and citizens advice centres. These include the SPES, the Association of Citizens Advice Centres, the Consumer Protection Association, the Czech Consumer Association and People in Need. According to information from the SPES[27] and the new Financial Difficulties Advisory Centre,[28] the number of people seeking help from these organisations is gradually rising. The most frequent

26 These clauses, implemented by some lenders in loan agreements, mean that any future disputes between the lender and the debtor will be settled by arbitration. Their problematic feature is the subsequent unilateral appointment of the arbiter by the lender under the terms and conditions of the loan agreement.

27 More details about the SPES can be found at: http://www.pomocsdluhy.cz.

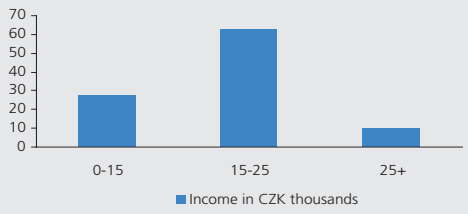
28 The centre was opened in January 2008. More details can be found at: http://www.financnitisen.cz.

visitors to such centres are men aged 30–40,[29] married with two children on average, with vocational or secondary education, an average monthly income of CZK 15,000–25,000 (see Chart II.29), 12 creditors and debts of CZK 300,000–CZK 600,000 (see Chart II.30). In the vast majority of cases (95%), the clients of such centres initially borrowed from banks, then moved to non-bank institutions and, in about 50% of cases ended up turning to advertisers offering loans to less creditworthy clients at very high interest rates. Only about every thirtieth client seeking help has a mortgage loan, but American mortgages and loans secured by property are very frequent. People ask most often about how to deal with multiple loans after misjudging what they could afford and ending up insolvent and faced with court cases and distraint. Other questions concern the option of debt discharge via personal bankruptcy.

The new Insolvency Act,[30] which took effect in January 2008, introduces the option of debt discharge (personal bankruptcy) for private individuals who are unable to manage their debts. Two basic mechanisms have been defined to this end. The first option involves selling off the debtor's assets, and the second entails payment according to a five-year payment plan. Both are conditional upon payment of at least 30% of the amount due and on the debtor having "honest intentions" to discharge his obligations. The first case involves selling off all existing assets, whereas in the second case the debtor keeps his assets and repays the debt out of future income. This, however, only applies to unsecured debts. Secured creditors are satisfied preferentially through enforcement of the relevant pledges. The discharge method is decided on by the creditors by a simple majority of the votes cast. The debtor thus cannot choose the alternative that is more advantageous to him. Both cases end with the debt being completely cleared and at least 30% of the unsecured liabilities being repaid. The Act, however, allows less than 30% of the debt to be repaid to creditors who express their written consent. Creditors may also recover less than 30% if the debtor is unable – through no fault of his own, for example due to illness – to pay the agreed repayment amounts in compliance with the five-year payment plan. In such case, the court may decide to clear the debt at the end of the five-year period without the 30% threshold having been met. Personal bankruptcy creates better conditions for both debtors and creditors. Via the discharge process, it motivates debtors to repay their debts and allows them to become economically active again.[31]

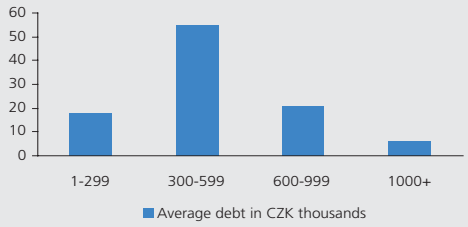
In practice,[32] personal bankruptcy is usually applied for by people with an average monthly income of about CZK 20,000, debts of around CZK 800,000 and 12 creditors on average. The majority are divorced or single and aged either over 55 or around 30 years. 40 years of age tends to be the exception. The applicants have most difficulty completing the petition.[33] The insolvency procedure itself incurs no direct financial expenses, but the debtor must pay CZK 900 each month to the insolvency trustee. The aforementioned non-profit institutions help people to prepare for personal bankruptcy.

CHART II.29
Distribution of clients of Financial Difficulties Advisory Centre by monthly income
(% of all clients of Centre)



Source: Financial Difficulties Advisory Centre

CHART II.30
Distribution of average debt of clients of Financial Difficulties Advisory Centre
(% of all clients of Centre)



Source: Financial Difficulties Advisory Centre

29 In the case of the SPES this is just an estimate, as clients are not asked to give their date of birth. By contrast, the Financial Difficulties Advisory Centre does ask about the age of its clients.

30 Act No 182/2006 Coll., on Insolvency and Methods of Resolution Thereof (Insolvency Act).

31 Another public source of information for potential creditors is the newly established insolvency register administered together with the bankrupts database by the Czech Ministry of Justice. In the first three months after the amendment came into effect, the courts permitted 135 discharges based on data from this register. The experience to date, however, shows that only a fraction of people with excessive debts meet the legal conditions for permitting the discharge process.

32 In the first three months, the SPES prepared 41 persons for personal bankruptcy, 15 of whom were granted permission for debt discharge. Eight applications were refused and the remainder are in proceedings. Personal bankruptcy only applies to private individuals and cannot be used to discharge debts associated with business activities.

33 The petition alone runs to 11 pages.

3 ASSET MARKETS AND THE FINANCIAL INFRASTRUCTURE

3.1 THE FINANCIAL MARKETS

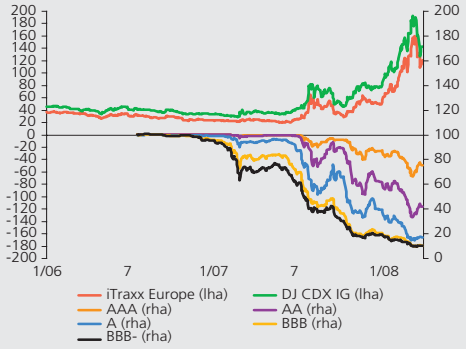
The US subprime mortgage crisis, which started in summer 2007, had a strong effect on global financial markets. The impact on the Czech markets was relatively limited and largely similar to the corrections seen in the previous two years, i.e. falling stock prices, stable long-term yields and appreciation of the koruna against the main world currencies. Nonetheless, some indicators suggest that the increasing global risk aversion was partially reflected in the Czech financial markets.

In mid-2007, the advanced financial markets experienced strong shocks (see section 2.1). In July, in an environment of rising interest rates and slowing property price growth, a surge in subprime mortgage defaults in the USA was reflected in a slump in the prices of bonds backed by these risky mortgages in all rating categories (see Chart III.1). The subsequent massive sales of risky structured products led to a virtual halt in trading in these products and caused an increase in global risk aversion. This affected other credit derivatives markets, particularly the CDS contracts market, where spreads widened considerably (see Chart III.1). The higher risk aversion was instantly reflected in prices of other risky assets and in rising volatility on stock, bond and foreign exchange markets.

The preceding several years of low volatility, global excess liquidity and search for yield had encouraged financial institutions, including many European banks, to invest in complex structured financial products, hedge funds and – via off-balance sheet exposures and credit facilities – in structured investment vehicles (SIVs, conduits) investing in bonds backed by risky assets. At the beginning of August, the sudden fall in the value of these investments raised strong concerns regarding the extent and particularly the distribution of the losses across individual banks on both sides of the Atlantic. This resulted in an increase in the perceived potential risk of counterparty default and in the interbank rates of major world currencies above the level of expected monetary policy rates (see Chart III.2).[34] The uncertainty regarding bank losses was strengthened by the activation of credit lines promised by banks to SIVs, which were no longer able to refinance themselves on the money market by means of short-term bonds. The increase in interbank rates also had a negative effect on banks that had no exposure to the US mortgage market and the related bonds and that only used the interbank market to finance their activities (e.g. Northern Rock in the UK). Since the interest rates at which the real sector is financed are often linked to interbank reference rates, the interest rate conditions in the real economy tightened significantly.

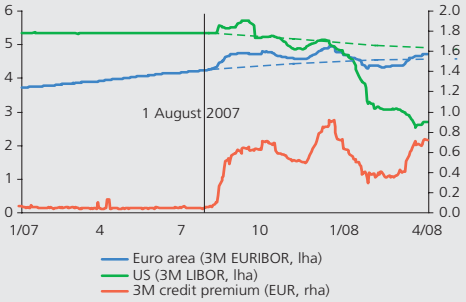
The increased risk of counterparty default on interbank markets resulted in a sharp fall in liquidity on the money markets at maturities longer than about 2 weeks, requiring massive interventions by monetary authorities in order to bolster market liquidity. The US Fed and other key central banks (the ECB and the Bank of England) reacted to the deteriorating money market conditions by increasing the liquidity offered in repo operations and later by changing the conditions for such operations, extending the maturities used to as much as 6 months and by coordinating the supply of liquidity internationally. The collateral accepted by

CHART III.1
Developments on markets of subprime mortgage–backed securities and CDS contracts
(CDS indices in basis points; ABX-HE 2006-2 index by rating, in % of nominal value of backed securities)



Source: JP Morgan Chase
Note: The ABX-HE 2006-2 index includes bonds (incl. CDOs) backed by subprime mortgages granted in the second half of 2006.

CHART III.2
3M money market rates and credit premium
(money market rates in %, credit premium in percentage points)



Source: Bloomberg
Note: Dotted lines denote market expectations of 3M money market rates derived from FRA contracts as of 1 Aug 2007 (in case of USD from LIBOR contracts). 3M credit premium is spread between 3M EONIA swap rate and 3M EURIBOR.

34 Counterparty default risks on the interbank market can be measured using the spread between interbank rates and O/N swap rates at the same maturity. An O/N swap is an interest rate derivative where one counterparty pays the O/N rate on a daily basis and the other counterparty pays a fixed agreed (swap) rate on the agreed principal. In O/N swaps, the counterparties exchange only the net balance of the two rates, so the impact of counterparty default is very small and the credit risk is thus marginal, unlike in the case of interbank deposits, where the whole principal deposited with the counterparty is at stake.

central banks in these operations was also gradually extended. The Fed, and later also the Bank of England, introduced the option of borrowing government bonds against collateral in the form of mortgage-backed bonds, which can be interpreted as a measure also aimed at stimulating markets other than the money market. In addition, the Fed and partly also the Bank of England responded to the unfolding crisis and its expected impacts on the real economy by radically reducing monetary policy interest rates (see section 2.1), and both these banks made active use of their position as lender of last resort to save renowned financial institutions (Northern Rock in the United Kingdom and Bear Stearns in the USA).

Unlike the corrections in the previous two years (see Financial Stability Report 2006), the global financial market situation has yet to return to normal. Between the start of the crisis in summer 2007 and April 2008, the markets were very sensitive to the publication of global financial institutions' losses on risky subprime mortgages, news about the impact of the crisis on the real economy and the measures taken by monetary and supervisory authorities to bail out problem institutions and calm the situation. This period saw several dramatic falls on global stock markets, widening spreads on risky bonds, rising risk premia and volatility on a number of markets, and faster depreciation of the dollar (see Chart III.3). Long-term government bond yields in both the USA and the euro area fell in reaction to a "flight to quality" and to expectations that the financial crisis would have some impacts on the real economy. Some segments of the credit derivatives market are essentially non-functional. Asset prices reflect the insufficient market liquidity rather than credit risk, which further complicates the valuation of such instruments in the balance sheets of financial institutions and hence also the calculation of the total losses due to the credit crisis.

The Czech financial markets responded to the developments in global financial markets similarly as during corrections in previous years. Share prices went down in line with the falls in foreign stock markets, while bond yields initially declined slightly and then stabilised around 4.5% in March 2008 (see Chart III.4). This confirms the past experience that Czech koruna bonds are considered a relatively safe investment compared to the bonds of some other Central European economies. A downward revision of the expected future monetary policy interest rate path, in an environment of a potential cooling of the economy and an appreciating domestic currency, might also have played a role.

Nevertheless, it cannot be said that the global financial crisis had no major effect on the Czech financial markets. During 2008 Q1, market signals indicated increased sales of Czech government bonds by foreign investors, fostering a modest increase in long-term yields. Owing to declining yields on German government bonds, the long-term spread widened gradually. The spreads on euro-denominated Czech government bonds against euro area benchmark bonds decreased slightly at the beginning of the crisis and then started growing in reaction to the rising global risk aversion, similarly to the spreads on Hungarian and Polish eurobonds (see Chart III.5). Despite this increase, Czech eurobonds are maintaining some distance from Polish and Hungarian bonds. This partly reflected the Czech Republic's better long-term sovereign rating, which indicates its ability to repay foreign-currency liabilities (see Chart III.6).[35]

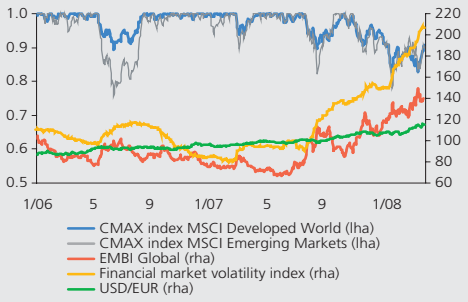
Given the heavy participation of foreign banks in the Czech financial sector, concerns might arise about potential spill-over of the problems caused by the losses

35 Rating issues are dealt with in the article *The Role of Ratings in Financial Sector Stability Assessment* in the thematic part of this Report.

CHART III.3

Turbulence on global financial markets: risky assets, USD exchange rate and volatility

(EMBI Global, volatility indicator and USD/EUR as index, 1 Aug 2007=100; CMAX index = ratio of current value of stock index to maximum value in past 60 days)



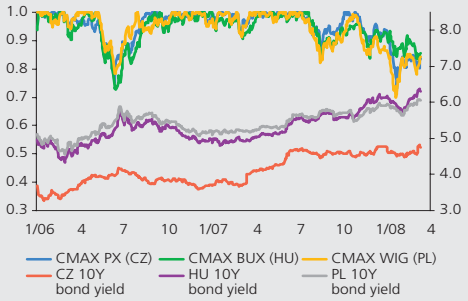
Source: JP Morgan, Bloomberg

Note: EMBI Global Index– weighted spread of yields on dollar-denominated emerging markets bonds; Financial market volatility index – sum of historical volatility of S&P500, DJ Eurostoxx, 10Y US and German bonds, EUR/USD exchange rate and JPY/USD exchange rate over past 90 days.

CHART III.4

The 2007 crisis: impact on stock and bond markets in the Central European region

(CMAX index = ratio of current value of the stock index to maximum value in past 60 days, lha; 10Y yields in %, rha)

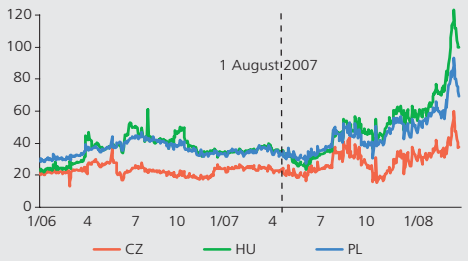


Source: Bloomberg

CHART III.5

The 2007 crisis: impact on 10Y yield spreads on bonds denominated in euro

(in basis points)

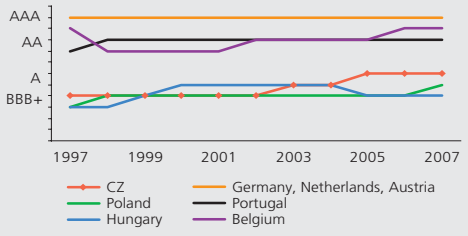


Source: JP Morgan, Bloomberg

CHART III.6

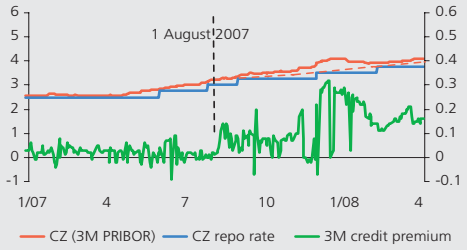
Development of sovereign rating of selected countries

(long-term rating in foreign currency, Fitch)



Source: Fitch

CHART III.7
Czech koruna money market development
(rates in %, lha; credit premium in percentage points, rha)



Source: Bloomberg, Reuters
Note: Dotted lines denote market expectations of 3M money market rates derived from FRA contracts as of 1 Aug 2007. 3M credit premium is spread between 3M CZEONIA swap rate and 3M PRIBOR.

due to the current crisis from parent institutions to their subsidiaries. Short-term koruna rates increased in the first phase of the turbulence in line with the expected monetary policy tightening. The money market recorded a modest increase in the credit risk premium, although a much smaller one than in the euro area (see Chart III.7). Market liquidity also declined in this market (see Box 4).

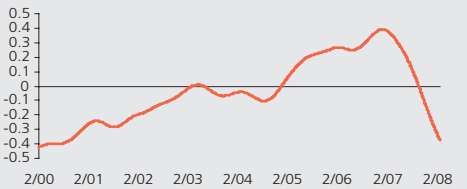
Box 4: Financial market liquidity

Financial market liquidity (market liquidity) is generally regarded as the ability of market participants to execute financial transactions in assets of a given volume without causing a significant change in their prices.[36] The term "liquidity" can also be encountered in the context of the need to safeguard liquidity within a particular financial institution (see Box 7). It refers to balance-sheet liquidity, i.e. an institution's ability to meet its immediate commitments. The two concepts of liquidity are more or less interconnected. The stability of a financial institution is closely linked to financial market stability through liquidity risk management by the institution and, conversely, through the provision of liquidity to the market via its participation in this market.[37]

This box focuses on the derivation of market liquidity indicators – an composite indicator for the entire Czech financial market as a whole and separate indicators for the individual markets. It is based on calculations containing key information across the selected markets (the money, bond, foreign exchange and stock markets) and also across the separate attributes of market liquidity, including market tightness, depth and resilience and the liquidity risk premiums. Market tightness (short-run position turnover costs) can be measured by the width of bid-ask spread. In general, a market maker on an illiquid market will increase the width between bid prices and ask prices as compensation for the difficulty of realising a prompt sale of an asset he holds. Market depth (the ability to execute large transactions without excessively affecting the current market prices of an asset) and market resilience (the speed at which prices recover from a random shock) can be determined using indicators based on the ratio of the yield to the transaction volume. The final market liquidity calculation included here is an estimate of the liquidity premium. This can be understood as a form of compensation demanded by an investor for the potential risk of having to abandon the position associated with uncertain future market conditions. The individual sub-indicators were normalised before aggregation.

The composite market liquidity indicator (liquidity index) for the Czech financial market indicates relatively sharp rise in financial market liquidity between the

CHART III.1 (BOX)
Composite market liquidity indicator for the Czech financial market



Source: CNB, Bloomberg, Datastream

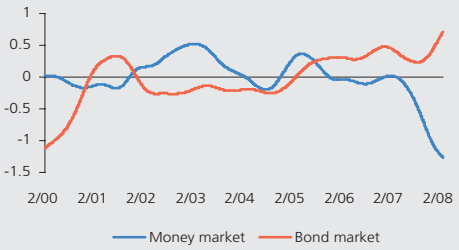
36 A detailed definition of a liquid market (as applied to the stock market) can be found in Black, F. (1971): Towards a Fully Automated Exchange, Part I. Financial Analysts Journal, pp. 29-34.

37 Take, for example, a bank facing a balance-sheet liquidity shortage. The bank will try to sell assets on the market to raise the necessary funds. If, however, it faces an illiquid market, the intended sale may be very difficult to realise and the prices of its assets may fall under supply pressure. In the extreme case, this may trigger a spiral of rising sales of assets to raise additional funds and a related further decline in prices.

end of 2004 and mid-2007 (see Chart III.1 Box).[38] Similarly constructed liquidity indices for the euro area and UK financial markets[39] suggest a similar rise in market liquidity in recent years (since mid-2003) and a rapid fall since mid-2007.[40] This indicates some global basis for the evolution of this indicator and also confirms the increased integration of European financial markets. In the period under review, market liquidity has also decreased on the foreign exchange market, stock market (see Chart III.3 Box) and money market (see Chart III.2 Box). By contrast, the Czech government bond market is relatively liquid and its liquidity index shows the opposite trend (see Chart III.2 Box). This may indicate increased caution on the part of investors on those markets with falling indices (a lower number of buyers and sellers on the market, a higher liquidity risk premiums, etc.), or, conversely, a search for a potential safe haven on the government bond market at a time of increased market volatility associated with rising investor uncertainty (a flight to quality).

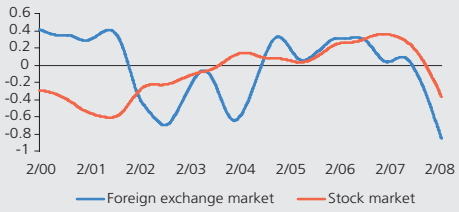
The market liquidity index does not include an exhaustive number of market liquidity measures, so further refinement to include other possible measures could have an effect on it. It is also impossible to eliminate from the primary market liquidity index certain temporary investor behaviour that is not necessarily related to market liquidity but may have at least some short-term effect on liquidity (e.g. speculation on increases in monetary policy rates). It is also important to say that the measures included remain relevant for defining liquidity on various markets, but only at times of relative quiet. At times of market tension, when the price volatility is higher, the significance of market participants' behaviour, which is often over-sensitive or herd-like, increases. In such a situation, market participants assign an unhealthily higher weight to market liquidity (compared to risk and yield), so it is more difficult to determine the relevant nominal or market value of an asset at such times.

CHART III.2 (BOX)
Market liquidity indicators for the money and bond markets



Source: CNB, Bloomberg, Datastream

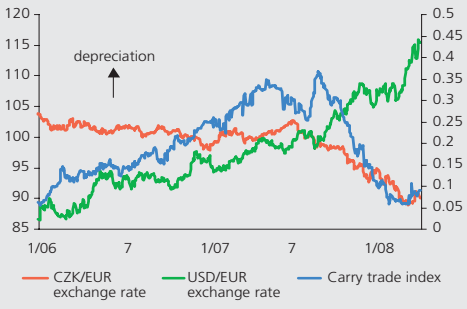
CHART III.3 (BOX)
Market liquidity indicators for the koruna and stock markets



Source: CNB, Bloomberg

The koruna's exchange rate has followed an interesting path since summer 2007. At the start of the crisis, the koruna appreciated dramatically, probably due to the liquidation of carry trades for which the koruna was used as the financing currency, in an environment of growing global risk aversion (see Box 5). The attractiveness of the koruna for carry trades decreased in October 2007 owing to rising interest rates and higher exchange rate volatility (see Chart III.8). The following period, however, saw a further strengthening of the appreciation trend, driven both by a shift in foreign investment away from the depreciating dollar and towards appreciating currencies such as the Czech koruna, and by domestic exporters, who in an environment of faster appreciation of the koruna started hedging on a mass scale by selling euros.

CHART III.8
CZK/EUR exchange rate: the role of the attractiveness of carry trades and dollar development
(exchange rates: 1.8.2007=100,lha; carry trade index as 3M interest rate spread of CZK against EUR for a unit of implied volatility, rha)



Source: Bloomberg

38 The liquidity index is constructed so that its values indicate the number of standard deviations from the historical average. It is a combination of nine individual liquidity measures, three of which involved measurements based on bid-ask spreads: (1) the CZK/EUR, CZK/USD, CZK/GBP and CZK/CHF exchange rates, (2) the 12 most liquid shares in the PX index, and (3) 28 government bonds; a further four fall into the category of liquidity risk premiums estimates: (4) the spreads between interbank deposit rates and the monetary policy repo rate, (5) the spreads between interest rate swaps and government bond yields, (6) the historical volatility of the CZK/EUR exchange rate and (7) the Czeonia reference interest rate; and the last two comprise (8) the yield-to-trade volume ratio and (9) the yield-to-market capitalisation ratio for the 12 most liquid shares in the PX index. The individual composite indicators are then the unweighted average of the individual liquidity indicators normalised on the period 2000–2/2008. The whole time series is subsequently smoothed using the Hodrick-Prescott filter.

39 ECB, Financial Stability Review, June 2007, p. 81; Bank of England, Financial Stability Report, April 2007, p. 18.

40 ECB, Financial Stability Review, December 2007, p. 92; Bank of England, Financial Stability Report, October 2007, p. 10.

Alternative scenario C: "Loss of confidence"

Scenario C assumes a different impact of the current turbulence on the Czech economy. As in Scenario A, there would be a cooling of the global economy and thus also of the euro area economies, and domestic economic activity would decline sharply. Global risk aversion would rise further, reversing the previously positive attitude towards the Czech koruna and leading to a radical depreciation (a "loss of confidence"). Although the weaker koruna would partly help the export-oriented corporate sector, it would on the other hand generate a large increase in inflation, to which the central bank would react by raising rates.

This combination of macroeconomic variables would lead to a rise in the default rate, generated primarily by low GDP growth and high rates. Share prices would fall and property prices would also see a modest decline. Growth in lending would slow to a very low level.

Box 5: Carry trades and the exchange rate of the Czech koruna

Carry trades became a phenomenon in 2006 H2 and 2007 H1. This speculative transaction can be described generally as an investment in a high-yielding currency financed by a loan in a low-yielding currency. The classic case was investment in currencies such as the British pound and the Australian or New Zealand dollar financed by loans in Japanese yen or Swiss francs. Owing to low interest rates in the Czech Republic, the Czech koruna became another popular currency for financing such trades at the start of 2007.

In practice, financial derivatives (mainly forwards and swaps) are used more frequently for carry trades, as they enable investors to achieve the same exposure with lower administrative demands. Credit lines are far less burdened and swaps spreads are narrower than those for cash transactions. It is thus cheaper for an investor to create the required position. The purchase of higher-yielding British pounds and the sale of lower-yielding Czech korunas through an outright forward would be a typical example of a carry trade using derivatives. In the future, usually two business days before the forward matures, the higher-yielding currency is sold and the lower-yielding currency is purchased, thereby finalising the transaction. This strategy allows the investor to make a profit from the interest rate differential between the British pound and the Czech koruna for the time period until maturity date of the forward.

When investing in carry trades, the investor always bears the exchange rate risk stemming from future exchange rate fluctuations of the currencies used. The investor cannot hedge against such risk by using standard financial derivatives, as he would thereby forfeit profit from the interest rate differential. A change in the exchange rate can thus force the investor to abandon an investment in a carry trade earlier than expected, where the exchange rate loss would be higher than the gain from the interest rate differential.

It is not easy to prove the use of the koruna as a carry trade financing currency. One way might be to analyse the off-balance sheet of the banking sector. As it is financial derivatives that are mainly used for investment in carry trades, growth in such instruments should be visible in the balance sheet of

CHART III.4 (BOX)

Fixed-term CZK operations vis-à-vis non-residents in banking sector off-balance sheet

(CZK billions; upper chart assets, lower chart liabilities; figures in value of underlying asset; circled areas denote March-June period in 2006 and 2007)

Source: CNB

the banking sector at times when such positions are created or closed. Unfortunately, the data on derivatives in the off-balance sheet do not allow us to observe the direction of the trade (purchase or sale) or to distinguish them from other derivatives transactions used for other purposes (for example, hedging against exchange rate risk).

The aggregate data for the Czech banking sector show a sizeable increase in the volume of derivatives in spring 2007 (see Chart III.4 Box) – of about EUR 20 billion in March–June in euro terms (a rise of 20%, compared to less than EUR 5 billion, or 6.5%, in the same period of 2006). This can be partly explained by exporters' hedging interest at a time when the koruna was depreciating. However, this depreciation of the koruna and the increase in the off-balance sheet might also have been partly due to the financing of carry trades using financial derivatives. Furthermore, when analysing the balance sheet of the domestic banking sector, one needs to bear in mind that it does not include all koruna transactions, but only those where the reporting bank was a counterparty to the transaction. According to the BIS Triennial Survey and the CNB, a large proportion (one-quarter to one-half) of koruna transactions might take place off the Czech foreign exchange market.

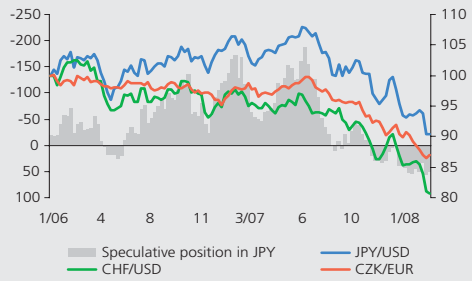
Another way of demonstrating the use of the koruna for carry trades is to analyse the co-movement of the exchange rates used for such strategies, i.e. the Japanese yen and the Swiss franc in addition to the koruna. Investors' sentiment in relation to these transactions often develops regardless of the currency from which the position is financed. The use of the yen to finance carry trades can also be proved by the International Money Markets (IMM) data published by the Commodity Futures Trading Commission – the US exchange regulator, on the difference in the numbers of speculative futures contracts for the purchase and sale of the relevant currency. Co-movement of the koruna and the yen would thus indirectly confirm the role of the koruna as a financing currency (see Chart III.5 Box).

The market data show that the exchange rates of the koruna, yen and franc against the reference currencies were relatively strongly correlated in certain parts of the year. Given the developments on global markets and the rise in interest rates in the Czech Republic, it is likely that the koruna-financed carry trades were terminated at the end of summer 2007 and no longer occur to any great extent now. While the opening of carry trades probably fostered depreciation of the Czech koruna in 2008 H1, their termination in H2 contributed to its appreciation.

CHART III.5 (BOX)

Exchange rates of currencies used to finance carry trades and carry trade indicator from IMM data

(currencies as indices, 13 January 2000 = 100, right-hand scale; IMM data as difference in numbers of contracts for purchase and sale of JPY futures, in thousands, left-hand scale – inverted)

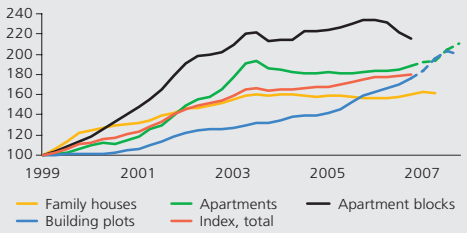


Source: Bloomberg

3.2 THE PROPERTY MARKET

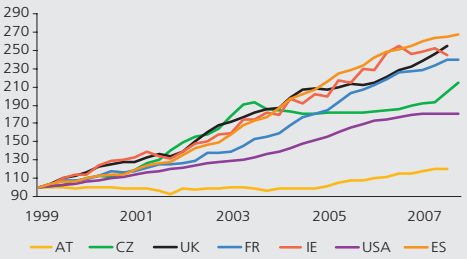
The property market trends identified as risky in the 2006 Financial Stability Report continued into 2007. Property prices in the Czech Republic rose relatively fast in 2007 despite the problems on real estate markets in many advanced economies. Besides the favourable macroeconomic situation, record demographic characteristics also played a role. The Czech Republic saw converging prices across individual regions and individual property types. The rise in property prices led to a rise in the ratio of flat prices to wages and a decline in the rent return, which fell below the level of mortgage lending rates. Prague seems to be the most risky region in terms of these indicators. It also has the highest intensity of housing construction. The large number of flats under construction may pose risks to the property development sector.

CHART III.9
Property prices – transfer prices according to tax returns
(absolute index; 1999 Q1 = 100)



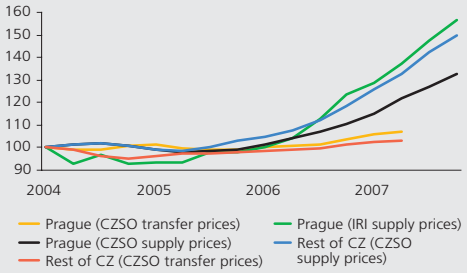
Source: CZSO, CNB calculation
Note: 2007 data preliminary or calculated from supply prices

CHART III.10
Property prices – international comparison
(absolute index; 1999 Q1 = 100)



Source: BIS, CZSO
Note: Country abbreviations given in list of abbreviations.

CHART III.11
Property prices – transfer prices and supply prices
(absolute index; 2004 Q1 = 100))



Source: CZSO, IRI

The relatively fast property price growth seen since 2006 H2 continued during 2007. Prices of flats and building plots recorded particularly high growth (a 23% rise in supply prices year on year). Prices of family houses rose more slowly (by less than 5%). Prices of apartment blocks, for which only 2006 data are available, recorded an absolute fall, following previous years of growth. As in previous years, the prevailing price growth was driven mainly by rising demand for housing. This demand is due, for example, to rising household income, dynamic growth in loans for house purchase in an environment of low interest rates,[41] demographic factors[42] and also "forward buying" factors associated with the rise in the standard VAT rate on 1 January 2008 (see section 2.1).

Since the credit crisis in the USA can be seen in direct relation to the interaction of mortgage lending and property prices (see Box 1), one can ask whether the current relatively fast growth in prices of most types of property in the Czech Republic will lead to a similar situation. The importance of finding an answer to this question is emphasised by the fact that property prices have started falling in some of the other countries where buoyant growth in prices was recorded in previous years (see Chart III.10).[43] Within the EU, the Czech Republic ranks somewhere between the countries with relatively high price growth (Spain, Ireland, the UK, France, etc.) and those where property prices have tended to remain flat in the past (Germany and Austria). However, prices have been stagnating mainly in economies geographically close to the Czech Republic, which are its major trading partners. The direct impacts of the mortgage crisis are thus not likely to affect the Czech property market quickly. This is confirmed to some extent by the conclusions in Box 6 *Identifying property market bubbles*.

The apartment price growth identified above implies uncertainties associated partly also with the inadequate quality of the property price source data. Comparing the rises in prices of flats in Prague with those in the rest of the Czech Republic for various sources (see Chart II.11), it is apparent that the current relatively fast growth in supply prices is not completely in line with the growth in transfer prices according to the CZSO, which are rising much more slowly. It is possible that transfer prices will be revised upwards or that their low growth is due to non-market effects such as tax optimisation,[44] but the increasing difference between supply prices and final transaction prices can be viewed as a sign of falling market liquidity or rising risk on the property market.

Convergence of prices across regions is also apparent. This is reflected by higher growth in supply prices for the rest of the Czech Republic compared to Prague (see Chart III.11). Convergence of prices can also be seen across individual property types classed according to degree of wear and tear. This can be identified by comparing the growth in the supply price indices for Prague according to the IRI and the CZSO, which are constructed in slightly different ways. The IRI index

41 The direction of the causality between property price growth and growth in house purchase loans remains an issue. However, analyses suggest that loan growth to prices prevails. See also the discussion of Chart III.1.5.

42 According to preliminary CZSO data, the population grew by 93,900 people in 2007. This increase is even higher than those recorded during the 1970s "baby boom" and only slightly lower than those in the post-war period. Unlike in these periods, when the rise was due almost exclusively to natural population growth, the current increase is being driven mainly by record immigration (83,900 persons). However, even the natural population growth was the highest in 25 years.

43 In addition to the USA, some declines in prices can also be observed in the property markets in Ireland, the UK and Spain, although for the most part these declines are not yet included in the given time series.

44 The data for the CZSO's property transfer prices are sourced from prices given in property transfer tax returns.

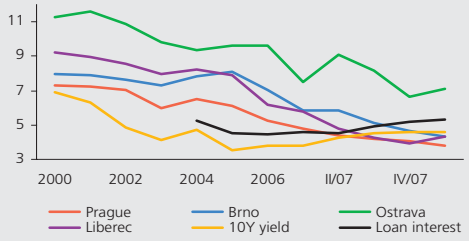
measures the price of a "standard" flat,[45] while the CZSO supply price index covers all types of flats, including those with less wear and tear. The larger increase in prices according to the IRI may thus suggest convergence of prices of lower-quality flats towards those of higher quality.

The large rise in supply prices of flats together with considerably lower increases in supply rents led to a further fall in the rent return in 2007 (see Chart III.12).[46] For most large cities in the Czech Republic, the rent return is below the level of long-term bond yields and the level of interest rates on new loans for house purchase. This means a lower rate of return and a higher degree of risk associated with speculative property purchases financed by mortgage loans. The decline in the rent return may potentially imply an increase in the risk of loans provided to property developers. Such companies currently specialise in selling flats after completion and are not directly affected by a decline in the rent return. However, if their assumptions regarding future prices fail to materialise or if they fail to sell their properties, they might be forced to let them. In this case, a decline in the rent return coupled with higher interest rates could mean losses for them. But no major rise in market rents can be expected in the near future, given the ongoing rises in regulated rents.

As mentioned earlier, property prices are also closely related to household income growth. If property prices rise too fast relative to household income growth, households could become overleveraged and any fall in prices would then have negative impacts on consumption and their ability to repay their obligations. The risk of such a development is described by the price-to-income indicator (the ratio of property prices to household income, see also Box 6). Although this indicator has recently been rising for most regional capitals (see Chart III.13), it is still below its end-2003 highs.[47] Although wages in Prague are about 25% higher than the average in the Czech Republic, the price-to-income ratio identifies Prague as the riskiest region. Generally speaking, regions with lower incomes and higher unemployment have lower price-to-income ratios.

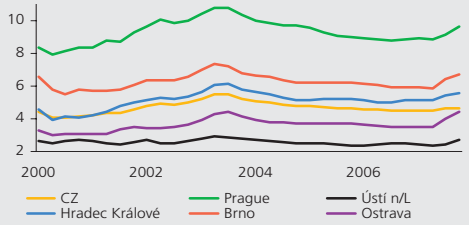
Easier access of households to loans for house purchase has undoubtedly been one of the major factors underlying the property price increases in recent years. The link between property prices and mortgage loans is clear both from the development of these two variables over time and from the distribution of the value of mortgage loans across individual regions. Regions with a higher average mortgage amount[48] also show higher prices of flats (see Chart III.14). The correlation between the two indicators is high (0.9). Nevertheless, in terms of interpreting the increase in property prices, the direction of the causality between the two indicators is also important. If the property price growth is being driven by increased demand stemming from greater availability of loans for house purchase, this could be interpreted as convergence towards the standard features of property markets in advanced countries. Such convergence would be relatively risk-free. However, if the property price growth is exerting upward pressure on mortgage loans through a need to increase the average mortgage value, the risk of a bubble on the property

CHART III.12
Rent returns
(averages for period in %; comparison with yields on 10Y government bond and house purchase loan rates)



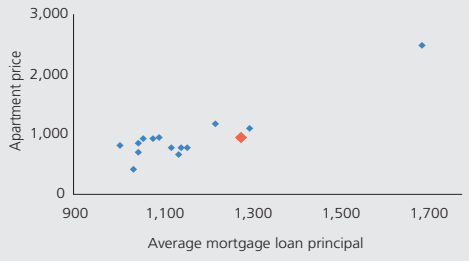
Source: IRI, CNB

CHART III.13
Price-to-income ratios
(ratio of price of 68 m² apartment to wage for last 4 quarters)



Source: CZSO, CNB calculation
Note: 2007 data preliminary or calculated from supply prices

CHART III.14
Average size of mortgage provided to households and transfer prices of standard apartment (69 m²) by region
(2006; CZK thousands)



Source: MRD, CZSO, CNB calculation
Note: Average for Czech Republic in red

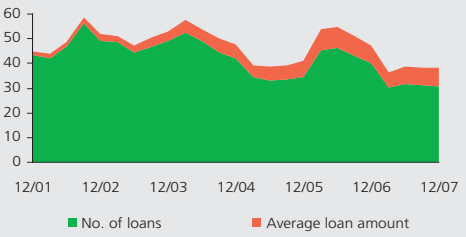
45 A flat with wear and tear of 40% located outside the city centre, often in a prefabricated "panel" block of flats, i.e. flats whose prices tended to be low in the past.

46 The rent return is calculated as the one-year supply rent divided by the supply price of the flat.

47 The decline in the indicator in 2004–2006 was associated with a stagnation in prices of flats amid rising income.

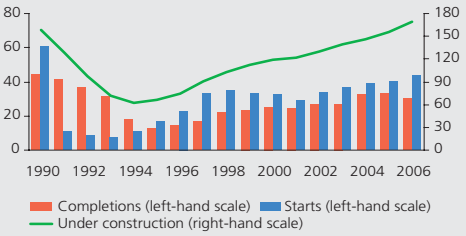
48 The average mortgage amount is calculated from data given in the Ministry for Regional Development's publication *Selected Data on Housing*. The data give the contractual principal of mortgage loans granted, which is higher than the real amount of the loan drawn. The data are gathered from surveys of banks and are thus not fully comparable with the loan data in the CNB's statistics.

CHART III.15
Contributions to household mortgage loan growth
(year-on-year increases in %)



Source: CNB, MRD

CHART III.16
Apartment construction
(numbers of starts, completions and apartments under construction in given year in thousands)



Source: CZSO

market would be higher. In this case, the effects of a bursting of the bubble on households' balance sheets and their ability to repay their loans would also be higher. It can be derived from the data on mortgage loans that the past buoyant growth in mortgage loans was due more to their rising number. The contribution of growth in the average mortgage amount has so far been relatively low (see Chart III.15). This confirms the generally accepted hypothesis that the causality runs from house purchase loans to flat prices and that the current growth in flat prices is relatively risk-free. On the other hand, there has been a clear rise in the contribution of the average size of mortgage loans to their total growth. This has grown from 5% to 20%.

With prices rising, the fast growth in housing construction continued into 2007 (see Chart III.16). The numbers of completions, starts and flats under construction rose year on year (completions by a significant 38%), reaching record highs for the Czech Republic. As in previous years, the housing construction was concentrated mainly in Prague and the surrounding Central Bohemian Region, which accounted for 43.3% of housing completions. In terms of completions per 1,000 inhabitants, the intensity of housing construction in these two regions was more than 2.5 times higher than in the rest of the Czech Republic (7.6 completions per 1,000 inhabitants, compared to 3.0 in the rest of the country). The growing number of housing completions was also reflected in an increase in the total number of flats, which according to our estimates has risen by 4.2% since 2001.[49] The number of flats per 1,000 inhabitants has increased from 427 in 2001 to about 440.[50] Most of the properties completed were intended for sale, as reflected in an increase in the share of owner-occupied housing from about 50% in 2001 to the current more than 60% (data from the CZSO's household budget survey). The question is whether the market for new housing will be satisfied in the foreseeable future by the increasing supply and whether the large number of flats under construction will pose problems for developers (see the "property market crisis" scenario). This risk may be exacerbated by the aforementioned increasing gap between transfer prices and supply prices, the decline in the rent return and tighter bank credit standards for loans to such companies.

Box 6: Identifying property market bubbles

This box mentions selected approaches to identifying unbalanced developments on property markets, in particular ways of identifying "bubbles".[51] Property market bubbles can have serious implications for

49 The total number of existing flats was estimated on the basis of the number of flats determined in the latest *Census of people, houses and flats* (CZSO) in 2001. The number of housing completions in 2002–2007 was added and the number of flats cancelled in the same period was deducted (based on the building permit statistics). However, it should be added that this is only a rough estimate. For example, the number of flats increased by 292,000 in 1991–2001 (based on the census), while the number of housing completions was only 226,000 in the same period. According to the CZSO, about one-half of this disproportion was due to administrative changes in existing flats (declarations of additional flats in a single house, restitutions, etc.), while one-half was due to a physical increase in the number of flats, for example through reconstructions of existing non-residential buildings. To what extent such effects are significant today remains an open question.

50 This ratio is higher than in Austria (421 flats per 1,000 inhabitants in 2004), Belgium (409), Ireland (400) and the Netherlands (422) and lower than in Germany (477), France (513) and Sweden (486). Source: *Housing Statistics in the European Union 2005/2006*.

51 An asset price bubble can be defined simply as an explosive and asymmetric deviation of the market price of an asset from its fundamental value, with the possibility of a sudden and significant correction. Asset price bubbles are often caused by psychological and behavioural factors, self-fulfilling expectations, etc. The possibility of the onset of a property price bubble in the Czech Republic was mentioned, for example, in the 2006 Financial Stability Report.

macroeconomic stability and the development and soundness of the financial sector. Empirical research tells us that when property price bubbles burst, the implications for the real economy are more serious than in the case of a bursting stock market bubble.[52] Property market bubbles also pose a greater threat to a country's financial stability if the banking sector is more exposed to such assets through investment in real estate or through mortgage-backed loans.

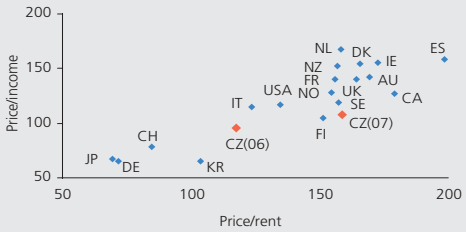
The "practical approach" to identifying bubbles is based on analysing simple ratios and comparing them with the long-run (average) historical value of the given ratio. The *price-to-income* and *price-to-rent* ratios are used most frequently. They denote, respectively, the ratio of flat prices to household income (wages) and the ratio of flat prices to market rents.[53] Higher values of both indicators imply a higher probability of a price bubble. A comparison of the two indicators (see Chart III.16 Box) suggests relatively overestimated property prices, for example, in Spain and Ireland (the upper right-hand corner of the chart) and underestimated property prices in Japan and Germany (the lower left-hand corner of the chart). Our estimate of the comparable[54] indicators for the Czech Republic does not suggest strongly overestimated property prices. However, both indicators recorded sizeable increases last year.

The use of ratios does not guarantee correct identification of a bubble, as the hypothetical fundamental value of a property includes apart from information about income and rent also a number of other determinants, such as growth in house purchase loans, growth in construction output, interest rates, demographic factors (e.g. population growth) and the size of the property market. The shortcomings of the "practical approach" are addressed to some extent by the "econometric approach" to bubble identification, which compares the market value and the estimated fundamental value of the asset. The application of the econometric approach to the data for the Czech Republic is hindered by the short time series of key indicators and the instability of the estimated coefficients over time, which, in turn, is related to changes in the structural characteristics of the property market (e.g. rent deregulation). The assessment of bubbles in the Czech Republic as a transition economy is further complicated by the fact that the property markets here have shown signs of underestimation in the past. It is thus difficult to distinguish whether the current price growth is due to convergence towards the averages of the advanced economies or whether a bubble is developing.

CHART III.6 (BOX)

Relationship between price-to-income and price-to-rent indices for various countries

(long-run average = 100, 2006 except CZ 07)



Source: Datastream, CZSO, IRI, CNB calculation
Note: Country abbreviations given in list of abbreviations.

52 See, for example, Helbling, T., Terrones, M. (2003): Real and Financial Effects of Bursting Asset Price Bubbles. IMF World Economic Outlook, April 2003. The effects of bursting property price bubbles are accompanied by greater output losses and last longer on average (about 4 years) than the effects of bursting stock market bubbles (about 1.5 years).

53 The price-to-income ratio is therefore the inverse of the "rent return" used in Chart III.12 of this Report.

54 For the advanced economies in the chart both indicators are related to their long-run averages for 1990–2006, while the indicators for the Czech Republic are compared with their averages for 2000–2006. The shorter period for the calculation of the averages for the Czech Republic puts some limitations on their comparability.

3.3 THE FINANCIAL INFRASTRUCTURE

In 2007, financial stability continued to be supported by the smooth operation of the interbank payment system CERTIS and the short-term bond system SKD,[55] *both of which are administered by the Czech National Bank. These systems recorded no irregular situations in the period of turbulence in global markets. The CNB aims to safeguard the quality and security of the services provided and monitors current developments and trends in the European financial infrastructure. The further development of the capital market in the Czech Republic and its external competitiveness would benefit from the existence of a central securities depository, but this still remains in the preparatory stage.*

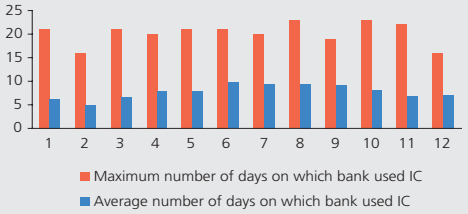
The Short-Term Bond System (SKD) is used for issuing and registering all book-entry securities with maturities of up to one year and for settling trades in these securities. T-bills and CNB bills are registered in SKD. The system enables sales of securities, repos and sell and buy operations, as well as pledges and exchanges of securities. CERTIS (Czech Express Real Time Interbank Gross Settlement System) processes all domestic interbank transfers in Czech koruna in real time.

The volume of transactions processed in SKD was gradually rising between 2000 and 2006, and amounted to almost CZK 47,000 billion in 2007 (see Table III.1). An average of CZK 185 billion was processed every day. SKD's turnover in roughly 19 days equalled annual nominal GDP.

Smooth and stable interbank settlement is supported by the use of intraday credit (see Table III.1). In 2007, the volume of intraday credit grew by around 4% compared to the previous year to CZK 7,152 billion. This meant a continuation of the previous years' steady upward trend in the volume of intraday credit as banks became more aware of how it can be used. Through SKD, the CNB provides CERTIS participants with interest-free intraday credit to boost their balance-sheet liquidity during the day. All intraday credit extended to commercial banks by the CNB is collateralised. The credit is used regularly by about 15 banks, five of which use it to a greater extent. While some banks use the credit almost every business day in the month, others use it either not at all or only rarely. Therefore, the average number of days on which banks used the credit was around 8 days[56] in 2007 (see Chart III.17). However, it is not possible to determine whether banks used the credit more frequently in any particular period of 2007. As regards the volume of credit, higher – but not extreme – amounts were used between June and August (see Chart III.18). It appears, then, that Czech banks did not need to use this instrument more often, despite the liquidity problems in global financial markets.

CERTIS ran smoothly, with a continued upward trend in the number of payments settled (see Table III.2). CNB Clearing processed 411 million items totalling CZK 174,854 billion, up by 15% compared to 2006. The average daily number of items processed was 1.64 million and the average daily value of the items was CZK 697 billion (see Charts III.19–III.21). These figures reveal the extent of payment settlement in CERTIS and its significance for financial stability. It took roughly five days to reach a turnover equal to annual nominal GDP.

Chart III.17
Average and maximum number of days in month when banks used intraday credit
(2007)



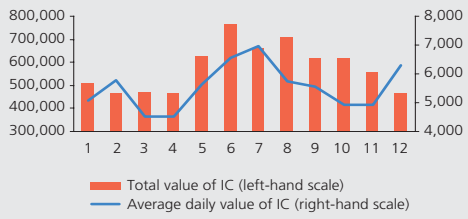
Source: CNB

Table III.1
SKD – statistical information

Period	Total value of transactions (CZK billions)	Total number of transactions	Total volume of intraday credit (CZK billions)
2000	23,258	27,350	n.a.
2001	22,865	22,334	n.a.
2002	32,418	16,615	n.a.
2003	39,040	17,029	2,493
2004	40,713	16,214	3,055
2005	38,742	14,552	3,557
2006	47,534	13,810	6,884
2007	46,902	12,870	7,152

Source: CNB

Chart III.18
Total and average value of intraday credit
(2007)



Source: CNB

Table III.2
CERTIS interbank payment system – statistical information

Period	Turnover (CZK billions)	Average daily turnover (CZK billions)	No. of transactions (millions)	Average daily no. of transactions (millions)	GDP/Average daily turnover
2002	100,343	431	262	1.12	5.6
2003	96,938	385	317	1.26	6.6
2004	110,127	434	333	1.32	6.4
2005	123,354	488	356	1.40	6.0
2006	151,537	604	382	1.52	5.3
2007	174,854	697	411	1.64	5.1

Source: CNB

55 A more detailed description of these systems was published in the 2004 Financial Stability Report. Risk management and the evaluation of these systems against international standards was dealt with in the 2005 Financial Stability Report.

56 Average for banks that used the credit at least one day in the month.

As regards number of items, non-priority items transferring lower amounts are dominant in the long term. Items with amounts of up to CZK 100,000 account for 96% of all transactions in the month. By contrast, in terms of the volume of the funds transferred, the remaining 4% of the number of items represent more than 98% of total turnovers. Items with amounts of over CZK 10 million account for 0.1% of the number of items and 94% of turnovers. An analysis of the monthly turnovers of priority items in 2005–2007 reveals that ten participants in the system are regularly the biggest payers into the system and simultaneously the biggest payment recipients (about 87% of the total turnover). Each of them receives and sends payments to more than ten participants. The maximum share of monthly turnover of a single payer in the total monthly turnover is 20%. The shares of these biggest payers are roughly the same for the comparable periods of 2005–2007 (see Chart III.22).

In order to test the contingency plan, CERTIS items were processed at the backup facility on two days of 2007. The test confirmed that the CERTIS system can be run fully at this facility if necessary.

Central depository

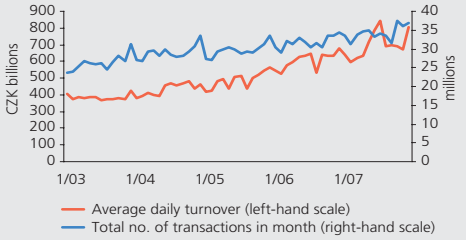
The basic infrastructure of the Czech capital market for the registration and settlement of investment instrument transactions is currently highly fragmented and thus inefficient. One of the main reasons is that there is still no single central entity – a central depository – maintaining a securities register and performing transactions settlement as is the case in the advanced capital markets.

Transactions in investment instruments are settled by Univyc, a.s. (exchange and off-exchange transactions), RM-S, a.s. (transactions concluded on the over-the-counter market it organises) and the CNB (the short-term bond market). However, all domestic book-entry and immobilised securities are still registered by the Czech Securities Centre. Univyc maintains a register of physical and foreign securities, while the CNB maintains a register of short-term bonds in SKD. Cash settlement is performed by Univyc, a.s. through the CNB's clearing centre and by RM-S through ČSOB, a.s. Transaction settlement is thus fragmented and associated with high transaction costs. After the central depository opens for business, registration of investment instruments and settlement of transactions, along with other related activities, will be performed by this single entity, which should lead to more efficient settlement of transactions in investment instruments, lower transaction costs and also reduced operational and credit risk. Only entities subject to state supervision will be granted direct access to the central depository. This will increase the security of the investment instrument register maintained at the central depository, and will also reduce costs. These costs are currently high, partly because the register at the Czech Securities Centre is accessed through counters. Although discussions about establishing a central depository have been going on for years, the groundwork has still not fully been laid for it.

Monitoring of European trends

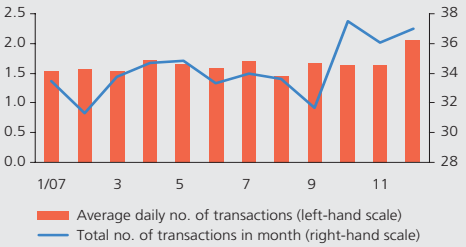
CNB representatives work in the relevant ECB committees and working groups and monitor the development of the four key European infrastructure projects, which advanced fairly significantly in 2007: progress towards the single euro payment area (SEPA), the launch of TARGET2 and CCBM2 (a single shared platform for collateral management) and the preparation of TARGET2-Securities (a common technical platform for the settlement of securities transactions in central bank money).

CHART III.19
CERTIS interbank payment system
(number of transactions processed in 2003–2007)



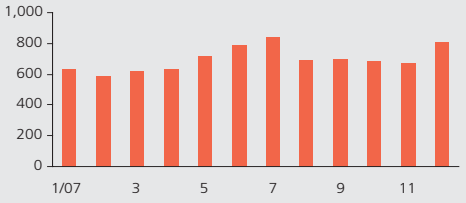
Source: CNB

CHART III.20
Number of transactions processed by CERTIS in 2007
(millions)



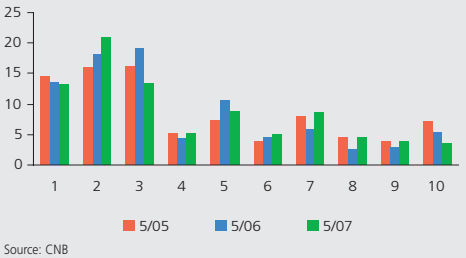
Source: CNB

CHART III.21
Average daily turnover in CERTIS in 2007
(CZK billions)



Source: CNB

CHART III.22
Share of largest payers in total CERTIS turnover in priority items
(%, ten largest payers, data for May of respective year)



Source: CNB

The aim of SEPA is to unify payments in the EU so that consumers can pay in euro under the same basic conditions regardless of whether they are making a national or cross-border payment. SEPA is based on the application of uniform European standards for credit transfers, direct debits and card payments (SEPA rulebooks). The system of SEPA rulebooks for credit transfers was successfully launched in January 2008. More than 4,000 European institutions joined it from the very beginning, including several banks in the Czech Republic. The application of SEPA rulebooks for direct debits is expected in 2009 and for card payments between 2008 and 2010. The ultimate goal is for the critical mass of payment transactions in the EU to migrate to SEPA by the end of 2010.

The approval of the Directive on Payment Services in October 2007, which is supposed be transposed into the law of the EU Member States by 1 November 2009, is considered the key step towards the implementation of SEPA. Among other things, the directive removes the previous uncertainty regarding the direct debit rules. The approved scheme is based on the principle that the direct debit payment process can be only initiated by the payee, which will mean a change in current Czech practices.[57]

The Eurosystem's new payment system for large and urgent payments TARGET2 was successfully launched on 19 November 2007. It is based on a single technical platform shared by all users. It will replace the decentralised TARGET system, which has been in operation since January 1999. A total of 259 banks from 8 countries joined the new system in the first stage. Another 13 EU countries joined in two subsequent migration waves on 18 February and 19 May 2008.

57 In most Western European countries, a contract between the payer and payee must be submitted to the payee's bank. The bank maintains a database of such contracts and checks payees' identification numbers. A different system applies in the Czech Republic. A database of mandates is administered by the payer's bank. The bank decides whether to approve the debit from the payer's account based on whether the payee's request matches the data in the database. This means the principle in the Czech Republic will be reversed.

4 THE FINANCIAL SECTOR

While global financial institutions were significantly affected by the credit crisis, the Czech financial system remained fairly isolated from the global turbulence. Major international banking groups were forced to admit large losses related directly or indirectly to a decline in prices of risky assets, especially bonds backed by defaulting US mortgages.[58] Czech financial institutions held a minimum amount of such risky assets, mainly because of the strong focus of banks and other financial institutions in the Czech Republic on the traditional (conservative) business model on the as yet unsaturated Czech market.[59] This focus is reinforced by the prevailing foreign ownership of domestic financial institutions, as foreign owners let their subsidiaries in new EU Member States generate income mainly from dynamically developing retail banking, while administration of securities and derivatives portfolios is typically concentrated in parent institutions or branches in financial centres (London and New York). The stability of the domestic banking sector in times of financial market turbulence has also been fostered by banks' high balance-sheet liquidity, the prevailing financing of credit expansion with primary deposits and thus minimum dependence on funds from foreign markets or parent companies. Moreover, domestic financial institutions do not belong to the global financial groups that have been hardest hit by the crisis.

Despite the above factors, the Czech financial sector will not necessarily remain immune to the current credit crisis. Large domestic banks with a strong surplus of balance-sheet liquidity might become a potential source of liquidity for their foreign parent institutions, which could subsequently affect the financing of the Czech economy. However, lending to parent banks is limited by the regulations. Certain medium-sized banks that do not have a broad deposit base might limit credit expansion and reduce the level of competition in the sector. Increased risk aversion could furthermore cause a decline in some other riskier assets held by Czech financial institutions in their portfolios. Moreover, preliminary signals confirm that some subsidiaries of foreign banks might have tightened their credit standards due to tighter credit policy within the globally operating group in response to the crisis.

The available analyses indicate that the Czech financial sector (and in particular the banking sector) is not exposed to the risk of a crisis similar to the one that hit the US subprime mortgage segment. This is due to very conservative loan-to-value ratios, traditionally higher required debtor creditworthiness, the traditional method of interest rate fixation, less use of external mortgage underwriters and the absence of significant credit securitisation. Nevertheless, it is vital to constantly monitor this area and assess any signs of increasing risks in a timely manner.

58 In its Global Financial Stability Report (April 2008), the IMF estimates the total losses of financial institutions related to the US mortgage market crisis at USD 945 billion. This sum is a combination of losses from loans and losses from related securities, with USD 565 billion pertaining to residential mortgage loans and the remaining USD 380 billion to other credit market segments. In a report for the OECD Committee on Financial Markets entitled *The Subprime Crisis: Size, Deleveraging and Some Policy Options* (April 2008), OECD experts estimate the total losses to be considerably lower (USD 422 billion), mainly because they focus only on losses related to residential mortgages. The differences in the loss estimates are also connected with difficult-to-determine assumptions about the recoverability of non-performing assets.

59 According to a CNB survey conducted at the start of the crisis in summer 2007, the Czech banking sector's overall exposure to CDOs was about CZK 11 billion, i.e. just 0.3% of assets (of which, moreover, only about 5% were directly related to subprime US mortgages). In the case of insurance corporations and pension funds, the figures were about 0.15% and 0.5% of assets respectively.

4.1 FINANCIAL SECTOR DEVELOPMENTS

The Czech financial sector experienced mostly positive developments in 2007. The banking sector achieved record profits in 2007 and showed continuing strong growth in lending to the real economy. Insurance companies have significant long-term potential for further development in both the life insurance and non-life insurance segments and hold capital above the required solvency margin. Insurance companies and pension funds saw marked growth in the costs of intermediating new contracts. These costs may negatively affect future profitability. Mutual funds are a popular investment opportunity for households. There was growing interest in funds with distributed risks, such as mixed funds, funds of funds and foreign guaranteed funds.

The depth of financial intermediation in the Czech Republic,[60] as measured by the ratio of financial sector assets to GDP, increased from 133% in 2006 to 142% in 2007. Financial intermediation, as measured by the volume of assets of financial institutions, grew by 17.5% year on year in 2007 (compared to only 7% in 2006). Within the structure of financial system assets (see Chart IV.1), there was a sharp (18%) year-on-year increase in bank assets. A similar rate of growth (19%) was recorded by the activities of investment companies and the domestic mutual funds they administer. Pension funds increased their assets by 14%. Unlike the other sectors, insurance companies recorded a smaller rise in assets (about 6.5%) due to lower growth in non-life insurance. Overall, both banks and insurance companies achieved high returns on assets (1.3%, 3.7%) and equity (24.5%, 21.7%) in the favourable economic growth conditions. The quality of the domestic financial market has improved further since the sales of the state-owned stakes in large banks in 2001–2007, and the activities of other non-bank institutions have undergone further development (see Chart IV.2).

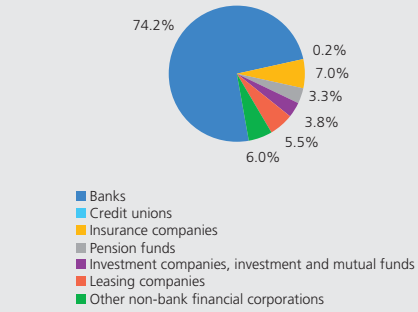
In 2007, the financial sector was shaped mainly by the favourable phase of the business cycle and the expected impacts of the fiscal reform. Also significant was the transition to the Basel II framework in the credit institution and investment firm sectors and the preparation for the new Solvency II framework in the insurance sector. The credit crisis on foreign markets in the second half of 2007 and the first few months of 2008 also had some impact.

4.1.1 The banking sector

2007 was another successful period for the banking sector. Total assets saw further growth, fostered by a sizeable increase in loans reflecting the favourable economic growth and rising demand for owner-occupied housing. However, growth in house purchase loans to households and a further rise in the rate of growth of loans to real estate companies may become a risk element in the future (see section 3.2). The quality of loan repayment is affected by the disposable income of debtors, property prices and the level of interest rates. A negative trend in any of these areas would probably result in a deterioration in loan quality. Banks as a whole again recorded strong profits. Provided that a sufficient proportion of the profit remains in banks in the form of equity capital, this lays the groundwork for maintaining the sector's stability in the future.

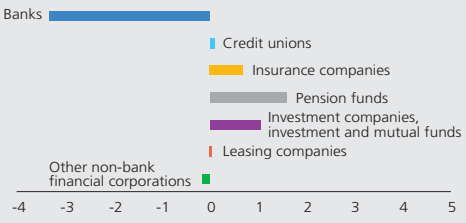
The intensive preparations for the implementation of Basel II and the actual changeover to the new prudential rules in several banks on 1 July 2007 were a significant challenge for the banking sector in 2007. The remainder of the sector took this step in January 2008. Owing to the gradual changeover to Basel II, there was a slight increase in capital adequacy. This reflects the fact that banks made use

CHART IV.1
Shares in financial sector assets
(%; 2007)



Source: CNB, CZSO

CHART IV.2
Growth (fall) in shares in financial sector assets 2001–2007
(percentage points)



Source: CNB, CZSO

60 The regular *Analyses of the Czech Republic's Current Economic Alignment with the Euro Area* (CNB 2007) contain a comparison with the monitored euro area countries.

of the possibility of more accurately assessing the risks they undertake. As expected, this led to a decline in capital charges[61] and more efficient use of capital.

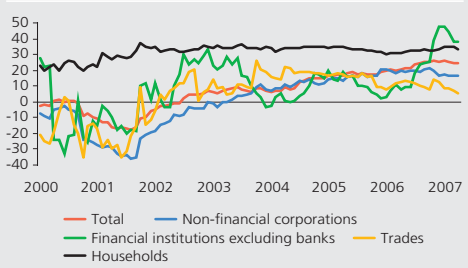
Loans and credit risk

Client loans extended by the banking sector totalled CZK 1,786 billion at the end of 2007. The annual growth rate of loans reached 26.4% (see Chart IV.3), the highest level recorded for the entire period under review, i.e. since 1996. Compared to the end of 2006, the growth rate was up by 6.5 percentage points. However, the annual rate of growth of total loans declined by almost 2 percentage points in 2008 Q1, to 24.5%. Although the current growth remains fairly robust, it is not excessive according to available studies (see section 2.3). As regards the credit structure, non-financial corporations are still the main debtor of banks, with a 42% share of total loans. Loans to households accounted for 37.5%.[62]

Client deposits, which were 1.3 times higher than client loans at the end of 2007, are the biggest source of loan financing. Financing of client loans by primary deposits in the Czech Republic is more than two times the average in the original EU Member States and 40 percentage points higher than the average in the new EU Member States (see Chart IV.4). At the end of 2006, the new Member States which joined the EU in 2004 or later held client deposits which were 10% higher than the volume of loans granted. By contrast, the old EU Member States sought on average 20% of missing funding sources for loans outside client deposits (on the interbank and capital market). It is this difference in the financing of bank assets that now makes the banking sectors in the new economies, including the Czech Republic, more resilient to the consequences of the mortgage crisis in the USA in the area of balance-sheet liquidity. The Czech Republic is one of the countries where banks' primary funds base is currently large. There are thus two advantages of this large volume of client deposits: protection against any rapid drying up of liquidity on the financial market, and the low costs of such funds compared to other forms of external financing. However, deposit growth (17% in 2007) has been lower than credit growth in the Czech Republic. The ratio of deposits to loans is gradually declining and banks may thus lose the above advantages.

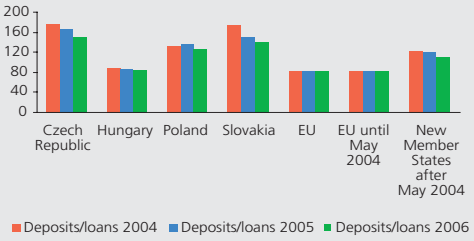
The rise in lending also means a rise in credit risk exposure.[63] The ratio of default loans[64] to total loans was 2.7% at the end of 2007 (see Chart IV.5), down by 0.9 percentage point from a year earlier. This ratio decreased in all sectors of the economy. This was due mainly to the favourable economic environment. The high rate of growth of loans is probably currently resulting in a slight overvaluation of their quality, as expressed by the percentage of default loans.[65]

CHART IV.3
Year-on-year credit growth by sector
(%)



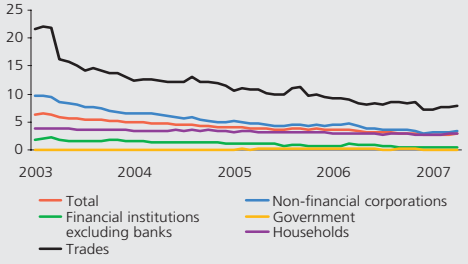
Source: CNB

CHART IV.4
Financing of loans by primary deposits
(%)



Source: ECB

CHART IV.5
Default loans by economic sector
(% of total loans of given sector)



Source: CNB

61 Basel II introduces a new category of capital charges for operational risk. Despite the creation of this new category, the banks that adopted the new rules in 2007 recorded capital savings overall, owing to generally lower capital charges reflecting more accurate measurement of other risk types. The share of operational risk capital charges in total capital charges is dealt with in the article *Operational Risk and its Impacts on Financial Stability* in the thematic part of this Report.

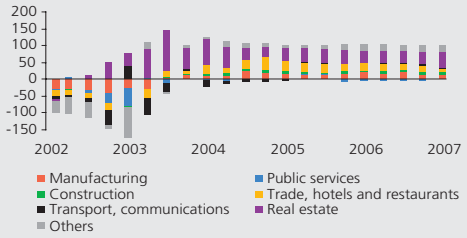
62 The remaining 20.5% are loans extended by banks to the government sector, non-banking financial institutions, small businesses and non-residents.

63 In its dominant form, credit risk is the risk of default on a loan or part thereof, or of default on contract leading to delayed repayments. This risk is usually a subject of ratings by external institutions. This issue is dealt with in relation to financial institutions in the article *The Role of Ratings in Financial Sector Stability Assessment* in the thematic part of this Report.

64 A default loan is defined by CNB Decree No. 123/2007 Coll., on prudential rules for banks, credit unions and investment firms, as exposure to a debtor in default. A debtor is in default at the moment when it is probable that he will not repay his obligations in a proper and timely manner, without the creditor proceeding to satisfaction of the claim from the collateral, or when at least one repayment (the amount of which is deemed by the creditor to be significant) is more than 90 days past due. The term default loan is essentially equivalent to the former term non-performing loan, which was used in last year's Report.

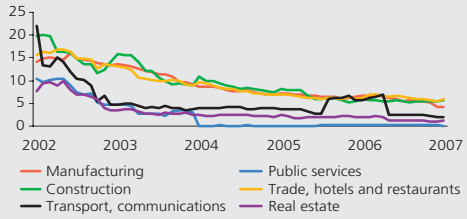
65 The risk of loan default, as expressed by the default rate in the non-financial corporations sector, has been roughly the same since 2002 (see section 2.1). The default rate for total loans to households, monitored since 2007 H2, has also been almost stable (see section 2.2).

CHART IV.6
Shares of industries in total annual increase/decrease in credit to corporations
(%)



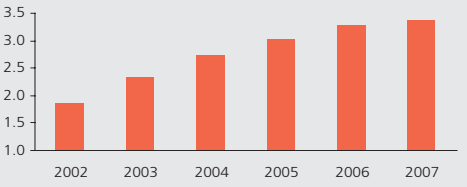
Source: CNB

CHART IV.7
Default loans by industry
(% of total loans of given industry)



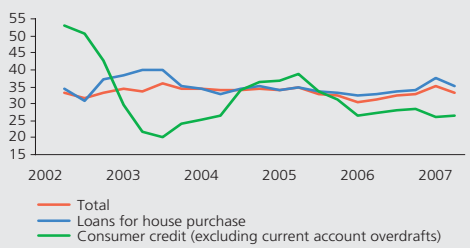
Source: CNB

CHART IV.8
Average age of a mortgage loan
(years; y-axis)



Source: CNB

CHART IV.9
Year-on-year growth in credit to households by purpose
(%)



Source: CNB

Loans to non-financial corporations

Demand for products and services of non-financial corporations increases when times are good. Such corporations need considerable external sources of financing. The volumes of bank loans to corporations have been growing since 2004 and amounted to CZK 744 billion at the end of 2007. Manufacturing was the most important debtor in terms of sectors (26%), followed closely by real estate companies (25%).

The rate of growth of bank loans to non-financial corporations decreased slightly in 2007, by 3.7 percentage points to 17%. Based on the developments in the first few months of 2008, it cannot be ruled out that the slowdown will continue. The biggest contributor to the growth in 2007 was the real estate sector with 46% (see Chart IV.6), followed by manufacturing. Loans provided to real estate companies have been growing faster and faster since 2003 H2 and showed record growth of 50% in 2007. Such high growth is consistent with the large increase in demand for new housing construction, which is being supported by a wide supply of bank loans. Given the enormous indebtedness of property developers, this sector and the property market were included in the "property market crisis" scenario of the stress testing of the Czech banking sector (see section 4.2). The results of the test show that the banking sector is sufficiently resilient to the risks associated with potential negative developments in developers' business activities and on the property market.

The favourable economic environment is having a positive effect not only on credit growth, but also on the ability of the corporate sector to repay its obligations. The quality of loans to corporations as a whole, as expressed by the ratio of default loans to total loans, is steadily improving. This ratio declined by 0.5 percentage point last year, to 3.1% in December (see Chart IV.7). Industries with the largest debts, i.e. manufacturing and real estate companies, recorded ratios of default loans to total loans of 4.2% and 1.3% respectively at the end of 2007. In both cases, the ratio of default loans to total loans declined year on year, largely due to large volumes of new loans. The effect of the current strong growth in loans is that the existing loans are relatively "young". If the rate of growth declined as a result of an overall slowdown in the economy or saturation of the given market (a decline in demand for residential and commercial property), the average "age" of the loans would gradually lengthen and the likelihood of repayment difficulties would increase. The average "age" of a mortgage loan is about 3.5 years (see Chart IV.8). This will lengthen if the slowdown in the provision of new loans of this kind observed in 2008 Q1 continues. Mortgage loans are now granted with a maturity of about 20 years on average.

Loans to households

Loans to households grew by 35.1% in 2007, reaching CZK 669 billion at the end of the year. After having slowed slightly in 2006, their rate of growth picked up again, by 4.7 percentage point year on year (see Chart IV.9). In 2007, the growth in total loans was driven mainly by house purchase loans, which accounted for 76.4% of total loans to households and increased by 37.6% in 2007, i.e. 5 percentage points faster than in 2006. By contrast, the rate of growth of consumer credit (26.1%) recorded a slight decline and ultimately led to a decline in the share of consumer credit in the structure of loans by purpose to 18.8%.[66]

66 The CNB's internal estimates based on economic models indicate that the current increase in consumer credit is relatively sound, i.e. driven by fundamentals. According to the model, a decline in the rate of growth of bank consumer credit to just above 20% can be expected in 2008.

New loans in 2008 Q1 signal the possible start of a slowdown in new borrowing by households. While loans to households recorded an increase of 24% in the first two months of 2007 compared to the same period a year earlier, the rise in new loans to households was "just" 13% in January and February 2008 compared to early 2007. The volumes of new loans for house purchase rose by 16.3% in the same period (compared to 31.5% a year earlier). New consumer credit even recorded a slight decline in January and February 2008 compared to 2007.

In 2007, the rising indebtedness of households in the Czech Republic was fostered mainly by growing income, ever expanding supply from banks and developers, and the persisting low interest rate environment. Factors common to the new EU Member States include a low initial level of household debt, a preference for owner-occupied housing and a visible change in households' behaviour with regard to consumer credit, as they are ceasing to be afraid of financing their short-term needs with credit if they are short of money. The rate of growth remained higher in the new Member States than in the old Member States in 2007 (see Chart IV.10).

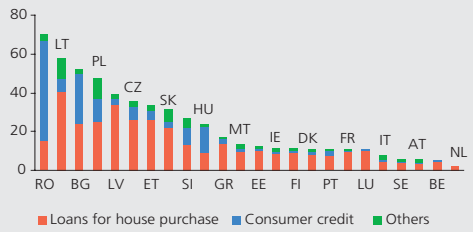
The ratio of default loans to total loans to households recorded an annual decline of 0.1 percentage point to 2.7% at the end of 2007. The quality of loans to households was affected by the large volume of new loans and the dominant share of less risky house purchase loans. Loans for house purchase are the highest-quality component of the credit portfolio, as expressed by both the ratio of loans in default to total loans and by the default rate (see section 3.2).

Loans for house purchase ended 2007 with a 1.5% share in default loans (see Chart IV.11), which is comparable with the end of the previous year. Mortgage loans (loans fully secured by property) account for about 65% of loans for house purchase. The loan-to-value indicator reached 56% for mortgage loans to households at the end of 2007 (compared to 53% at the end of 2006). Lower-volume loans usually take the form of building society loans not secured by property and special-purpose consumer credit. For several years, the share of default loans has been about 1 percentage point lower for mortgage loans than for unsecured loans. It stood at 1.2% at the end of 2007.

The share of default loans in total consumer credit was 6.6% at the end of 2007, down by 0.7 percentage point year on year. The ratio of credit card credit to consumer credit increased slightly to 8.7% year on year. Its quality is still higher than that of total consumer credit (see Chart IV.12).

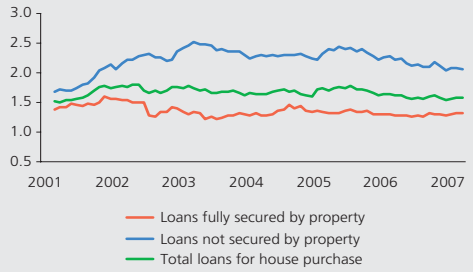
The rate fixation period is a potential risk for both banks and debtors. Variable and short-term fixed rates responding flexibly to changes in market conditions are advantageous for clients at a time of declining interest rates. At a time of an unexpected increase in interest rates they generate greater income for banks, while implying an increased burden for clients, which might, in the extreme case, result in default. The moment of change in the rate is usually associated with the option of early repayment, which poses a risk for the bank. If the client refinances the loan after a short period of time at a rival bank, the transaction may, in some cases, become unprofitable for the original bank due to considerable initial costs. The structure of new consumer credit by initial rate fixation period (see Table IV.1) is consistent with the structure by maturity. But the situation is different with loans for house purchase, as the client may usually choose a short initial rate fixation period even for a long-term loan. At the turn of the year, uncertainty regarding the future evolution of interest rates caused new clients to start more strongly preferring a long rate fixation period for mortgage loans. Building societies, whose loan rates are fixed for the entire repayment period, are more active on the long-term loan market.

Chart IV.10
Contributions to annual rate of growth of credit to households in EU Member States
(%; 2007)



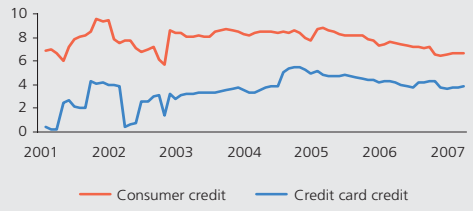
Source: ECB

Chart IV.11
Default loans to households for house purchase
(% of total loans of given type)



Source: CNB

Chart IV.12
Default consumer credit to households
(% of total loans of given type)



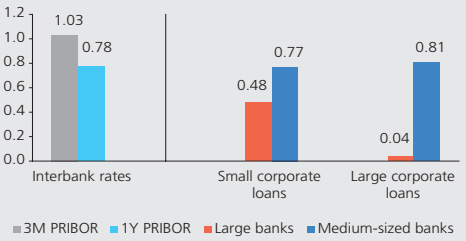
Source: CNB

Table IV.1
Rate fixation structure of new koruna credit to households
(%)

	Total	< 1 year	1-5 years	> 5 years	5-10 years	> 10 years
Consumer credit						
2006	100	32.3	27.2	40.5	n.a.	n.a.
2007	100	29.9	25.9	44.1	n.a.	n.a.
Jan–Feb 2008	100	40.2	26.6	33.2	n.a.	n.a.
Loans for house purchase						
2006	100	38.7	29.1	n.a.	7.8	24.4
2007	100	33.2	34.3	n.a.	6.6	25.9
Jan–Feb 2008	100	20.6	38.1	n.a.	7.7	33.6

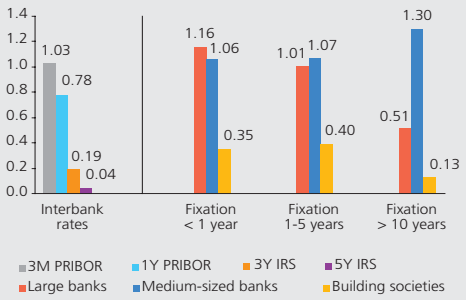
Source: CNB

CHART IV.13
Change in interest rates on new corporate loans to households versus change in interbank rates
(percentage points)



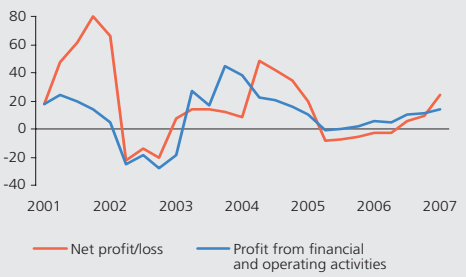
Source: CNB
Note: Change between June 2007 and January 2008; corporate loans with floating rates or fixations of less than one year, covering around 90% of all new corporate loans.

CHART IV.14
Change in interest rates on new house purchase loans to households versus change in interbank rates
(percentage points)



Source: CNB
Note: Change between June 2007 and January 2008; the given fixations cover around 95% of all loans for house purchase.

CHART IV.15
Year-on-year growth in profit from financial and operating activities and net profit
(%)



Source: CNB

The global crisis on financial markets could lead to Czech banks tightening their credit conditions above the yield curve, mainly because of uniform risk management in the multinational banking groups to which Czech banks belong. An analysis of interest rates on new koruna loans showed that the interest rate conditions had tightened only slightly for the corporate sector. This tightening was smaller than the increase in the corresponding yield curve rates. While three-month interbank PRIBOR rates rose by 103 basis points between June 2004 and January 2008, average rates on new corporate loans with floating rates or fixations of less than one year increased only by around 50 basis points. However, some riskier segments (small businesses and consumer credit to households) and also loans for house purchase saw some tightening above the yield curve. Yield curve rates with maturities of over one year rose by about 40 basis points (rising more at the short end), while rates on new loans for house purchase with fixations of between one and five years increased by almost 100 basis points. At the same time, market contacts confirm that a number of segments recorded some tightening of non-interest lending conditions (required collateral, etc.).

New koruna deposits have also shown a gradual increase in rates in recent months. Average new client deposits were remunerated at 1.12% at the end of 2006, 1.42% at the end of 2007 and 1.54% at the end of 2008 Q1. Growth is also noticeable for the generally higher rates on new time deposits. Such rates rose from 2.05% at the end of 2006 to 2.57% a year later. They have continued increasing in 2008, reaching 2.63% at the end of March.

Although the Czech banking sector is dominated by foreign banks, such banks differ in how they raise funds for credit expansion. While the three largest banks and the building societies sector draw on wide deposit bases, medium-sized and smaller banks can rely more on financing from foreign parent banks or the interbank market. An analysis of the tightening interest conditions on corporate loans by bank type reveals that large banks can profit from their relative financial independence of funding from foreign owners and thus increase interest rates less than medium-sized and smaller banks (see Chart IV.13). A similar conclusion applies to loans for house purchase, with the exception of fixations of up to one year (see Chart IV.14). As regards the volume of new loans, an analysis of the data indicates that the share of medium-sized and small banks in total new loans declined slightly in all segments.

Profit and capital

The banking sector generated a record net profit of CZK 47.1 billion in 2007, up by 24% on 2006, which was also a successful year (see Chart IV.15). The main source of profit for most banks was growing income from financial activities. This was in line with the high return on equity (24.5%) and return on assets (1.3%) achieved in 2007.

The growth in profit from financial activities was driven primarily by interest profit, with annual growth of 19% and an almost 64% share of the total profit from financial activities. The ratio of interest profit to non-interest profit has long been around 3:2 in the Czech Republic. The most important share of interest income comes from client loans. In some EU countries, especially the original members, the share of non-interest profit has risen gradually in recent years. In some countries, this component has now exceeded interest profit, which is being depressed by low rates and strong competition.[67]

67 In 2006, the share of non-interest profit exceeded 50% in Belgium, France, Germany and Luxembourg, i.e. countries with large banking sectors that significantly affect EU-wide aggregates due to their high weight in the total. These issues and international comparisons in other areas are addressed in more detail in Davidová, P., Komárková, E.: *Český bankovní sektor vs. evropské banky* (The Czech Banking Sector versus European Banks), Bankovnictví 2/2008.

Given the current slowdown in bank lending, interest profit growth can be expected to moderate and its share to decline gradually in the Czech Republic as well. Banks now operate in a competitive environment (especially as regards loans to households) that does not allow them to set their interest rates and fees above a reasonable level.

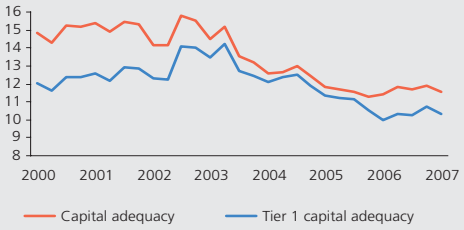
Profit generation is one of the most significant factors strengthening a bank's capital and hence also the financial stability of individual institutions and the sector as a whole. The gradual decline in capital adequacy indicators, which can be observed since 2003 (see Chart IV.16), is due to a combination of rising capital requirements as a result of an expansion in lending and the start of a period of massive dividend payments. At the end of 2007, capital adequacy and Tier 1 capital adequacy reached 11.5% and 10.3% respectively. Both indicators suggest a sufficient level of capital. The slight increase in both indicators in 2007 was related mainly to high net profit generation and a year-on-year fall in dividends paid of 55%. Capital adequacy growth was also aided by the gradual transition of Czech banks to the Basel II framework, which, thanks to more accurate risk assessment, allows the banks that have been governed by its rules since 1 July 2007 to set lower capital charges.

In the set of banks that switched to Basel II in 2007 H2 and were also required to report reference values under Basel I (a total of five banks using the IRB approach to credit risk and having a share in the sector's assets of 48%), the capital charge decreased by 13%–22% in individual months due to the new rules (see Table IV.2). All the banks recorded a decline. The Basel II rules are also more sensitive to the possibility of adding/deducting individual items to/from regulatory capital. Four out of the five banks had to deduct missing provisions from capital as a result of insufficient creation of provisions, which fell short of the expected loss. Capital fell by 4%–5% in the group of monitored banks in individual months by comparison with the Basel I rules. As this decline was smaller than the fall in the capital charge, the resulting capital adequacy ratio under the applicable Basel II Decree was higher than the Basel I reference value. The bands of the capital adequacy ratios for the individual banks calculated under the two approaches partly overlap (see Chart IV.17).

The expected decline in the capital charge and capital cushion materialised in all five banks. In the coming period it will be necessary to assess regularly whether models and processes are set correctly in all banks and whether the capital savings achieved thanks to the new framework correspond to the risk profiles of the individual banks.

The probability of default (PD) and loss given default (LGD) are important indicators under Basel II. Based on data from the five Czech banks that introduced the Basel II IRB approach in mid-2007, the average LGD was around 42%. This parameter was the same for exposures to both the corporate sector and the household sector. If this value and the average default rate based on aggregated data from credit registers[68] were applied to exposures to households and corporations for the whole banking sector in 2007, the aggregate capital charge for the whole banking sector under the Basel II IRB approach could be calculated. The baseline scenario based on the CNB's official macroeconomic forecast (see sections 2.1 and 4.2) implies a slight rise in the default rate for both corporations and households.[69] In line with the IBR

Chart IV.16
Capital adequacy
(%)



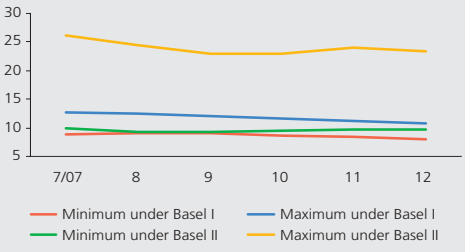
Source: CNB

Table IV.2
Selected indicators under Basel I and Basel II
(CZK billions; %; banks required to report under both frameworks)

	7/07	8/07	9/07	10/07	11/07	12/07
			Basel I			
Capital	105.0	104.7	104.8	104.8	95.2	100.8
Capital charge	80.1	78.9	80.6	82.7	84.1	87.1
Capital adequacy	10.5	10.6	10.4	10.1	9.1	9.3
			Basel II			
Capital	99.2	98.3	98.7	100.3	91.4	96.5
Capital charge	68.7	68.3	69.1	69.7	67.4	68.2
Capital adequacy	11.6	11.5	11.4	11.5	10.9	11.3

Source: CNB

Chart IV.17
Capital adequacy ratios under applicable Basel II framework and reference Basel I framework
(%, banks required to report under both frameworks)



Source: CNB

68 The historical 12-month default rate of non-financial corporations was calculated using aggregate data from the Central Credit Register, which is administered by the CNB and covers the whole banking sector. For the household sector, the default rate was estimated using data from the Banking Client Information Register operated by the Czech Banking Credit Bureau, which contains data for most banks.

69 Macroeconomic credit risk models for corporations and households predict an increase in the default rate of around 1.5 percentage points for corporations and around 0.5 percentage point for households at the end of 2008.

approach under Basel II, the regulatory capital charge should therefore increase. While the capital charge for exposures to households should rise by only 2%, the expected increase for exposures to corporations is 10%. The available evidence suggests a negative relationship between the probability of default and economic growth.[70] Thus, the capital requirement usually increases in an economic downturn, which may lead to restricted lending above all to the corporate sector, further exacerbating the decline in economic performance. However, this effect, often referred to as the pro-cyclicality of Basel II in the literature, is dampened by a sufficient capital cushion exceeding the mandatory capital charges.

The Basel II capital framework was gradually introduced in all EU countries in 2007 (and at the start of 2008). The evaluation of the impact of the new rules is being hampered by the effects of the US subprime mortgage crisis on European banks. Ultimately, the crisis led to significant losses of several large banks, resulting, among other things, in a decrease in their capital adequacy.[71]

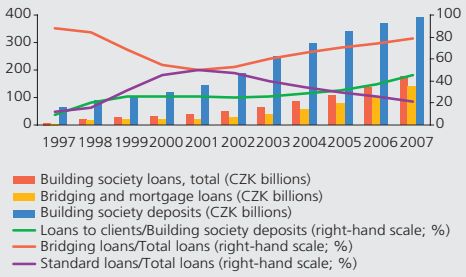
Building societies

As in the case of bank loans to households, building society loans rose by roughly one-third in 2007, amounting to CZK 180 billion, or 10% of total banking sector lending. As in previous years, bridging loans were the biggest contributor to this growth. Consequently, the share of bridging loans, which are to some extent an alternative to bank mortgage loans, in total building society loans approached 80%. Deposits with building societies grew by 7% year on year to CZK 394 billion in 2007, accounting for almost 20% of total deposits in the banking sector (see Chart IV.18). The ratio of loans to deposits rose to 45% at the end of the year. Building societies currently register around 4.8 million contracts with state contributions and the market can be regarded as almost saturated. Over the entire existence of the system, new loans amounting to CZK 28 billion have been provided on average each year. New standard building society loans have so far been fluctuating around several billion koruna a year.

The smooth development of the building savings system depends largely on the parameters of state support, which amounted to roughly CZK 15 billion in 2007. Over the entire lifetime of the building savings system, accumulated state support of CZK 122 billion, or an average of CZK 10 billion every year, has been provided (see Chart IV.19). The current level of state support in the Czech Republic is high by international standards.[72] Moreover, the building savings legislation does not allow a significant decrease in public expenditure to be achieved in the short run in the event of a decision to change the parameters of state support. For example, a change in the size of state support would fully manifest itself at a horizon of more than six years. Under the current legislation, building societies can allow their clients to increase the target amount, thereby prolonging the original contracts and letting them draw on state support even after the expiration of the compulsory saving period. Table IV.3 shows that more than 800,000 prolonged contracts with the maximum state contribution of CZK 4,500 existed within the system at the end of the year.

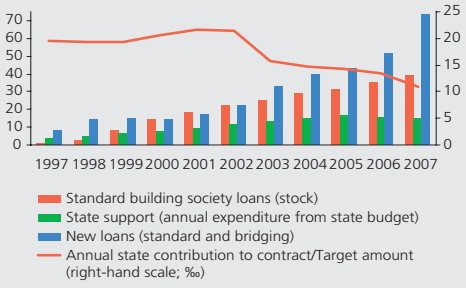
The stability of building societies under the existing system depends on the existence of a significant proportion of "friendly clients" (drawing state support

Chart IV.18
Building society loans and deposits
(CZK billions; %)



Source: CNB, MF CR

Chart IV.19
State support for building savings schemes
(CZK billions; ‰)



Source: CNB, MF CR
Note: State support estimated for 2007.

Table IV.3
Overview of building savings system

Situation as of 31 December 2007	No. of contracts thous.	Saved amount CZK bn	Av. interest rate on deposits % p.a.	Av. target amount CZK thous.
a) Old contracts without prolongation (until 31 Dec. 2003)	2,629	239	2.55	207
of which old contracts without state support entitlement	256	26	x	x
b) Prolonged contracts with entitlement of up to CZK 4,500	858	97	2.19	352
c) New contracts (since 1 Jan. 2004) with entitlement of up to CZK 3,000	1,609	40	1.92	263
of which new contracts without state support entitlement	64	2	x	x
Contract total – with state support entitlement	4,776	348	2.39	249
– without state support entitlement	922	28	x	x

Source: CNB

70 Jakubík, P. (2007): The Macroeconomic Environment and Credit Risk. Czech Journal of Economics and Finance, 1-2/2007, pp. 60–78.

71 Financial Stability Review, ECB, June 2008.

72 In 2007, state support amounted to CZK 3,000 (EUR 112) in the Czech Republic, EUR 88 in Germany (consisting of a housing bonus of EUR 45 and a contribution to the employee saving scheme of EUR 43), EUR 35 at most in Austria and EUR 60 in Slovakia.

without investing in housing) and may be adversely affected by parametric changes in state support for building savings, interest rate movements and changes in other financial market segments and the state's policies towards them. Building societies face a relatively high level of interest rate risk, as they offer fixed contractual rates and have a preponderance of saving clients, or, in other words, an excess of deposits over loans. Over the course of 2007, building societies managed to reduce their interest rate risk by cutting their deposit rates well below 3% in the contract prolongation process. However, only an increase in the loan-to-deposit ratio can bring about a further decline in interest rate risk.

4.1.2 Non-banking financial institutions

Insurance companies

The most important categories on the insurance market are the traditional segments of life and non-life insurance. Life insurance includes permanent life insurance and combined term and permanent insurance (46% of life insurance premiums). Life insurance combined with an investment fund (unit-linked) is gaining popularity (34%). As regards non-life insurance, the most important categories are vehicle liability insurance (30% of non-life insurance premiums), property insurance for entrepreneurs and private individuals (22%), vehicle accident insurance for entrepreneurs and private individuals (21%) and business insurance (20%).

Premiums written rose by 8.9% year on year in 2007. This growth was driven by life insurance (14.6%), especially investment (unit-linked) life insurance. Premiums written in non-life insurance were up by 5.2% (see Chart IV.20).

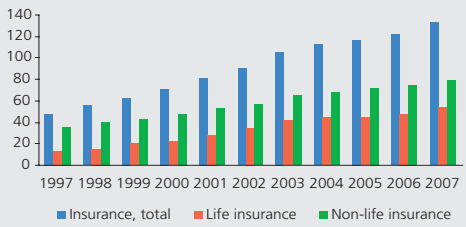
Previous analyses and international comparisons[73] reveal that there is room on the Czech insurance market for further growth over the long run, especially as regards premiums written and financial placement (as a percentage of GDP) in both life and non-life insurance. The ratio of financial investment in non-life insurance to GDP increased from 2.1% to 2.6% year on year. Given the rising volatility of climate change, a gradual reassessment of non-life insurance contracts and a rise in premiums under updated insurance schemes can be expected.

Insurance companies are creating higher technical provisions for life insurance. Claim settlement costs in life insurance rose from 33% to 41% of total claim settlement costs in 2007. Within non-life insurance, vehicle liability (17%), vehicle accidents (16%) and natural disasters (14%) accounted for most of the claim settlement costs. Non-life insurance segments have faced repeated shocks and claim settlement costs, mainly in connection with damage caused by the floods in 2002 and the hurricane in 2007 (see Chart IV.21). In non-life insurance, the ratio of claim settlement costs to technical provisions was usually higher than in life insurance. Premiums written were also higher due to a shorter claim settlement cycle (see Chart IV.22). Selected non-life segments (vehicle accidents, natural disasters, damage to property) require the involvement of reinsurers. Reinsurers accounted for 15% of total claim settlement costs, of which 1% in life insurance and 25% in non-life insurance.

Technical provisions are a source of funds for investment in financial assets. Insurance companies invested 50% of their funds in bonds of banks and international institutions and 6% in reinsurance companies. Other investments were made in mortgage bonds and mutual fund units, property and marketable shares and bonds (see Chart IV.23).

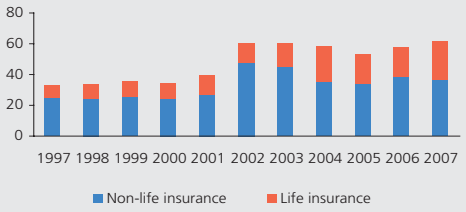
73 Financial Stability Report 2006, CNB.

CHART IV.20
Life and non-life insurance (premiums written)
(CZK billions)



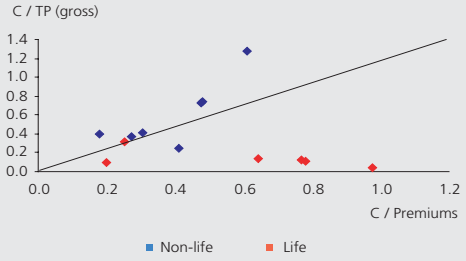
Source: CNB

CHART IV.21
Claim settlement costs
(CZK billions)



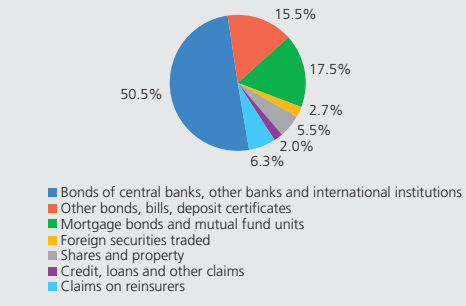
Source: CNB

CHART IV.22
Cost ratios of main insurance segments
(coeff.)



Source: CNB
Note: Claim settlement costs (C), technical provisions (TP) and premiums written are at gross value (not adjusted for the effect of reinsurers).

CHART IV.23
Financial investment in assets
(% of financial investments)



Source: CNB

Insurance companies were compliant with the solvency criteria (according to audited 2006 results), as their internal funds were greater than or equal to the required solvency margin (100%). Under the existing legislation, the aggregate available margin was three times the required solvency margin on the life insurance market and 3.3 times that on the non-life insurance market.

Under the planned Solvency II framework,[74] a total of 12 domestic insurance companies underwent a solvency calculation under the quantitative impact study (QIS3). The insurance companies had to meet the capital requirements under the new rules – the solvency capital requirement (SCR) in the case of mobilisation of own funds for some of them and the minimum capital requirement (MCR). A total of ten insurance companies met the solvency criterion under the methodology used without additional capital needs. As in the case of stress testing (see section 4.2), it was found that capital requirements for market risks (especially interest rate and equity risks) were most important for life insurance, while the capital requirement for non-life insurance risk was predominant in non-life insurance.[75]

Insurance company stability was fostered by return on equity, which reached 21.7% in 2007, and average return on assets, which was 3.7%. Strongly rising contract acquisition costs acted in the opposite direction. These costs could place a burden on the insurance system in the future (see Table IV.4).

Pension funds

At the end of 2007, a total of CZK 162.4 billion in contributions was registered on the accounts of private pension planholders. State contributions accounted for CZK 21.9 billion of this amount. Funds from employers totalling CZK 16.6 billion, to which the state contribution does not apply, receive preferential tax treatment. Overall, CZK 73.3 billion has been paid in benefits since 1994, of which CZK 48.8 billion as lump-sum settlement and CZK 8 billion as termination settlement. The other items paid include retirement, service, survivors' and disability pensions and other payments.

Contributions from planholders have recently been rising (by 14.2% year on year in 2007). This growth in funds has been supported by the state contribution and tax deductions and by a stronger motivation among individuals to provide for their old age. Benefits paid have also risen quite strongly in the last two years (see Chart IV.24).

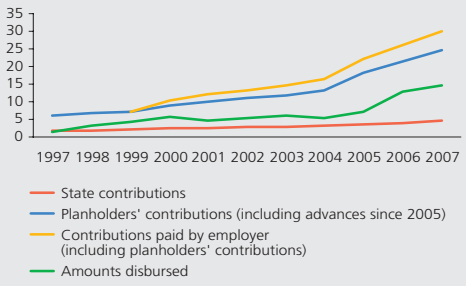
The ratio of pension insurance to GDP was 4.7% in the Czech Republic in 2007, a low figure by comparison with the data available for selected countries (see Chart IV.25). Nevertheless, the number of planholders has increased significantly to 3,936,000 since 2005 (the rates of increase were 11.3% in 2005, 10% in 2006 and 9.5% in 2007). Planholders represent more than one-third of the Czech population.

Table IV.4
Insurance contract costs paid to intermediaries
(%)

	2007	2006
1. Contract costs for payment in given year		
Year-on-year growth	17.9	8.4
Share in profit after taxation	159.8	121.2
2. Contract acquisition costs as prepayments		
Year-on-year growth	43.6	22.9
Share in profit after taxation	43.1	26.9
Ratio of costs (1.+2.) to annual premiums written	19.4	17.2
Ratio of costs (1.+2.) to total costs	8.5	8.0
Coverage of total costs by annual premiums (in years)	2.3	2.2

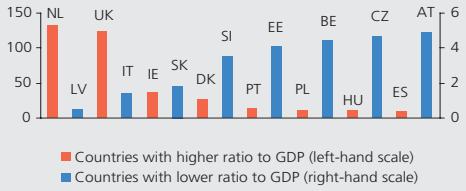
Source: CNB

Chart IV.24
Pension fund sources and amounts disbursed in given year
(CZK billions)



Source: CNB

Chart IV.25
Pension planholders' funds
(% of GDP)



Source: CNB, ECB
Note: Data for 2006. Selected EU countries.

74 The new Solvency II regulatory framework in the insurance industry affects not only the technical risk for life, non-life and health insurance, but also market risks and credit and operational risk. Under a procedure organised by CEIOPS, the QIS3 results for the calibration of the standard formula for calculation of the minimum capital requirement (MCR) and the solvency capital requirement (SCR) were published in November 2007. In 2008, a QIS4 study is under way to recalibrate the capital requirements, technical provisions and other processes in solvency calculation.

75 CEIOPS' Report on its Third Quantitative Impact Study (QIS3) for Solvency II, CEIOPS, October 2007. The results of the study for the Czech insurance market are described in Justová, I., Kotaška, M. (2007): *Vyhodnocení výsledků třetího kola kvantitativní dopadové studie (QIS3) za český pojistný trh* (Assessment of the Results of the Third Round of the Qualitative Impact Study (QIS3) for the Czech Insurance Market). Pojistný obzor 12/2007.

As in the insurance industry, efforts to win clients led to an increase in contract acquisition costs (including prepayments) in 2005–2007. Intermediaries also made use of the possibility of transferring money to other funds and charged higher amounts for new contracts than in the past. Planholders' contributions rose by 14% year on year, but contract intermediation costs increased by 30% in the 2007 result and another 20% in prepayments. The increase in costs may place a burden on the pension scheme industry in the future (see Table IV.5).

Under the limits set by law, pension funds should invest the funds they raise from planholders in relatively safe assets. At the end of 2007, 84.8% of assets were invested in bonds issued by general government, deposits with domestic banks and other bonds (see Chart IV.26). 10.4% of funds were invested in shares and units, which can be more volatile. Investments in shares and mutual fund units were less favourable in terms of profit generation. In 2007, funds recorded losses of 6.6% of the acquisition price from investments in shares and 12.5% from investments in mutual funds, i.e. a total of CZK 1.5 billion. The value of funds' assets was adversely affected by the appreciating koruna and rising market interest rates.[76] According to their balance sheets, annual valuation losses in the total assets of pension funds were CZK 5.6 billion. Profit of pension funds was CZK 4.4 billion. The real performance of their assets was slightly negative as a result of the valuation losses.

The existing pension funds are designed to provide a non-negative annual yield which, after coverage of fund administration costs, should ensure that the client's contribution gains in value owing to continuous efforts by the manager to raise the value of the fund's assets in real terms.[77] However, growing volatility on the asset market and in particular negative differences between the real value of assets and their acquisition price may have an adverse effect on the funds' assets in the longer run, especially if benefits rise or are paid at a faster pace (primarily lump-sum settlements). Commensurate capital increases by funds' shareholders would be desirable as protection against this risk (see Table IV.5).

Investment companies and mutual funds

In 2007, a total of 18 investment companies were operating on the capital market, three of which were controlled by resident banks. The companies maintained a high RoE of 46.5% and RoA of 25.6%. Investment companies usually administer domestic open-ended mutual funds. The accounts and transactions of these funds are separate from transactions for the company's own account.

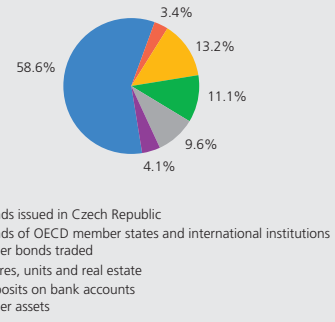
Domestic open-ended mutual funds are a form of collective investment designed mainly for individual investors. At the end of 2007, 120 funds, with assets of CZK 191 billion, were active. Of this number, 10 funds, with assets of CZK 77 billion, were money market funds (see Chart IV.27). A total of 66 funds, with assets of CZK 146 billion, were administered through domestic subsidiary banks. Thus, banks contribute significantly to the intermediation of transactions and offer units as an alternative to bank deposits.

Table IV.5
Pension scheme contract costs paid to intermediaries and effect of asset revaluation
(%)

	2007	2006
1. Contract costs for payment in given year		
Year-on-year growth	30.2	20.2
Share in profit from financial operations	61.6	36.0
Share in profit after taxation	21.2	17.4
2. Contract acquisition costs as prepayments		
Year-on-year growth	20.2	29.5
Share in profit after taxation	78.5	69.6
Ratio of costs (1.+2.) to annual state support	95.8	88.9
Valuation differences between acquisition price and fair value of assets [1/]		
Share in pension funds' capital	-124.3	38.3
Ratio to annual state support	-96.2	28.7

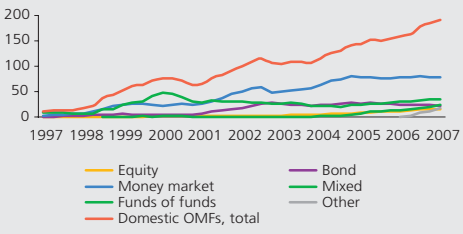
Source: CNB
Note: [1/] A negative value means that the fair (market) value fell below the acquisition price of the assets.

Chart IV.26
Structure of pension fund investments
(%; 2007)



Source: CNB

Chart IV.27
Assets of domestic open-ended mutual funds
(CZK billions)

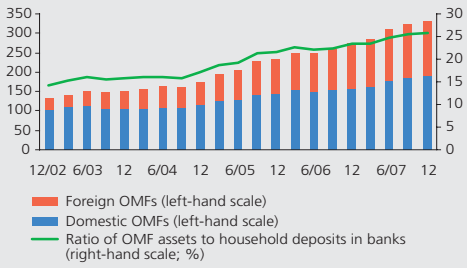


Source: CNB, AFAM CR

76 For example, unsecured currency exposures of funds would result in valuation losses of around CZK 1.5 billion if the koruna appreciated by 10%. Further losses would be caused by a fall in market prices of bonds. If interest rates rose by 1%, the valuation losses would be CZK 2.5 billion (see also section 4.2).

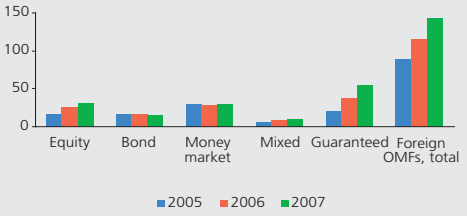
77 In recent years the possibility of separating the accounting of planholders' assets from that of the assets of the pension fund's shareholder (manager) has been discussed. The World Bank published a study on pension funds in the Czech Republic: Pilot Diagnostic Review of Governance of the Supplementary Private Pension Fund Sector, The World Bank, January 2007. This evaluation study, prepared at the request of the Ministry of Finance, focused on principles of management in the supplementary pensions sector and should provide recommendations leading to better management and control in the sector and enhanced protection of planholders.

CHART IV.28
Assets of open-ended mutual funds
(CZK billions; %)



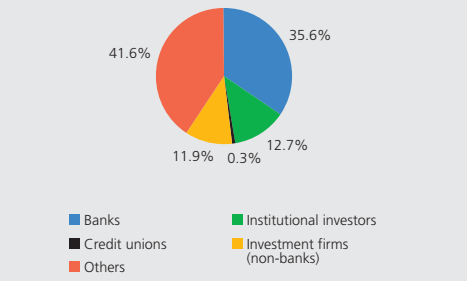
Source: CNB, AFAM CR

CHART IV.29
Assets of foreign open-ended mutual funds
(CZK billions)



Source: AFAM CR and AKAT

CHART IV.30
Structure of investment firm clients by volume of transactions arranged in 2007
(%)



Source: CNB

TABLE IV.6
Activities of leasing companies, other lending companies and factoring and forfaiting companies
(CZK billions; year-on-year change in %)

	2005	2006	2007	y-o-y change 06/07
Leasing companies				
Loans, total	182.6	190.2	222.1	16.8
Loans to non-financial corporations	126.8	131.2	143.4	9.4
Loans to households	53.8	57.3	76.9	34.4
Other lending companies				
Loans, total	54.1	62.3	74.7	20.0
Loans to non-financial corporations	2.1	3.3	4.6	38.8
Loans to households	51.3	57.5	69.1	20.2
Factoring and forfaiting companies				
Loans to non-financial corporations	14.2	16.9	20.4	20.6

Source: CNB

Foreign mutual funds offer products on the domestic market through registered investment intermediaries and investment firms (see Chart IV.28). The investment itself is carried out by investment companies (funds) registered abroad. The total invested in foreign funds in the Czech Republic in 2007 was CZK 142 billion, 90% of which was intermediated by banks (see Chart IV.29).

As regards the structure of financial investment, bond funds and money market funds lost market share. Clients showed interest in mixed funds and funds of funds. The first investments in new domestic real estate funds were also recorded. There was growing interest in guaranteed funds offered from abroad, which offer a contractual guarantee of return of principal and a minimum yield. The investments in these funds were the highest, almost twice as high as investments in foreign equity funds.

Investment firms

There were 44 investment firms active in the capital market at the end of 2007, of which 31 were non-banks.[78] Total assets of non-bank investment firms reached around CZK 25 billion in 2007, a moderate increase of 20% compared to the previous year. Loans and other receivables accounted for the largest part (80%) of their assets, owing to the nature of their business. Their profit totalled CZK 890 million at the end of the year. Non-bank investment firms generally achieved higher profitability (RoE 22.2% and RoA 3.6%). The capital ratio of non-bank investment firms was high (average more than 200%, median 25%), but the values were dispersed over a wide range (from 8% through to 5,000%). Non-bank investment firms administered client assets of CZK 393 billion in their balance sheets at the end of the year. As regards the structure of active clients, whose number exceeded 31,000 at the end of the year, other clients prevailed in both management and other relationships, accounting for 40% (see Chart IV.30). Given the nature of the business of non-bank investment firms (frequent changes in trading portfolio positions) and their predominant focus on the Czech financial market, the risk of the current crisis affecting this segment is rather low.

Non-bank financial corporations engaged in lending

There were 223 leasing companies (with assets of CZK 278 billion), 57 other lending companies (with assets totalling CZK 100 billion) and 10 factoring and forfaiting companies (with assets of CZK 24 billion) active on the non-bank credit market at the end of 2007. CZK 222 billion was lent in leasing, of which CZK 143 billion to corporations and CZK 77 billion to households (see Table IV.6). Annual growth in leasing loans (5.3%) had been low by comparison with bank loans (19.9%) in 2006, but these indicators were almost identical at 17% last year. This was probably due to expected changes in the tax reform, which is reducing the tax breaks offered on financial leasing. These tax changes seem to have led to a stocking-up effect. Although leasing loans are used mainly by non-financial corporations (65%), annual growth in such loans was higher for households (34%). Consumer credit, hire-purchase loans and credit card loans from other lending companies totalled CZK 75 billion, the overwhelming majority of which was provided to households. However, their annual growth of 20% was below that of bank consumer credit provided to households (35.1%). Total loans to non-financial

78 Nine non-bank investment firms are members of the Prague Stock Exchange and the volume of their trading was CZK 1,456 billion in shares and CZK 2.97 billion in bonds in 2007. While their share trading increased by 20%, their trading in bonds fell by almost one-half compared to 2006. Bank and non-bank investment firms carried out transactions in the two types of instruments totalling CZK 1,998 billion.

corporations backed by receivables were CZK 20 billion in 2007. Their rate of growth picked up slightly, by 1.6 percentage point year on year.

A potential risk arising from the activities of non-bank credit institutions is the fact that they are not subject to direct supervision. Many leasing companies, however, are controlled by banks or other large financial institutions.

4.2 ASSESSMENT OF THE FINANCIAL SECTOR'S RESILIENCE

According to stress tests, the financial sector is currently resilient to market, credit and some specific risks. Only an extreme macroeconomic scenario with significant adverse impacts on interest rates, the exchange rate and GDP growth would necessitate capital injections to ensure compliance with the regulatory limits and maintain sufficient capitalisation in financial institutions. This is particularly true of pension funds, which are very sensitive to market risks according to the tests. The banking sector stability indicator confirms a continuing process of capital optimisation in the banking sector, with unchanged resilience to the main risks. Tests of banks' balance-sheet liquidity indicate that the banking sector is sufficiently resilient to an outflow of deposits and some other hypothetical changes in the financial market. However, only institutions with a strong deposit base withstand the extreme variant of pressures on balance-sheet liquidity.

This section sets out to assess the resilience of the Czech financial sector. This is done using stress tests quantifying the impacts of various shocks on financial institutions as well as some supplementary indicators. In the stress testing, we analyse in particular the effects of alternative model-consistent scenarios. Sensitivity analyses were also performed to assess some specific risks in more detail. This section also presents tests of the banking sector's balance-sheet liquidity for the first time (see Box 7).

The three alternative scenarios were introduced in sections 2 and 3 of this Report: "safe haven", "property market crisis" and "loss of confidence". All the scenarios were defined primarily by the evolution of key macroeconomic indicators such as GDP, inflation, the unemployment rate, short-term interest rates and the exchange rate. They were prepared using the CNB's official forecasting model (see Table IV.7). The other parameters entering the stress tests were derived using the values of these macroeconomic variables with the aid of sub-models and expert estimates based on historical averages or foreign experience. The key parameter for credit risk testing, i.e. the ratio of non-performing loans to total loans, was generated using a credit risk model and a credit growth model.[79] Parameters from the asset markets, i.e. stock prices, long-term yields and real estate prices, were set by expert judgement (see Tables IV.8 and IV.9).

The impacts of the individual alternative scenarios can be compared with the most probable path of the economy, as expressed in the baseline scenario. This is based on the CNB's official February 2008 macroeconomic forecast and assumes a slowdown in GDP growth in 2008, gradual appreciation of the exchange rate and a higher inflation rate, which, however, will start to decline in Q2.[80] As the baseline is not a shock scenario, the stress tests in this case use the average predicted values of the macroeconomic variables for 2008 (see Tables IV.8 and IV.9).

79 Both models are described in detail in the thematic article *Credit Risk and Stress Testing of the Banking Sector in the Czech Republic* in the 2006 Financial Stability Report.

80 The baseline scenario is described in detail in the CNB's Inflation Report, I/2008, February 2008.

TABLE IV.7
Calibration of baseline and alternative scenarios
(2008 averages)

	Baseline	Scenario A	Scenario B	Scenario C
Real GDP growth (%; y-o-y)	4.1	2.4	0.3	2.8
Inflation rate – CPI (%; y-o-y)	6.2	7.0	5.3	8.0
Unemployment rate (%)	6.0	6.3	6.7	6.3
1Y PRIBOR (%)	3.8	2.8	1.5	8.7
CZK/EUR exchange rate	... 1/	25.6	27.0	30.5

Source: CNB
Note: 1/ In 2008, the baseline expects a correction of the record values initially and then a slight appreciation

TABLE IV.8
Scenario type and shock size in bank stress test

Scenario type	Baseline	Scenario A	Scenario B	Scenario C
Change in CZK interest rates	-0.2 p.p.	0.1 p.p.	-0.9 p.p.	4.4 p.p.
Change in EUR interest rates	-0.8 p.p.	-1.4 p.p.	-0.4 p.p.	-0.4 p.p.
Change in CZK/EUR exchange rate (– appreciation)	-	-6.7%	-0.4%	20.1%
Loan default rate	4.2%	5.2%	6.9%	4.9%
Total credit growth	16.4%	9.9%	14.6%	4.9%
Interbank contagion risk	x	x	x	x
"Change in property prices (+ rise, - fall)"	15%	0%	-30%	-5%

Note: Changes in parameters represent the difference between 2007 Q4 and 2008 Q1, or, in the case of the baseline, between 2007 Q4 and the average for 2008.

TABLE IV.9
Scenario type and shock size in insurance company and pension fund stress test

	Baseline	Scenario A	Scenario B	Scenario C
Change in CZK interest rates	-0.2 p.p.	0.1 p.p.	-0.9 p.p.	4.4 p.p.
Change in EUR interest rates	-0.8 p.p.	-1.4 p.p.	-0.4 p.p.	-0.4 p.p.
Change in CZK/EUR exchange rate (– appreciation)	-	-6.7%	-0.4%	20.1%
Increase in default loans (reclassification)	4.2%	5.2%	6.9%	4.9%
Change in share value	0%	-15%	-15%	-15%
Change in property prices (+ rise, - fall)"	15%	0%	-30%	-5%
Increase in LI[1)] (risk of epidemics)	3%	3%	3%	3%
Increase in NLI[1)] (risk of climate change)	50%	50%	50%	50%

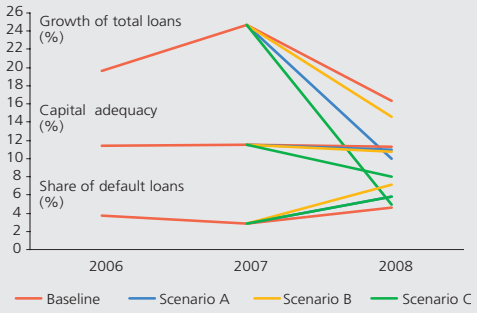
Note: 1/ Insurance company test only.
Note: Changes in parameters represent the difference between 2007 Q4 and 2008 Q1, or, in the case of the baseline, between 2007 Q4 and the average for 2008.

The overall effects of the shocks – also referred to as losses – are expressed in both absolute and relative terms (relative to capital or past profits).[81] It is also assumed that the individual financial institutions generate profits at the level of the average of the last few years, which could be used to cover the losses resulting from the shocks.[82] The allocation of profit to cover losses would continue until the original capital adequacy ratio was reached again, provided that the volume of profit allows this.

The methodology and results of the stress tests for banks were described in the previous Financial Stability Reports. Compared to last year, the calculation of interest rate risk by currency was refined (detailed calculation for the bond portfolio in koruna and in foreign currency) and the effect of a decline in real estate prices was included for the first time.

The CNB first published the methodology and results of stress tests for insurance companies and pension funds in its 2006 Financial Stability Report.[83] The insurance company stress tests apply the currently valid solvency calculation and capital adequacy conversion to allow comparison of the results with banks. The capital requirements relate to equity capital and are calculated separately for life and non-life insurance. Stress testing of insurance companies captures the same market risks[84] and credit risk (or risk of counterparty default) resulting from the individual scenarios as in the case of the banking sector. Moreover, the test for insurance companies includes shocks specific to the insurance sector. In the case of non-life insurance the shock concerns climate change and the property consequences of natural disasters (the risk of catastrophic events). The hypothetical shock to life insurance is associated with the risk of occurrence and consequences of epidemics. The life insurance shock was defined as an increase in premium reserves, premiums written or gross technical provisions depending on the category of life insurance. These items were in all cases increased by 3%. In non-life insurance, the shock for the scenario was set as a 50% rise in gross claim settlement costs in a reference (usually three-year) period and was derived from historical experience (the insured losses during the floods in the Czech Republic in 2002). Where current reserves or payments by reinsurance companies are not sufficient for insurance companies and the required solvency margin would fall, the uncovered part of the effect of the shock represents the capital requirement. The tests take into account the participation of reinsurers within the scope laid down for the solvency calculation.[85]

CHART IV.31
Results of macro stress testing scenarios



Source: CNB
Note: Growth in total loans is defined as the average annual rate of growth. The share of default loans relates to the estimation of the loan volume at the end of 2007.

81 These are "gross" losses representing the overall impact of the shocks. The banking sector as a whole can continue to generate profit even in the event of such gross losses if it is able to generate sufficient income to cover them. The stress tests incorporate the response of financial institutions to the negative effects of the shocks. It is therefore assumed that financial institutions will use profits (or the income generating them) as a first line of defence against a drop in capital adequacy.

82 This is a relatively optimistic assumption, as weaker demand for financial services can be expected in addition to a decline in the value of asset holdings and higher costs due to the fall in quality of the loan portfolio in the event of adverse economic developments. This would lead to a slowdown in activity of financial institutions, affecting both interest and non-interest income.

83 Central banks and authorities supervising insurance companies in numerous EU countries are currently engaged in stress testing of insurance companies. Similar tests are also part of the International Monetary Fund and World Bank's reports under the Financial Sector Assessment Program (FSAP). The International Association of Insurance Supervisors has issued recommendations for stress testing of individual insurance companies.

84 The calculation of the effect of the exchange rate shock in the test should be viewed as approximate, since it is based on only partial information on foreign currency assets and instruments. However, relatively low foreign currency liabilities exist in the balance sheets of insurance companies.

85 The effect of shocks on insurance companies' claim settlement costs could be fully transferred to reinsurers. In the Solvency I stress testing, the calculation of the required solvency margin includes minimum coverage by insurance companies themselves of 50% for non-life insurance and 85% for life insurance.

The pension fund tests include market risks (interest rate, equity and exchange rate risk) and counterparty default risk (credit risk) and are similar to the tests applied to insurance companies.

Interest rate risk is the most important market risk in the pension funds segment. Unlike last year, when it was based on aggregate data, the calculation of the effect of an interest rate shock is based on detailed data on the debt instrument portfolios of the individual institutions. These data (including the currency, maturity and coupon of the individual instruments) enable very precise calculation of the portfolio's value in the event of interest rate changes. Separate koruna and foreign currency portfolios were used to analyse the impacts of the alternative scenarios.

Impact of alternative scenarios on the banking sector

The impact of scenario A ("safe haven") on the banking sector is relatively moderate compared to the effects of the other scenarios (see Table IV.10). The total effects of the shocks would be CZK 53 billion (roughly 24% of the banks' capital), or 112% of the average annual profit in the last five years. Under this scenario, losses in the banking sector would be driven by an increase in credit risk, especially for non-financial corporations (around 53% of the total losses). This is due to the strong koruna, which would cause problems with loan repayments in the export-oriented corporate sector. However, the decline in GDP growth would also be reflected in households' income and their ability to repay their obligations. The default rate for the overall portfolio would rise from 2.8% to 5.8%. This would be a combination of an increase from 3% to 7.9% for corporations and a rise from 2.7% to 3.1% for households. As regards market risks, certain losses would be suffered in the event of currency appreciation. Any interbank contagion would result in further – albeit limited – losses. After the allocation of disposable profit, the capital adequacy ratio would fall from 11.5% to 11%, remaining high above the regulatory minimum (see Chart IV.31).

The impact of scenario B ("property market crisis") is slightly higher than that of the previous scenario. The overall effects amount to CZK 57 billion (120% of average profit). Capital adequacy would decline from 11.5% to 10.8%, also remaining high above the regulatory minimum (see Chart IV.31). Under scenario B, the losses would again be driven mainly by credit risk vis-à-vis non-financial corporations. However, greater defaults would also be recorded in the household sector owing to the decline in property prices. The aggregate default rate would rise to roughly 7.1% in 2008.

Scenario C ("loss of confidence") would have the strongest impact on banking sector stability. This is an extreme scenario, with the total effects of the shocks reaching CZK 118 billion, or 250% of the average profit in recent years. A capital injection of CZK 38 billion would be needed to keep capital adequacy at the regulatory minimum. The losses would be driven by interest rate and credit risks. Owing to long currency exposures, the strong depreciation of the koruna would not cause losses, but the upward pressure of the weak currency on prices would lead to high interest rates and losses due mainly to a decrease in bond prices. The high interest rates and a decline in GDP would result in a rise in the default rate for corporations and households to around 5.8% in 2008.

Impact of alternative scenarios on the insurance sector

All three scenarios would cause negative effects in the insurance sector, ranging from CZK 9.8 billion (around 85% of the average profit in the last two years) under scenario A to CZK 6.1 billion (54% of profit) under scenario B and a relatively strong impact of CZK 19 billion (167% of profit) under scenario C, due to market shocks, credit risk and the specific risks tested (see Table IV.11). To balance any losses, insurance companies would use pre-tax profits (which are assumed to reach the average of the last two years in the absence of shocks) and equalisation

TABLE IV.10
Results of bank stress tests
(capital adequacy; % and p.p.)

Scenario type	Baseline 2007	Scenario A 2007	Scenario B 2007	Scenario C 2007
Capital adequacy (CAR) [1/]	**11.5**	**11.5**	**11.5**	**11.5**
Results for chosen scenario type				
Overall impact of shocks (p.p. CAR)	-2.1	-2.8	-3.0	-6.3
Interest rate shock	0.2	0.1	0.6	-2.6
Exchange rate shock	-0.1	-0.2	0.0	0.5
Credit shock	-2.0	-2.4	-3.3	-3.6
… households	-0.5	-0.5	-0.5	-0.5
… non-financial corporations	-1.0	-1.5	-2.0	-0.6
Interbank contagion [2/]	-0.2	-0.2	-0.2	-0.7
CAR before profit allocation	9.4	8.7	8.5	5.2
Profit allocation (p.p. CAR) [3/]	1.8	2.3	2.2	2.8
Post-shock CAR	**11.3**	**11.0**	**10.8**	**8.1**
Capital injection (% of GDP) [4/]	0.0	0.1	0.1	1.1
Share of banks with negative capital after shock [5/]	0.0	0.0	0.0	14.9

Notes:
1) CAR means the capital adequacy ratio defined in accordance with the relevant CNB regulations (in particular those governing the capital adequacy of banks and other prudential business rules).
2) Test integrated with interbank contagion and expected level of loss given default (LGD) 100% and chosen probability of the banks' failure (default) on the basis of the CAR.
3) The scenarios assume that in the absence of shocks each bank would generate profit (or loss) equal to the average for the previous five years and that it would use any profit (income) as a first line of defence against a declining CAR.
4) The capital needed to ensure that each bank has a post-shock CAR of at least 8%.
5) Market share of banks with negative capital after the impact of the assumed shocks (as a percentage of total assets).

TABLE IV.11
Results of insurance company stress tests
(capital adequacy; % and p.p.)

Scenario type	Baseline 2007	Scenario A 2007	Scenario B 2007	Scenario C 2007
CAR [1/] for insurers as a whole (%)	**13,3**	**13,3**	**13,3**	**13,3**
Overall impact of shocks from exposures (p.p.)	1.2	-3.0	-1.7	-6.3
Interest rate shock	1.3	-0.1	1.3	-5.7
Exchange rate shock	-0.3	-0.6	0.0	1.9
Credit shock	-0.2	-0.2	-0.3	-0.4
Equity shock	0.0	-2.1	-2.1	-2.1
Property price shock	0.3	0.0	-0.7	-0.1
Overall impact of shocks in insurance (p.p.)	-0.4	-0.5	-0.4	-0.5
Life insurance	-0.1	-0.1	-0.1	-0.1
Non-life insurance	-0.4	-0.4	-0.4	-0.4
…motor vehicle insurance	-0.2	-0.2	-0.2	-0.2
…climate change, natural disasters, property	-0.2	-0.2	-0.2	-0.2
CAR before allocation of profit and eq. provisions	14.1	9.9	11.2	6.5
Allocation of profit and equalisation provisions (p.p.)	-1.3	2.8	1.6	3.9
Post-shock CAR (%)	**12.8**	**12.7**	**12.8**	**10.4**
Capital injection (% of GDP)	0.2	0.2	0.2	0.3

Note: 1) Calculation for June 2007, derived for illustration from bank capital adequacy methodology in 2006.

provisions (in non-life insurance), if available, to prevent a decline in solvency in life and non-life insurance below the set minimum of 100% or to prevent a decline in capital adequacy.

Insurance companies would be able to withstand the extreme stress ensuing from specific shocks (climate change, epidemics) with an impact of CZK 60 billion in settlement costs at a horizon of three or more years (even though this figure exceeds the clean-up costs of the 2002 floods by roughly one-third). This is thanks to the volume of technical provisions, the spreading of claim payments over several years, the involvement of, and payments by, reinsurance companies, and part payment of losses by policyholders. Insurance companies are capable of responding to an increasing frequency of climate change manifestations and potential rising losses and claim costs by changing their procedures, particularly in non-life insurance. Not even the extreme scenario C combined with the other shocks would cause solvency to drop below the minimum of 100%.

The stress test results indicate that the insurance company sector as a whole would be able to withstand even relatively strong shocks, taking into account current capitalisation, technical provisions and the utilisation of collateral. The worst result was recorded under scenario C, with the strong interest rate and equity shock manifesting itself most in life insurance provided by universal insurers. The extent of the impact of the combination of adverse shocks is clearly visible in the solvency ratio before allocation of profit and equalisation provisions (see Table IV.12).

TABLE IV.12
Solvency and insurance company test results
(%)

Insurance type		Total	Life	Non-life
Baseline scenario	SOLVE	315	301	327
Post-test SOLVE		286	290	283
Required/available solvency margin		35	34	35
Scenario A	SOLVE	315	301	327
Before allocation of profit and eq. provisions		249	286	220
Post-test SOLVE		284	288	280
Required/available solvency margin		35	35	36
Scenario B	SOLVE	315	301	327
Before allocation of profit and eq. provisions		268	326	222
Post-test SOLVE		285	289	281
Required/available solvency margin		35	35	36
Scenario C	SOLVE	315	301	327
Before allocation of profit and eq. provisions		200	125	260
Post-test SOLVE		250	217	276
Required/available solvency margin		40	46	36

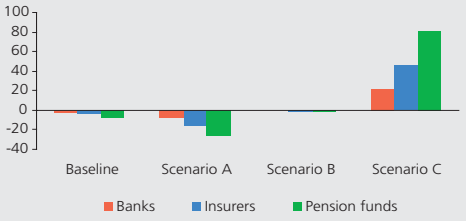
Source: CNB

TABLE IV.13
Impact of shocks in pension fund stress tests
(capital adequacy; p.p.)

Scenario type	Baseline	Scenario A	Scenario B	Scenario C
Overall impact of shocks (p.p.)	0.5	-5.8	0.5	-16.7
Interest rate shock	1.1	-0.2	4.6	-20.3
Exchange rate shock	-1.0	-2.3	-0.1	7.2
Credit shock	0.0	0.0	0.0	0.0
Equity shock	0.0	-3.3	-3.2	-3.4
Property price shock	0.3	0.0	-0.7	-0.1

Note: Calculation for June 2007, derived for illustration from bank capital adequacy methodology in 2006.

CHART IV.32
Potential impact of exchange rate shock from open exposure
(% of 2007 current profit)



Source: CNB
Note: CZK appreciation (Baseline, A, B) and CZK depreciation (C); impact before potential hedging with currency instruments.

TABLE IV.14
Ratio of mortgage loan value to property (collateral) value
(LTV in %)

Year	Weighted av.	Lower decile	Median	Upper decile
2005	43	17	49	81
2006	43	27	53	74
2007	45	38	55	65

Source: CNB
Note: Banks including building societies.

Impact of alternative scenarios on the pension fund sector

The stress testing of pension funds suggests that they are highly sensitive to unfavourable economic developments and do not always have a sufficient capital cushion to cover market risks. Given the high sensitivity to interest rate risk, the largest losses would be recorded if scenario C, which assumes a surge in interest rates, were to materialise (see Table IV.13). The aggregate effect of the shocks on the funds would be very strong if this shift in the yield curve were to be accompanied by currency appreciation and a decline in the value of share holdings. The losses under scenario C would run to 175% of last year's (average) profit and would require relatively extensive capital injections.

In addition to interest rate and equity risks, pension funds are relatively sensitive to exchange rate movements. Owing to an excess of foreign currency assets over foreign currency liabilities, they are exposed to a risk from stronger appreciation of the koruna (see Chart IV.32).

Sensitivity analysis: credit risk and the role of real estate prices

From the point of view of financial institutions, residential and commercial real estate is not only an investment instrument, but also collateral, especially for loans to households and corporations. The buoyant growth in loans for house purchase and loans to developers, often secured by real estate, raises the question of what the effect on banks' credit risk would be if an increase in unpaid loans was accompanied by a decline in the prices of real estate used as collateral in the event of a mass sell-off.

The stress tests assume that new default loans have a loan-to-value (LTV) ratio of 100%.[86] This is quite a radical assumption, as the average values are about 45% for

86 If the standardised approach is applied, only collateral fulfilling the condition of over-securing is acceptable according to the prudential rules (Basel II and a CNB decree define the relationship between the value of real estate and the exposure such that the value of real estate must significantly exceed the exposure and fully cover the principal, interest and fees). The exposure can be divided into a secured part and an unsecured part, but no specific LTV is defined for the secured part. The current rise in real estate prices in the Czech Republic, and hence the increasing collateral value, reduces the risk of banks incurring losses in the event of voluntary sales of pledged real estate by debtors.

both loans for house purchase and loans to corporations secured by real estate (see Table IV.14). Moreover, the continuing property price growth is further decreasing the LTV ratio for existing loans. On the other hand, it can be assumed that entities that obtained loans equalling the value of the collateral do not have sufficient reserves and also face higher interest rates and are more prone to default owing to the riskier nature of such loans.

A simple sensitivity analysis of loans for house purchase assumes that an increase in the share of loans in default would be accompanied by a fall in real estate prices of the same extent.[87] Problem debtors or banks themselves would sell the collateral on the real estate market, which, in the event of high volumes, would cause property prices to decline. This simple test demonstrated the banking sector's high resilience to a mortgage loan portfolio shock given the above-mentioned radical assumptions. Taking into account aggregate loan developments, the banking sector should withstand an increase in the share of default mortgage loans in total mortgage loans of up to 25% if the return on the voluntary sale of the pledged real estate was at least 75% of its value (see Chart IV.33).

In the model-consistent stress tests, a property price decline can be incorporated into the calculation of the effects on capital. In the aggregate calculation, this represents a partial indirect effect of credit risk. Scenario B – "developers in crisis" – assumed a relatively pronounced shock on real estate prices, so its effects are the strongest. Although the scenario assumed a one-off slump in prices of 30%, the impact on credit risk and capital adequacy was very low (see Chart IV.34).

Sensitivity analysis: the role of interest rate risk

As regards scenario C ("loss of confidence"), a sensitivity analysis of the impact of a smooth increase in the interest rate on banks, insurance companies and pension funds was performed. The tests assume a shift at the long end of the yield curve of one-half, i.e. the increase in long-term interest rates (five years or more) is one-half of the increase in short-term interest rates. The sensitivity analysis showed that the capital adequacy of the banking sector would fall below the regulatory minimum if short-term interest rates rose by more than 4.4 percentage points (see Chart IV.35). By contrast, pension funds are much more sensitive. If we assume a hypothetical capital adequacy ratio of 8% for pension funds, their capital would fall to zero if interest rates picked up by around 4 percentage points and no additional capital injection was provided.

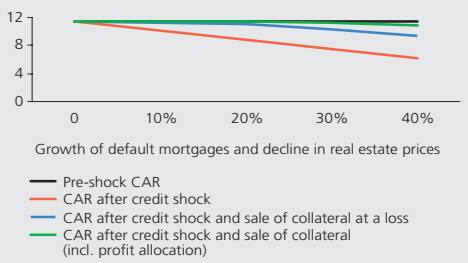
The high sensitivity of the bond portfolios of insurance companies and pension funds to interest rate changes is due to their term structure. Whereas in life insurance the investments are usually in long-term instruments, the term structure in non-life insurance is determined by the different nature of creation of insurance provisions and claim settlement. A unit shock would manifest itself chiefly in a fall in the value of medium- and long-term bonds, most of all in the life insurance portfolio and also for pension funds (see Chart IV.36).

Box 7: Stress testing of banks' balance-sheet liquidity

The turbulence afflicting world financial markets since the summer of 2007 underlined the key significance of balance-sheet liquidity for ensuring the

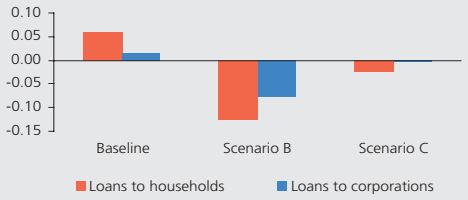
87 For example, a rise in the volume of default loans of 20% would result in a property price decline of 20% according to this very simplified assumption.

CHART IV.33
Simple test for mortgage loans
(%; 2007)



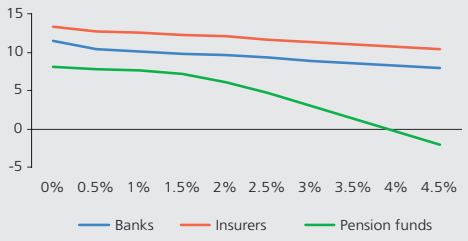
Source: CNB
Note: Scenarios of additional defaults as 10–40% of mortgage loans becoming default loans. Banks or clients would sell collateral at 90–60% value.

CHART IV.34
Impact of change in property prices on credit risk
(capital adequacy; p.p.; 2007)



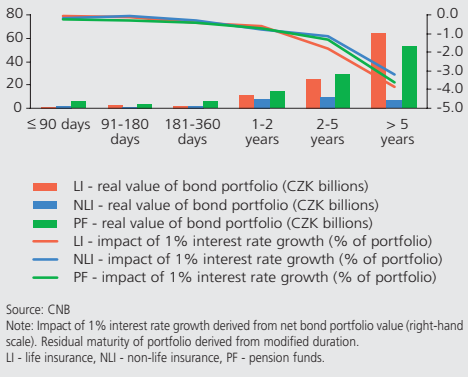
Source: CNB
Note: Scenario A does not assume any change in property prices..

CHART IV.35
Smooth change in interest rate for selected scenario
(capital adequacy; %; 2007)



Source: CNB
Note: Calculation for scenario C.

CHART IV.36
Sensitivity of bond portfolio to change in interest rates
(by maturity basket; CZK billions; %; 2007)



Source: CNB
Note: Impact of 1% interest rate growth derived from net bond portfolio value (right-hand scale). Residual maturity of portfolio derived from modified duration.
LI - life insurance, NLI - non-life insurance, PF - pension funds.

efficient operation of the banking sector.[88] The drying-up of market liquidity on many financial markets caused problems with financing of the balance sheet and off-balance sheet activities of several banks. This prompted regulatory and supervisory authorities to discuss balance-sheet liquidity management policies with the supervised entities, with the aim of reducing the risk of such a situation recurring in the future. Stress tests, which to some extent can help banks to assess the potential negative impact of unlikely stress scenarios on their liquidity positions and subsequently set a protective cushion against potential liquidity risk, are one of the sub-instruments of liquidity risk management.

Simple stress testing of banks' balance-sheet liquidity is also the focus of this box. Only an illustrative stress test was applied, involving a few very simplifying assumptions (no distinction is made between the business models of the individual banks, different maturity types are used for individual assets and liabilities, the test uses only historical data and does not account for the response by the central bank and other implications for the financial markets).[89] This test serves as an introduction to the methodology of balance-sheet liquidity stress testing, which has not previously been carried out in the analyses of the Czech financial sector's stability. The test was applied separately to 37 banks active on the Czech market. It attempted to answer the question of whether each of the banks is able to withstand a marked outflow of its balance-sheet liquidity for 21 days,[90] assuming that liquidity cannot be obtained externally (from the central bank, another bank or another sector). Liquidity outflow is expressed as a loss of clients' confidence in the bank, as reflected in panic deposit withdrawals (a bank run, see Table IV.1 Box). Gap analysis, based on expected cash flows comparing the expected inflows from the liquidation of selected assets and expected outflows from deposit withdrawals, was used to quantify balance-sheet liquidity. The test examines whether the inflow of liquidity for each bank equals or exceeds its potential outflow, i.e. whether a non-negative gap is maintained.

Three basic liquidity indicators were chosen for the assessment of balance-sheet liquidity (see Table IV.2 Box).[91] The starting scenario involves an outflow of each bank's liquidity, as reflected in panic deposit withdrawals current deposits. This scenario has two variants, a strong one and a weak one, consisting, respectively, in withdrawals of 5% and 2% of existing demand deposits per day and 1% and 0.5% of existing time deposits per day. The daily percentage of withdrawals was set according to past domestic and foreign experience (for example, it was 3.5% in the case of IPB shortly before the imposition of conservatorship and around 5% in the case of Northern Rock in the UK). The scenario is supplemented with other risks taking the

Table IV.1 (Box)
Scenario characteristics and shock sizes in stress test
(%)

	Variant	
Bank run	Strong	Weak
Withdrawal of demand deposits per day	5	2
Withdrawal of time deposits per day	1	0.5
Liquid assets: available per day	95	95
Other assets: available per day	1	1
Fall in prices of liquid assets (govt bonds)	0.5	0.5
Fall in prices of other assets	0.5	0.5

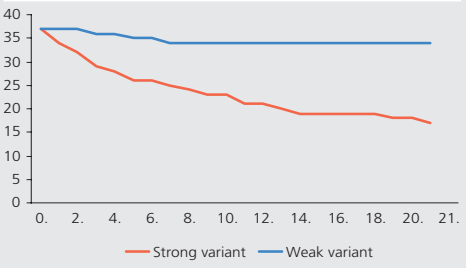
Source: CNB

Table IV.2 (Box)
Summary of stress test results after ten days of stress
(values express situation of average bank)

Selected indicators	Pre-shock		Post-shock			
			Strong variant		Weak variant	
	Value iv)	Rating v)	Value	Rating	Value	Rating
LA/A[i)]	24.00	2.44	12.39	3.15	22.72	2.39
LA/FL[ii)]	26.35	1.85	13.98	3.08	25.21	2.22
LA/DD[iii)]	46.27	2.31	17.18	3.34	29.99	2.83

Source: CNB
Note:
i) liquid assets to total assets,
ii) liquid assets to total financial liabilities,
iii) liquid assets to total demand deposits,
iv) value given in %,
v) assessment of size of indicator (1 = low risk, 4 = high risk), rating thresholds set according to international values.

Chart IV.1 (Box)
Resilience of individual banks to outflow of balance sheet liquidity
(x-axis: number of days bank could withstand outflow of balance sheet liquidity; y-axis: number of banks)



Source: CNB

88 A bank's balance-sheet liquidity expresses its ability to meet its obligations in a corresponding volume and term structure.

89 The assessment of balance-sheet liquidity was applied only to three basic liquidity indicators and the test uses a simplified model of a bank's balance sheet. The assumptions do not include interbank contagion or lack of confidence in the banking system as a whole.

90 The maximum time for monitoring of the effects of the stress situation on the banks was set at 10 and 21 days by expert judgement. It is usually chosen according to the type of scenario selected (e.g. a week in the case of a failure of a major payment and settlement system, two months to simulate a deep and sudden crisis, etc.).

91 Instead of the "liquid assets" indicator, "assets with a maturity of up to 7 or 30 days" were also used in the tests. As the results were similar, they are not presented in the box.

form of a decline in market liquidity and a fall in asset prices.[92] A decrease in the value of liquid assets (government bonds) and non-liquid assets of 0.5% every day is assumed (see Table IV.1 Box).

The results of the test after ten days of stress (see Table IV.2 Box) show a considerable decline in the selected indicators for the average bank under the "strong" variant. The "weak" variant did not lead to a significant decrease in the average value of the monitored indicators. The chart (see Chart IV.1 Box) provides an answer to the question above – whether the bank is able to withstand an outflow of balance-sheet liquidity for 21 days. It shows that 18 monitored banks would be able to withstand a strong outflow of liquidity for 21 days despite the very strong assumption underlying the test. As regards the "weak" variant, only three banks would not be able to withstand the outflow of balance-sheet liquidity.

An alternative indicator of banking sector stability

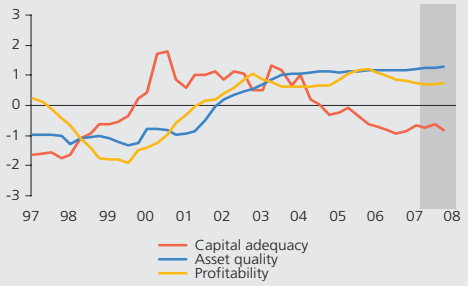
The 2006 Financial Stability Report featured a thematic article introducing an alternative indicator of banking sector stability – the banking sector stability index. This index was constructed as a weighted average of sub-indicators of the financial soundness of the banking system and includes the standard areas used in many financial soundness indicators (e.g. the IMF indicators). The sub-indicators of capital adequacy, asset quality, profitability, balance-sheet liquidity, currency risk and credit risk are constructed using financial ratios and normalised so as to express the number of standard deviations from the historical average. All partial indicators were converted such that an increase means an improvement and a decrease means a deterioration.

The aggregate banking stability index continued to decline slightly in 2007 (see Chart IV.39). This was due chiefly to a continuing decline in balance-sheet liquidity and an increase in interest rate risk amid broadly unchanged profitability, capital adequacy and asset quality (see Charts IV.37 and IV.38). As in the previous year, this result can be interpreted as a consequence of credit expansion in a situation of relatively low interest rates. Credit expansion causes balance-sheet liquidity to decline and intensifies the time mismatch between assets and liabilities, thereby contributing to a rise in interest rate risk. Asset quality, measured by the share of default loans, does not deteriorate despite the credit expansion, as the rise in default loans is diluted by the growth in new loans.

Overall, the evolution of the index can be viewed as a reflection of the optimisation of capital and its return towards the historical average in a situation of a credit boom rather than as a decline in the banking sector's resilience to shocks. This is confirmed by comparison with the results of the standardised stress test (see Chart IV.39). Capital is sufficient to cover the losses given the current quality and management of assets. However, the process of optimising capital utilisation may raise certain questions regarding future developments. A cooling of the economy would lead to a rise in default loans, which would affect profitability. Capital optimisation would be replaced by a slowdown in credit growth and possibly a forced increase in capital to maintain capital adequacy, as indicated by the results of the stress tests of the alternative scenarios.

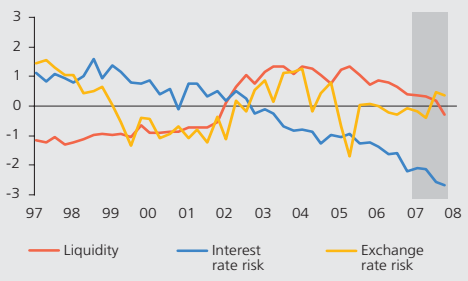
92 Generally speaking, a bank attempts to balance the inflows and outflows of liquidity at different asset basket maturities, at the same time holding sufficiently liquid assets in case of an unexpected mismatch in the balance sheet. If such a mismatch occurred and the bank tried to remove it by means of a large sell-off of assets, it could result in a decline in the prices of those assets given insufficient elasticity of demand.

CHART IV.37
Sub-indicators of banking sector stability
(standard deviations from historical average)



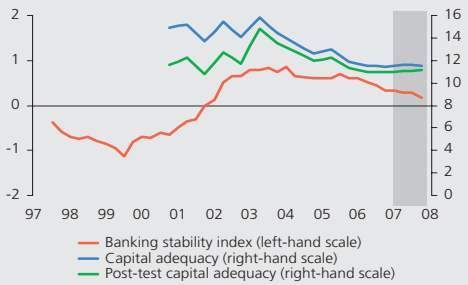
Source: CNB

CHART IV.38
Sub-indicators of banking sector stability
(standard deviations from historical average)



Source: CNB

CHART IV.39
Banking sector stability index
(standard deviations from historical average; capital adequacy in %)



Source: CNB
Note: Stress test based on historical scenario I (see FSR 2006), combining a rise in default loans (of 30%), depreciation of the koruna (by 15%) and an increase in interest rates (by 1 p.p.).

PART II – THEMATIC ARTICLES

THE ROLE OF RATINGS IN FINANCIAL SECTOR STABILITY ASSESSMENT

Petra Davidová and Renata Opravilová, CNB

This article discusses the ratings of financial market participants as one of the indicators of financial stability. Particular attention is paid to the sector of banks and insurance corporations in the Czech Republic. Besides discussing the ratings of individual financial institutions, the article explores aggregate ratings. For the banking sector, Fitch's Bank Systemic Risk Matrix is used as an aggregate rating for assessing a country's financial stability. For the insurance sector, the article presents for the first time the results of a newly constructed aggregate rating for insurers in the Czech Republic, which performs an analogous role to the matrix mentioned above. The analyses conducted in the article confirm that the banking and insurance sectors are showing satisfactory and steadily improving performance from the ratings perspective, in line with the conclusions of previous analyses of a different type. An analysis of the correlations of rating types and of the correlations between the ratings of banks and those of their owners demonstrated that the individual types of ratings of the various agencies are not fully interchangeable and that there is a positive correlation between the average long-term ratings of banks and those of their owners.

1. INTRODUCTION

Ratings are one of the indicators of the financial soundness of financial institutions and thus also of the overall financial stability of the system. They stand alongside other composite indicators which, in aggregate, i.e. by means of a single score, express the degree of resilience to risks undertaken. In the case of banks and insurance corporations, these other indicators include capital adequacy ratios, solvency ratios and financial soundness indicators.[93] The advantage of ratings – unlike solvency ratios and financial soundness indicators – is that they take into account qualitative information on companies, including expert expectations. On the other hand, it is important to emphasise that ratings provide only an estimate of the probability of default, and deducing the level of other types of risks from this indicator can lead to overestimation of the indicator. The recent subprime mortgage crisis in the USA shows that a correct understanding of ratings by investors is crucial for financial stability.

In this article we look at bank ratings (section 2) and assess the ability of such ratings to reflect potential support from strategic owners and the state. In this context, we examine the dependence of bank ratings on the ratings of their owners. Fitch's Bank Systemic Risk Matrix is used to assess the banking sector as a whole. In section 3, we deal analogously with ratings on the insurance market. We present the first-ever construction of an aggregate insurance sector rating, which to some extent addresses the fact that there are fewer official ratings in the insurance sector than in the banking sector and that there is no systemic rating for the insurance sector.

Our analysis of banks and insurance corporations is based on the ratings issued by the best-known agencies: Moody's, Standard&Poor's (S&P), Fitch and A.M. Best.[94] The methodologies, procedures and symbols used by these agencies differ, even when same types of institutions and instruments are assessed. The range of entities assessed by means of external ratings is enormous.[95] In this article we focus on the ratings of banks and insurance corporations in the Czech Republic. Other areas, such as sovereign ratings (indicating the state's ability to meet the obligations arising from the loans it accepts or the bonds it issues), corporate liability ratings and the use of ratings as a regulatory tool under Basel II are dealt with in other CNB publications and in the economic literature.[96] The role of ratings in the mortgage market crisis has been significant, as stated in section 2.1 of this report.

2. BANK RATINGS

In this section we look at bank ratings. The specific features of bank ratings are described and an analysis is conducted of the ratings of banks and their parents and affiliates. The Fitch matrix is used to assess the systemic banking risk of the Czech Republic.

93 See Geršl and Heřmánek (2007).

94 A.M. Best specialises primarily in the insurance market.

95 For example, Moody's alone issues around 40 types of rating depending on the entities assessed.

96 See Liška and Vinš (2005), Sůvová, Kozelková, Zeman and Bauerová (2005) and Derviz and Podpiera (2004).

Specific features of bank ratings

The banking sector can be characterised by a relatively small number of defaults[97] compared, for example, to the corporate sector. An important role is played here by the fact that banks are subject to state regulation and supervision and enjoy potential support from the state should they run into difficulties. These support mechanisms are reflected in banks' ratings.

Rating agencies usually issue banks with a rating expressing the unsupported (self-reliant) risk of failure of the bank and a rating evaluating the state's or owner's ability and propensity to support it. These components are contained, for example, in Fitch's individual and support ratings and joint probability default analyses. The support rating[98] sets a floor for the bank's long-term rating.[99] The setting of such a floor significantly reduces the volatility of long-term ratings when severe adverse factors hit the economy. Likewise, Moody's uses a bank financial strength rating to assess a bank's own credit risk. In 2007, the agency introduced joint default analyses, which explicitly include potential support in banks' final ratings. This leads generally to an increase in long-term ratings and a slight decrease in bank financial strength ratings.

Table 1 shows the correlations[100] between selected types of ratings issued to banks in the CEC5 region[101] by the three main agencies. In all cases the correlations are positive. The most closely correlated are Moody's financial strength ratings and Fitch's individual ratings; this is consistent with their similar content. The analysis demonstrates that the individual types of ratings from the various agencies are not fully interchangeable.[102] For this reason, most large institutions on the market pay for ratings commissioned from all three agencies. Banks in the Czech Republic likewise have ratings from several different agencies.

Table 1 – Correlation matrix for individual types of ratings from Fitch, Moody's and S&P
(correlation coefficients; CEC5 region; as of 31 December 2007)

	Fitch support rating	Fitch long-term rating	Fitch individual rating	Moody's long-term rating	Moody's financial strength rating	S&P long-term rating
Fitch support rating	1					
Fitch long-term rating	_	1				
Fitch individual rating	_	_	1			
Moody's long-term rating	0.75	0.566	0.46	1		
Moody's financial strength rating	0.112	0.23	0.797	0.5	1	
S&P long-term rating	1	1	1	0.707	1	1

Source: BankScope
Note: The selected sample of all banks in the CEC5 countries contains very few banks that have a rating both from S&P and from another agency, which means that the correlation results are affected.

97 Fitch (2007a) defines bank default and bank failure as follows: "A bank has defaulted if it fails to make a timely payment of principal and/or interest. … A bank has failed if it is kept going only by state support or support from a (deposit) insurance fund … if it is kept going only by being acquired by some other corporate entity … if it is kept going only by an injection of new funds from its shareholders or equivalent … [or] if it has defaulted". Fitch (2007a) states that over the past 25 years there have been no instances of default among banks in developed economies with high support ratings (1 or 2). Up to 2003, there were only seven bank defaults in developed economies (mostly small US institutions); these banks defaulted because they failed to get third-party support.

98 The support rating combines two factors: the state's or owner's ability to support (as expressed by its own long-term rating) and its readiness to support (as estimated by the agency). It ranges from 1 (an implied propensity to support of at least 99%) to 5 (a 40% propensity to support).

99 For example, a bank with a support rating of 1 has a long-term rating floor of A-. In an "AAA" economy, the implicit risk that the "AAA" sovereign will not be willing to support is equal to 44 b.p. (for more details on the calculation, see Fitch, 2007a).

100 For the purposes of these correlations, the qualitative rating scale was converted into a numerical one assuming that the difference between the individual rating scores is the same. However, the rating agencies do not set target quantitative default rates for the individual rating scores; only the historical rates are known. Hence, the rating cannot be precisely quantified and the approach used is something of a simplification.

101 All banks in the Central and Eastern European countries (the Czech Republic, Hungary, Poland, Slovakia and Slovenia) which have a rating. The close correlation results for S&P's ratings are due to the fact that the BankScope database contains very few banks that have ratings from both S&P and another agency. The sample contains around 350 credit institutions.

102 In addition to the dependence on the specific sample assessed, we should emphasise in particular:
• the diversity of the agencies' models, • the expert component of the rating, which further increases the uniqueness of each agency's assessment, • the possibility of a clearer assessment of a given company, in particular as regards the number of unknowns entering future expectations, • the speed at which changes are incorporated into an updated rating, • the rating scale, as a more detailed scale allows more nuances to be differentiated, • better knowledge of a specific environment by a particular agency, • and sometimes also the declared own interests of the agency.

Table 2 – Moody's, Fitch and S&P rating scales

	Moody's			Fitch			Standard&Poor's	
	Long-term	Short-term	Fin. strength	Long-term	Support	Individual	Long-term	Short-term
Excellent	Aaa	P-1	A	AAA	1	A	AAA	A-1+
	Aa1	P-1	A-	AA+	1	A	AA+	A-1+
	Aa2	P-1	B+	AA	1	A	AA	A-1+
	Aa3	P-1	B	AA-	1	A/B	AA-	A-1+
Good	A1	P-1	B-	A+	1	B	A+	A-1
	A2	P-1	C+	A	1	B	A	A-1
	A3	P-2	C	A-	1	B/C	A-	A-2
Reasonable	Baa1	P-2	C-	BBB+	2	C	BBB+	A-2
	Baa2	P-2	C-	BBB	2	C	BBB	A-2
	Baa3	P-3	D+	BBB-	2	C/D	BBB-	A-3
Speculative	Ba1	Not prime	D+	BB	3	D	BB+	B
	Ba2	Not prime	D	BB	3	D	BB	B
	Ba3	Not prime	D-	BB	3	D/E	BB-	B
Highly speculative	B1	Not prime	E+	B	4	E	B+	C
	B2	Not prime	E+	B	4	E	B	C
	B3	Not prime	E+	B	5	E	B-	C
	Caa	Not prime	E	C	5	E	CCC	C

Source: Moody's, Fitch, Standard&Poor's

Bank ratings in the Czech Republic

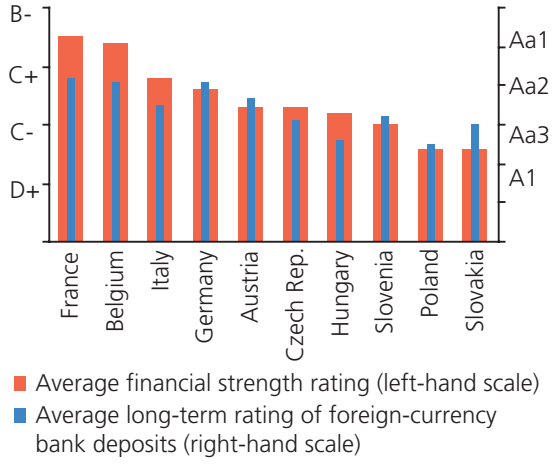
The profiles of the external ratings issued by the main international rating agencies between 2000 and 2007 illustrate the positive development of the Czech banking sector and the positive macroeconomic trend[103] (Table 5 and Chart 2). The main reason for the rising ratings are higher profitability and cost-effectiveness of banks, increased competition, a significant increase in service quality, and improved credit risk management (e.g. CNB, 2007a). In recent years, banks have been strengthened by the completion of their restructuring processes and by growing interest in loans.

The average Moody's financial strength rating for Czech banks is C with a positive outlook, and the average long-term rating in the Czech currency is Aa3 with a stable outlook. Compared to the other CEC5 banking sectors, the Czech system has the highest financial strength rating (at the same level as Austria) and the second-best long-term rating (behind Slovenia) (Chart 1). Like their parents, the largest Czech banks have the highest possible support rating (i.e. an implied propensity to support of 99%).

Chart 2 compares the evolution of the average rating of the three largest Czech banks and that of their owners. The slightly higher rate of improvement of the Czech banks' rating in 2001–2003 is linked with higher relative profitability of subsidiary banks in this period (CNB, 2005).

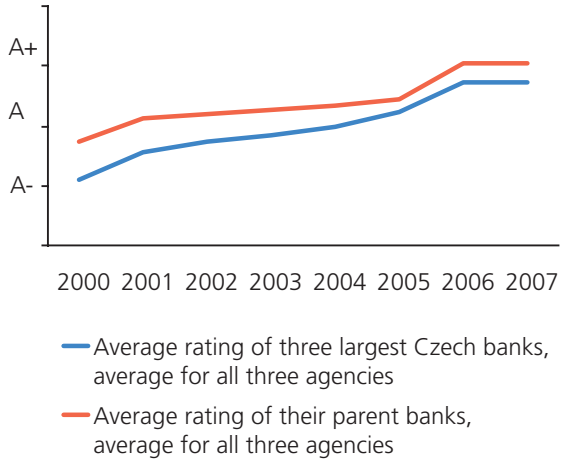
103 The analyses focused on the three largest Czech banks, ČS, ČSOB and KB, which account for around 60% of the assets of banks based in the Czech Republic. This makes the sample sufficiently representative (Derviz and Podpiera, 2004). Besides these banks, ČEB and J&T have external ratings, but their market shares are very small. In the past, Živnostenská banka also had a rating, but it went out of business in 2007. This bank was not included in the analysed sample, as the options for investigating the relationships were limited owing to changes in ownership.

Chart 1 – Comparison of average ratings of CEC5 countries and home countries of parents of Czech banks and branches operating in Czech Republic
(as of 31 December 2007; asset-weighted average)



Source: Moody's

Chart 2 – Average ratings of three largest Czech banks and their parent banks
(long-term foreign currency ratings, Moody's, Fitch and S&P; simple average)



Source: BankScope, CNB calculation

The evolution of the ratings of Czech banks since 2000 shown in Table 3 indicates that the ratings of Czech banks and their parent banks from S&P correlate most closely. This result can be explained by the different construction of the ratings of this agency. Unlike Moody's and Fitch, S&P does not have products specifically distinguishing between ratings with potential state or owner support and those without it, and probably takes such support into account more in its long-term ratings. The low correlation coefficient for financial strength ratings (Moody's) is consistent with the logic of this rating, which measures the institution's internal strength regardless of the probability of owner or state support. The negative correlation of Fitch's ratings in the case of SocGen/KB is due to the temporary lowering of Société Générale's rating and the steady rise in KB's rating in 2003–2005, which corresponds to the higher relative profitability of the subsidiary bank in this period (CNB, 2005).

Table 3 – Correlation of series of ratings of largest Czech banks and their parent banks
(correlation coefficient; 2000–2007; yearly observations)

Owner/bank	Moody's financial strength rating	Moody's long-term rating	Fitch long-term rating	S&P long-term rating
SocGen/KB	0.25	0.41	-0.16	0.65
KBC/ČSOB	-0.27	0.22	0.60	0.65
Erste/ČS	0.13	0.76	0.47	0.64

Source: BankScope, CNB calculation

An aggregate rating for the Czech banking sector

A Fitch rating – the Bank Systemic Risk Matrix (see Fitch, 2007b) – can be used to assess the financial stability of a country and the stability of its financial system as a whole. The matrix combines two indicators: a Banking System Indicator (BSI) and a Macro-Prudential Indicator (MPI). The BSI measures the true "intrinsic" banking system strength regardless of potential state or owner support and is calculated as an asset-weighted average of individual bank ratings. The BSI ranges from A (very high quality) to E (very low quality). The MPI tracks three key indicators: the ratio of private sector credit to GDP; the real effective exchange rate; and equity prices. Hence, the MPI takes into consideration the existence and severity of a set of macroeconomic circumstances that in the past has anticipated full-blown systemic crises in the banking sector. It ranges between 1 (low vulnerability of the system) and 3 (high vulnerability). A score of 3 applies when the ratio of private sector credit to GDP is more than 5% and either equity prices are more than 40% above trend or the real effective exchange rate is more than 9% above trend. The advantage of this approach is that it takes account of the fact that weak spots in the banking

system (always reflected in banks' individual ratings and aggregated in the BSI) can have systemic impacts in an adverse macroeconomic environment (reflected in the MPI). We can see some limitations in this matrix in that the three-point MPI scale makes it impossible to differentiate between countries where average annual credit growth is around 20% (the case of the Czech Republic) and countries where it is around 40% (e.g. Latvia and Estonia) – both these groups get MPI = 2. The result is that half of the 87 countries that Fitch includes in this matrix are in category MPI = 2 and 9% are in category MPI = 3[104] – i.e. roughly 60% of the countries lie in the higher-risk part of the matrix. Table 4 shows the results for the EU member states. It is clear from the table that the Czech Republic has the best bank systemic risk rating of all the CEC5 countries.[105] This matrix seems to be an appropriate complement to the IMF's Financial Soundness Indicators as discussed in Geršl and Heřmánek (2007).

Table 4 – Bank Systemic Risk Matrix for EU member states
(Fitch, 2007; MPI = Macro-Prudential Indicator; BSI = Banking System Indicator)

		MPI	
BSI	1	2	3
A		Luxembourg	
		Netherlands	
		Spain	
		Switzerland	
		United Kingdom	
B	Austria	Belgium	
	Germany	**Czech Republic**	
		Denmark	
		Estonia	
		Finland	
		France	
		Greece	
		Ireland	
		Portugal	
		Italy	
		Sweden	
C	Cyprus	Latvia	
		Malta	
		Slovakia	
		Slovenia	
D	Hungary	Bulgaria	
	Poland	Lithuania	
		Romania	
E			

Source: Fitch
Note: MPI = 1 low vulnerability; MPI = 3 high vulnerability

Table 5 – Comparison of ratings of Czech banks and their parent banks, branches and affiliates in CEC5 countries
(ratings of main rating agencies;[106] as of 31 December 2007)

		Moody's	S&P	Fitch
Three largest Czech banks	KB	A1/P-1/C	A+/A-1	AA-/1/B/C
	ČSOB	A1/P-1/C	n.a.	A+/1/B/C
	ČS	A1/P-1/C	A/A-1	A/1/B/C
Parent banks	Societé Generale (France)	A1/P-1/B	AA/A-1+	AA/1/A/B
	KBC Bank (Belgium)	Aa2/P-1/B-	AA-/A-1+	AA/1/A/B
	Erste (Austria)	Aa3/P-1/C	A/A-1	A/1/B/C
Branches	ING Bank N.N.	Aa1/P-1/B	AA-/A-1+	AA/1/A/B
	HSBC Bank plc	Aa3/P-1/n.a.	AA-/A-1+	AA/1/B
	Commerzbank AG	Aa3/P-1/C+	A/A-1	A/A-/n.a.
	Deutsche Bank AG	Aa1/P-1/B	AA/A-1+	AA-/1/B
	Calyon S.A.	Aa1/P-1/C	AA-/A-1+	AA/1/B/C
	Fortis Bank SA/NV	Aa2/P-1/C-	AA-/A-1+	AA-/1/n.a.
Affiliates of three largest Czech banks	SKB Bank d.d. (Soc. Gen. Slovenia)	A1/P-1/D+	n.a.	n.a.
	Slovenska sporitel'na (Erste Slovakia)	A1/P-1/C-	A-/n.a.	A/1/C/D
	Erste Bank Hungary	A2/P-1/C+	n.a.	n.a./1/n.a.
	KB (Soc. Gen. Slovakia)	n.a.	n.a.	n.a.
	Nova Ljubljanska Banka (KBC Slovenia)	Aa3/P-1/C	n.a.	A-/1/C
	K&H Bank Rt. (KBC Hungary)	A2/P-1/C	BBB/n.a.	A+/1/D
	Kredyt Bank S.A. (KBC Poland)	A2/P-1/D	BBB/n.a.	A+/1/D

Source: Moody's, S&P, Fitch, BankScope
Note: Moody's (long-term rating/short-term rating rating/financial strength rating), S&P (long-term rating/short-term rating), Fitch (long-term rating/support rating/individual rating).

The results of the analysis show that the improving ratings of Czech banks and the clear convergence trend towards their owners' ratings indicate a steady rise in the performance and stability of the Czech banking system (e.g. CNB, 2007b). At the same time, the broadly similar ratings of their affiliates generate no concerns about potential problems arising and spilling over into the domestic financial system. An analysis of the correlations between rating types and of the correlations between the ratings of banks and those of their owners

104 These are non-European countries, e.g. Canada, Korea, South Africa, Iran and Azerbaijan.

105 The different MPIs for Hungary and Poland can be explained by the slower credit growth in these countries in 2005 and 2006, which did not exceed 15% – the limit for a switch to MPI = 2 (Fitch, 2007b).

106 The rating scales are given in Table 2.
For more details on definitions and rating scales, see www.moodys.com, www.fitchratings.com and www.standardandpoors.com.

demonstrated that the individual types of ratings from the various agencies are not fully interchangeable and that there is a positive correlation between the average long-term ratings of banks and those of their owners.

3. RATINGS ON THE INSURANCE MARKET

This section discusses the individual ratings of institutions operating in the insurance market. The small number of institutions with ratings[107] is a limiting factor for the assessment of this sector in the Czech Republic. We tried to solve this problem by constructing our own aggregate rating of the insurance company sector.

Specific features of insurance company ratings

The agencies issue insurance companies with two main types of ratings. The financial strength rating gives an independent expert opinion on an insurer's ability to pay under its insurance policies and contracts in accordance with their terms (Standard&Poor's, 2007). Its ability to meet other debt obligations, especially those associated with issues of fixed-interest securities, is the subject of a debt rating. The financial strength rating and the debt rating can differ from each other, as they serve different purposes and do not measure the same risks.

Only some of the insurance companies with one rating request a rating from another agency. Most global insurance market participants opt for a rating from A.M. Best. The literature states that the ratings issued by Moody's and S&P tend to be lower than those issued by A.M. Best (e.g. Pottier and Sommer, 1999).[108] We noted the same fact in our sample of foreign insurers and reinsurers relevant to the Czech insurance market, with A.M. Best assigning a higher rating than the other agencies in 13 cases out of 18.

Unlike banks, which can obtain support from their owners or the state if they run into difficulties, insurance companies can obtain extraordinary funds to meet their obligations from contractual reinsurers as well. These institutions play an important role in the financial stability of the insurance sector, as reinsurance represents a transfer of risk from insurer to reinsurer.[109] When a rating is assigned to an insurer, the financial strength of the relevant reinsurers is taken into account as well. A high-quality reinsurer should mean a higher rating for the reinsured insurer. Rating agencies state explicitly that they take the financial strength expressed by the relevant ratings of contractual reinsurers into consideration in the rating process (A.M. Best, 1996). Contracts between insurers and reinsurers often include rating clauses containing a trigger mechanism that comes into operation when the reinsurer's rating falls below a certain level (ECB, 2006).[110] These links between the financial strength ratings of insurers and those of their contractual reinsurers were used to construct an aggregate rating for the Czech insurance sector, which is presented later in this section.

Insurance company ratings in the Czech Republic

Česká pojišťovna is currently the sole domestic insurance company that has a rating from two internationally recognised agencies. ČSOB Pojišťovna is the only other insurer with a rating from one of these agencies. The Czech insurance market thus lags behind the advanced economies in terms of the number of companies with ratings.[111] The two insurers mentioned above have sizeable market shares.[112] Their ratings are of investment grade and are steadily rising[113] in line with the conclusions of CNB documents (CNB, 2006, 2007a) concerning the quality and stability of the insurance sector.

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107 Only two out of the total of 34 insurance companies based in the Czech Republic (i.e. 6%) currently have a rating from an external agency.

108 A.M. Best started issuing ratings to insurance companies back in 1899 and for a long time specialised exclusively in this sector. Other agencies entered the insurance segment of the market in the 1980s and the ratings newly issued to insurance companies had to conform to their previous practices.

109 The transfer of risk to a reinsurer simultaneously increases the insurance capacity of the insurer, which can insure more risks and generate a bigger profit. This occurs only to the extent to which the reinsurers are capable of meeting their liabilities.

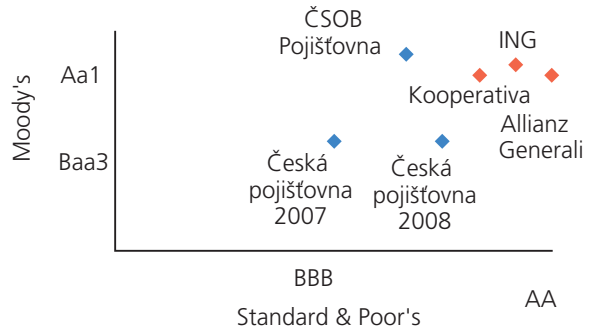
110 For example, the rating clause may state that if the reinsurer's rating is downgraded below a certain level (the rating trigger), the insurer may require the reimbursement of part of the premiums it paid or terminate the contract.

111 This situation has two apparent causes. Low pressure from other market participants is exacerbated by the price of ratings, which can be high for relatively small institutions. Subsidiaries and branches of major international insurers also operate in the Czech insurance market. Their ratings can sometimes be used for a simplified assessment of an entity in the Czech Republic.

112 The Czech Insurance Association gives shares of 31% and 7% of total premiums written for Česká pojišťovna and ČSOB Pojišťovna respectively. Both these insurers are members of the group of five large insurance corporations (CNB, 2007b).

113 The agencies find strengths in several areas. In the case of Česká pojišťovna they emphasise its long-term stable business performance, its good capital adequacy and liquidity, and also its strong market position. A major reason for its February rating upgrade from S&P was its incorporation into Generali PPF Holding. ČSOB Pojišťovna's rating is underpinned by its growing strategic importance for the parent KBC Insurance NV, including its increasing integration into the KBC group, and its improving financial performance.

Chart 3 – Ratings of the largest insurers active in the Czech Republic and their owners
(as of 31 December 2007)



Source: Databases of the rating agencies
Note: Both ratings have been issued to insurers based in the Czech Republic only in the case of Česká pojišťovna, whose rating by S&P rose to A in February 2008. ČSOB pojišťovna has been issued with an S&P rating. In all other cases, the ratings pertain to the owners.

Table 6 – Ratings of the largest reinsurers of insurers active in the Czech Republic
(as of 31 December 2007)

	Country	S&P	Moody's	Fitch	Best
Münchener Rückversicherung	DE	AA-	Aa3	AA-	A+
SCOR Paris	FR	n.a.	n.a.	n.a.	A-
Swiss Re Germany	DE	AA-	Aa2	AA-	A+
Swiss Re Frankona					
Rückversicherung	DE	AA-	Aa2	AA-	A
National Indemnity Company	US	n.a.	Aaa	AAA	A++
Hannover Re	DE	AA-	A3	A+	A
Wiener Städtische	AT	A+	n.a.	n.a.	n.a.
Transatlantic Reinsurance,					
Paris branch	FR/US	n.a.	n.a.	n.a.	A+
New Reinsurance Company	CH	AA-	n.a.	n.a.	A+

Source: Databases of the rating agencies

It is clear from Chart 3 and Table 6 that the ratings of the two Czech insurers are lower than those of the owners of the other large domestic insurers and those of the relevant reinsurers. This is due primarily to the smaller size of the domestic institutions and the limiting value of the Czech Republic's sovereign rating.

Construction of an aggregate rating for the Czech insurance sector

In this section we present our proposed calculation of an aggregate rating for the Czech insurance sector. The aim is to estimate an average rating for insurance companies in the Czech Republic which might, to some extent, make up for the lack of ratings actually assigned by agencies. The resulting value may, in line with the definition of the insurance company financial strength rating, serve as an indicator of the sector's ability to pay under its insurance policies and contracts in accordance with their terms. The result may also be used as one of the inputs for a comprehensive assessment of the sector.

We are chiefly interested in the category of large insurance companies, which accounts for roughly 75% of premiums written in the Czech Republic (CNB, 2007b). Our proposed method takes into account the relevant valid ratings of insurers, reinsurers and owners, the level of reinsurance of liabilities, and the weights of the individual insurers. This information enters the calculation via the parameters given in Table 7.

Table 7 – Input parameters

Weight of insurer
An insurance company's market share is usually expressed in terms of its share in premiums written. In our case, we opted for a variable that better matches the character of the financial strength rating, which reflects the ability to meet obligations arising under insurance policies and contracts. The weight is therefore given by the insurance company's share in total technical provisions, which represent obligations arising under insurance policies and contracts.
Reinsurance
Reinsured amounts are divided into three categories according to the amount pertaining to the particular reinsurer and according to the quality of the reinsurer as expressed by its rating. Of the total of almost 300 contractual reinsurers of large insurance companies, we chose the 15 largest reinsurers, which account for 73% of the total reinsurance. The reinsurers and the amounts reinsured by them are divided into: - the set of reinsurers having a financial strength rating from at least one of the four main agencies (12 reinsurers) - the set of reinsurers that do not have such a rating (3 reinsurers) - the remaining 27% of the reinsured amount, entering the calculation in a unified way with a single rating.
Ratings
The insurance companies are progressively assigned up to seven types of ratings (from agencies or calculated), which are derived from the existing ratings of the insurers and their owners and reinsurers.

The five largest insurers have around 25% of their non-life insurance liabilities reinsured with contractual partners. Including life insurance, which is rarely reinsured, the reinsurance ratios among the individual large insurers fall to 5%–22% of premium liabilities.[114] The calculation covers the 15 largest reinsurers out of the total of almost 300 reinsurers that have contracts with the five large insurers. These 15 reinsurers account for 73% of the total reinsurance, while 67% of them have at least one rating and 53% at least two ratings.

Ratings are assigned to the individual insurers according to the priorities shown in Table 8. If an insurer has a rating/ratings from an external agency, this rating – or, where relevant, its average rating – is assigned to it as a whole. In other cases, the ratings of contractual reinsurers are taken into account for reinsured liabilities. For non-reinsured liabilities, a reduced rating of the owner is used. The resulting calculated rating of the insurer is a combination of the weighted ratings of the reinsurers and the weighted adjusted ratings of the owners. The ratings of the individual institutions weighted by their shares in technical provisions then enter the calculation of the rating of the entire group of large insurance companies.

Table 8 – Procedure for assigning ratings to insurers

Insurer based in Czech Republic has rating(s)		Insurer based in Czech Republic has no rating				
		Reinsured liabilities				Non-reinsured liabilities
One rating	Two or more ratings	Reinsurers (out of 15 largest) with rating(s)		Reinsurers (out of 15 largest) with no rating	Reinsurers other than 15 largest	
		One rating	Two or more ratings			
Single rating assigned to insurer as a whole	Average rating assigned to insurer as a whole	Rating assigned to total liabilities pertaining to reinsurer	Average rating assigned to total liabilities pertaining to reinsurer	Average of three ratings* assigned to liabilities pertaining to these reinsurers	Average rating of 12 (out of 15 largest) reinsurers assigned to liabilities	Owner's adjusted rating, net of risk surcharge, assigned to liabilities

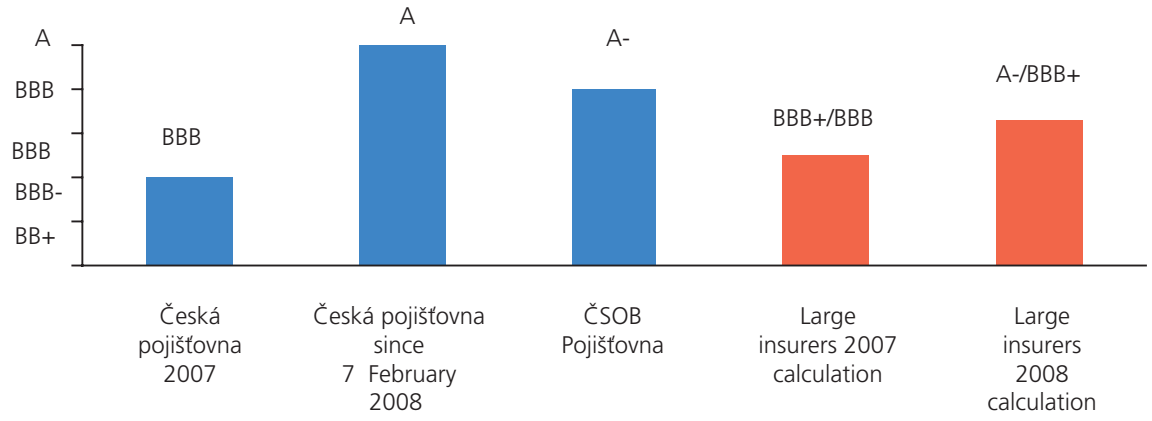
Note: The three ratings entering the calculation are: 1. the owner's adjusted rating, net of a risk surcharge; 2. the simple average of the ratings of 12 (out of the 15 largest) reinsurers = a constant; 3. the average of the ratings of reinsurers (out of 15 largest) weighted by the contractual amounts for a given insurer.

114 Insurance companies employ various strategies for reinsuring their liabilities. The largest domestic insurers have around 100 such contractual partners. Other insurers, by contrast, have exclusive partners. Reinsurance is often arranged with a member of the same financial group.

When setting the risk surcharge for the owner's rating, which our method employs to calculate the rating for the non-reinsured portion of the liabilities, we used the relationship between the existing ratings of domestic institutions and their owners. In the case of insurers, such a relationship exists between ČSOB Pojišťovna and KBC Insurance N.V. of Belgium, whereas in the case of banks such relationships exist between all the Czech-based banks analysed. Our method for calculating the rating of insurance companies draws on the conclusions of the analysis of the ratings of Czech banks and their owners described in section 2 of this article and presented in Chart 2. We start by assuming that the relationships that apply in the banking sector also exist for insurance companies and that the evolution of the ratings of foreign owners can be a good guide for estimating the evolution of the ratings of domestic insurers. That our approach is justified is confirmed by Česká pojišťovna's February rating upgrade, which demonstrated how important it is for an insurance company in the Czech Republic to have ownership or operational links with a strong foreign partner. In the calculation we lowered the rating by three grades. The resulting ratings calculated for the group of large insurance companies in the Czech Republic are illustrated in Chart 4.

At the end of 2007, our calculated average rating for insurance companies in the Czech Republic, expressed using the scale employed by S&P, stood at BBB+/BBB, i.e. investment grade.[115] Taking into account Česká pojišťovna's rating upgrade issued by S&P in February 2008, the overall calculated rating increases by one grade. This improvement corresponds to Česká pojišťovna's weight in the sector and to the rise in its rating by three grades.

Chart 4 – Existing ratings of insurers in Czech Republic and calculated aggregate ratings according to S&P scale
(as of 31 December 2007)



Source: S&P database, CNB, CNB calculation
Note: The group of large insurers in 2008 reflects a rise in Česká pojišťovna's rating on 7 February 2008 by S&P, while all other ratings keep their end-2007 values. The group of large insurers accounts for around 75% of the Czech market. The bar height represents the average rating attained.

The calculated aggregate financial strength rating approximates the quality level of the Czech insurance sector as a whole as regards insurers' ability to meet their obligations arising under insurance policies and contracts and thus to have a positive impact on the financial stability of other economic sectors acting in the role of their clients.

Our constructed indicator has some limitations. In a situation where an insurer's reinsured liabilities are on the rise but the relevant reinsurer's rating is downgraded, the insurer's calculated rating could decrease.[116] Another

115 This calculated rating took values of Baa1/Baa2 according to the Moody's scale, BBB+/BBB according to the Fitch scale and B+/B according to the A.M. Best scale.

116 However, this could only happen if the reinsurer's rating was lower than the reduced rating of the insurer's owner. Looking at the data in Chart 3 and Table 6, this is not very likely.

limitation is that the relationship between the ratings of institutions operating in the Czech Republic and the ratings of their owners is based on a small number of observations, so the calculation is affected by a small sample of existing relationships. The fact that the ratings between parent and subsidiary insurers do not necessarily move in the same way, owing to differing performances of specific institutions and differing macroeconomic trends in individual countries (leading, for example, to a change in the sovereign rating in one relevant economy), can also be regarded as something of a limitation.

The method outlined above cannot be applied to the banking sector, as it does not feature institutions with functions analogous to those of reinsurance companies. The Czech banking sector, moreover, has a far higher rating coverage than the insurance sector.[117] The need to construct an aggregate rating is thus less pressing than in the case of insurance companies. For the same reason, one can view the construction of an aggregate insurance sector rating as being less important in national sectors where the majority of insurers have ratings (in terms of number and market share) and in countries where the insurance sector represents only a negligible part of the financial sector.

4. CONCLUSIONS

The ratings of Czech banks and their parents and affiliates, as well as the systemic rating of the Czech banking sector, confirm that these institutions are in sound financial health, including as regards the potential spillover of problems within banking groups. Also, the individual ratings and our constructed aggregate rating for Czech insurers confirm the positive assessment of the insurance sector conducted earlier by means of stress testing. The analysis confirmed the mainly positive correlations between the ratings of Czech banks and those of their owners. At the same time, however, the discussion in this article demonstrated that the individual types of ratings or same ratings from the various different agencies are not interchangeable. Rating agencies do not automatically reflect an owner's rating downgrade in its subsidiary institution's rating, as confirmed by a negative correlation between the ratings of banks and those of their owners in some cases and also by current developments – Société Générale's rating was recently downgraded as a result of the liquidity crisis following the subprime crisis in the USA, but none of its subsidiaries had their ratings lowered.

Some rating products, such as Fitch's Bank Systemic Risk Matrix or our proposed aggregate insurance company rating, can be used to complement the Financial Soundness Indicators. Both these indicators, however, have some limitations, just like ratings themselves do. None of the ratings discussed here can be used to assess the financial stability of the system or the stability of individual banks and insurers without knowledge and application of other supporting indicators and tools.

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SCORING AS AN INDICATOR OF FINANCIAL STABILITY

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This article presents a financial scoring model estimated on Czech corporate accounting data. Seven financial indicators capable of explaining business failure at a 1-year prediction horizon are identified. Using the model estimated in this way, an aggregate indicator of the creditworthiness of the Czech corporate sector is then constructed and its evolution over time is shown. This indicator aids the estimation of the risks of this sector going forward and broadens the existing analytical set-up used by the Czech National Bank for its financial stability analyses. The results suggest that the creditworthiness of the Czech corporate sector steadily improved between 2004 and 2006.

1. INTRODUCTION

Credit scoring methods are a standard part of financial institutions' risk management processes. They allow lenders to rate the creditworthiness of their potential debtors by estimating the probability of default,[118] with the aim of maintaining a high-quality loan portfolio. The most common type of credit scoring used in banks for the legal entities segment is financial scoring. In this case, companies are rated using financial indicators based on their accounting statements. The financial scoring process generates a score expressing the company's creditworthiness. This type of model can be applied analogously to aggregate economic data to construct a financial stability indicator based on the creditworthiness of the non-financial sector. From the credit risk assessment perspective, the indicator can be used to complement the sectoral macroeconomic models that have been estimated for the Czech economy and incorporated into the banking sector stress tests (Jakubík, 2007a).

This article begins by looking briefly at the definition and estimation of scoring models (section 2). Section 3 discusses the corporate financial indicators that can be used as explanatory variables for business failure. Section 4 contains a description of the data used to estimate the model. The resulting estimated model is presented in section 5, and section 6 then applies the model to data for the entire sector to estimate a creditworthiness indicator for the non-financial corporations sector. The final section summarises the results.

2. SCORING FUNCTION

Scoring models play a role in the decision whether or not to provide a loan.[119] In practice, this is done by comparing information available on the client (obtained, for instance, from the client's loan application form or track record) against information on clients to whom loans have been granted in the past and whose quality is known. A predictive scoring model is estimated from the historical information on clients. By applying the model to known information on a potential obligor, one obtains the probability that the obligor will default. The decision is made by comparing the estimated probability of default against some threshold. A survey of these methods in the context of credit scoring can be found, for example, in Hand and Henley (1997) and Rosenberg and Gleit (1994).

A whole range of statistical methods can be used to construct scoring functions, among them linear regression, decision trees, neural networks and expert systems. In practice, however, logistic regression is the most commonly used method. In this case, it is assumed that the explanatory variables multiplied by the relevant coefficients are linearly related to the natural logarithm of the default rate (referred to as the logit – Mays, 2001).

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118 Default is generally defined as the failure of an obligor to meet its obligations arising under a loan agreement. The Basel Committee on Banking Supervision (2006) defines default as a situation where at least one of the following events has taken place. The first is the situation where the bank finds that the obligor is unlikely to pay its credit obligations in full, without recourse by the bank to actions such as realising security. The second is the situation where the obligor is past due more than 90 days on any of its obligations. In this article, default will mean the failure of the firm.

119 Altman (1968) and Beaver (1966) studied the prediction of corporate bankruptcy as early as the 1960s. These methods were refined in the 1980s and, in particular, the 1990s by, for example, Dimitras, Slowinski, Susmaga and Zopounidis (1999). In the Czech literature, credit scoring has been studied by, for example, Jakubík (2003).

$$\ln \frac{s}{1-s} = b_0 + \sum_{i=1}^{N} b_i x_i \ , \qquad (1)$$

where
s - denotes the probability of default of the firm at the one-year forecast horizon,
x_i - denotes the financial indicators of the firm,
b_i - denotes the coefficients of the relevant scoring function indicators.

This equation can then be used to derive the relationship for the probability of default. This relationship can be expressed using a logit curve.

$$s = \frac{1}{1 + e^{-b_0 - \sum_{i=1}^{N} b_i x_i}} \qquad (2)$$

In the case of financial scoring, financial indicators based on accounting data are considered as the explanatory variables. The coefficients of the function can be estimated using the maximum likelihood method (Baltagi, 2002). Owing to the large number of indicators that can be included in the model, stepwise regression is used to select the variables. This method involves testing various combinations of variables maximising the quality of the model. The model works with a binary dependent variable (0/1) and can be constructed for computation of either the probability of default or the probability of non-default, depending on the definition of the independent variable in the regression. If we denote a "bad firm"[120] with the value 1, the resulting score obtained from the model corresponds to the probability that the firm will default.[121]

If we assume that a large number of firms are used in order to estimate model (1), then according to the law of large numbers the variable *s* in equations (1) and (2) corresponds to the proportion of firms that default at the one-year forecast horizon. Assuming that model (2) is estimated on the set of firms to which the function will later be applied, the outcome of the model truly represents the probability of default. As the ratio of good to bad firms in the sample does not usually match the real situation, and given also that accounting data from various moments in time are taken into consideration, the outcome of the model cannot be interpreted as the probability of default. In this context, variable *s* is usually referred to as the score expressing the riskiness or creditworthiness of the firm.[122]

3. FINANCIAL INDICATORS

The financial indicators used as the explanatory variables in model (2) can be broken down according to several perspectives – for example the perspectives of lenders, shareholders or state authorities. It is important to emphasise that there is no clear consensus either in theory or in practice on the ideal method for analysing the financial indicators. In the Czech literature, various authors present various breakdowns of relative indicators – see, for example, Blaha and Jindřichovská (2006) and Kislingerová (2007). There is a similar lack of unity in the foreign literature – see, for example, Damodaran (2002) and McKinsey et al. (2005).

Given the primary aim of our research, namely to construct a financial stability indicator based on the prediction of business failure, we chose 22 indicators and divided them into four main groups: liquidity indicators, solvency indicators, profitability indicators and activity indicators. The individual financial indicators are given in Table 1. For each indicator we also indicate its theoretical influence on business failure (positive or negative).

120 A bad firm is defined here as a firm that defaults during the period under review but was a good firm prior to defaulting. A good firm means a firm that does not default during the period under review.

121 Some studies, conversely, denote "good firms" with the number 1. In this case, the resulting score represents the probability that the firm will not default.

122 The figure obtained can be converted to the probability of default with the aid of a suitable transformation. Either parametric or non-parametric estimates can be used for this purpose.

The liquidity indicators explore the firm's ability to meet its short-term liabilities (r1, r2, r15 and r19) or to cover its long-term liabilities with long-term assets (r10). Generally, higher liquidity implies a lower probability of default. Persisting problems with low liquidity usually indicate problems ahead with meeting long-term liabilities (i.e. declining solvency[123]), which in the extreme case can result in company failure.

The solvency indicators describe the firm's ability to meet its long-term liabilities. Generally, a higher debt ratio (r3, r4 and r14) and a longer debt repayment period (r9) result in a higher probability of default. By contrast, an ability of the company to generate sufficient funds for debt repayment (r5, r6, r13 and r16) and a higher proportion of internal funds (r17) reduce this probability.

The profitability indicators explain how the company generates profit and the quantity of inputs it uses to do so. Generally, higher profitability implies a lower probability of default (r7, r8, r20 and r21).

The activity indicators measure the efficiency of use of various inputs by the company. From the financial point of view, it would be ideal if the company generated sales/profit by using the minimum amount of resources. Generally, the lower the company's efficiency, the higher its probability of default (r11, r12 and r22). The *sales turnover ratio* (r18) is constructed so that the value of the indicator rises – and the probability of default falls – as the volume of sales rises.

The potential influence of the individual indicators on corporate bankruptcy can be demonstrated on the following simplified example.[124] One classic symptom of declining solvency is when a company fails to make efficient use of inputs (its activity indicators deteriorate). Cash flows into the firm consequently shrink, leading to a decline in the firm's ability to meet its short-term liabilities (its liquidity indicators deteriorate). Over time, the company proves to be incapable of generating a profit (its profitability indicators deteriorate) to cover its short-term and long-term liabilities (its solvency indicators deteriorate). The firm's liabilities exceed its assets and it goes bankrupt.

To estimate model (1), the financial indicators obtained using the relationships given in Table 1 were further transformed into their relative order vis-à-vis the data sample used. In this way, each indicator value was transformed into a number lying in the range 0–1. This simple transformation makes the model estimate more robust to outlying values of the indicators considered.

Table 1 – Financial indicators

Ratio	Definition	Notation	Expected impact
	Liquidity ratios		
Current ratio	$\frac{\text{current assets}}{\text{current liabilities}}$	r1	-
Quick ratio	$\frac{\text{cash + ST}^{i}\text{ receivables}}{\text{current liabilities}}$	r2	-
Cash ratio	$\frac{\text{working capital}}{\text{assets}}$	r19	-
Working capital	$\frac{\text{financial assets}}{\text{current liabilities}}$	r15	-
Capitalisation ratio	$\frac{\text{fixed assets}}{\text{long-term liabilities}}$	r10	-
	Solvency ratios		
Leverage I	$\frac{\text{debt}}{\text{equity}}$	r3	+
Leverage II	$\frac{\text{LT}^{ii}\text{ debt + LT}^{ii}\text{ bonds}}{\text{equity}}$	r4	+
Leverage III	$\frac{\text{debt}}{\text{assets}}$	r14	+

123 Liquidity is sometimes referred to as the short-term solvency of a company.

124 In this simplified example we ignore alternative ways of restoring the firm to health (e.g. corporate restructuring, debt capitalisation and so on).

Table 1 – Financial indicators – continued

Ratio	Definition	Notation	Expected impact
	Solvency ratios		
Debt payback period	$\frac{LT^{ii}\text{ debt} + ST^{i}\text{ debt}}{\text{operating profit+interest expenses+depreciation}}$	r9	+
Interest coverage	$\frac{\text{operating profit + interest expenses}}{\text{interest expenses}}$	r5	-
Cash-flow I	$\frac{\text{net profit + depreciation}}{\text{(debt-reserves)/365}}$	r6	-
Cash-flow II	$\frac{\text{net profit + depreciation}}{\text{debt/365}}$	r13	-
No credit interval	$\frac{\text{money} + ST^{i}\text{ payables} + LT^{ii}\text{ payables)}}{\text{operating expenses}}$	r16	-
Retained earnings	$\frac{\text{retained earnings}}{\text{assets}}$	r17	-
	Profitability ratios		
Gross profit margin	$\frac{\text{operating profit}}{\text{sales}}$	r7	-
Return on assets	$\frac{\text{operating profit}}{\text{assets}}$	r8	-
Return on equity	$\frac{\text{net profit}}{\text{equity}}$	r20	-
Net profit margin	$\frac{\text{net profit}}{\text{sales}}$	r21	-
	Activity ratios		
Average receivable collection period	$\frac{\text{receivables}}{\text{sales/365}}$	r11	+
Inventory ratio	$\frac{\text{inventories}}{\text{sales/365}}$	r12	+
Sales turnover	$\frac{\text{sales}}{\text{assets}}$	r18	-
Payables ratio	$\frac{ST^{i}\text{ payables}}{\text{sales/365}}$	r22	+

[i] Short-term [ii] Long-term

4. DATA USED

For our research we used the large database of the Czech Capital Information Agency (Česká kapitálová informační agentura, ČEKIA), which contains the accounting statements (balance sheets and profit-and-loss accounts) of selected Czech firms for the period 1993–2005. Of the total of 31,612 firms in the database, 932 went bankrupt. Since some of the accounting statements had been completed very sparsely, we focused on the records of firms whose main economic activity (NACE) was filled in, because for these firms most of the accounting items were filled in as well. In order to estimate the scoring function, from the firms that went bankrupt we initially selected only those for which there was accounting data one year prior to the declaration of bankruptcy. There were 151 such firms.[125] Then, for the sample of firms that did not fail in the period under review we selected only those for which we had accounting statements for at least two consecutive years.[126] The data sample for the

125 We excluded from our analyses those firms which underwent composition. There were only nine such cases in the database. Unlike bankruptcy, composition is not associated with the dissolution of the legal entity (Jakubík, 2007b).

126 To estimate the scoring function we need to have corporate accounting data for two consecutive years. The first period is used for estimating the function and the second for identifying the quality of the firm (failed, healthy). If no accounting data are available for the following period, we are unable to determine the quality of the company in question.

estimation of the model was constructed so as to best capture the true data structure. Usually, however, a larger proportion of bad firms than exists in reality is included in the sample so that the good and bad firms can be distinguished using statistical methods. Sometimes a sample containing the same number of good and bad firms is used (Wezel, 2005). Generally, the good firms are chosen so as to be as similar as possible to the bad ones according to selected criteria, for example size as measured by assets, number of employees or sales.[127] We also randomly selected accounting periods for which statements were available for the immediately succeeding accounting period. In this way we made sure that the firm in question did not fail in the year following the period under review. In all, 606 good firms were ultimately selected using this procedure. The data sample thus contained a total of 757 firms, which were divided into two categories according to whether they went bankrupt in the period following the period for which the accounting data were selected for the company in question. According to the econometric literature, when the event of interest is rare, logistic regression underestimates the influence of the characteristics on the event, so an artificial sample is generated and the estimated values are further transformed so that they match the incidence in the population.[128]

Table 2 shows the breakdown of the data in the database on the selected data sample by accounting period and firm quality (good/bad). In the total data sample, moreover, there exists a set of firms for which we are unable to determine the quality in the given year (indeterminate firms). These are firms for which accounting statements for the following year are not available. Although the database contained accounting data for the period 1993–2005, in the final year it is no longer possible to determine the firm's quality. For this reason, the selected data sample does not cover 2005.

Table 2 – Breakdown of data sample by accounting period and firm quality*

	Total data				Used data sample		
	Total	Undefined firms	Bad firms	Good firms	Total	Bad firms	Good firms
1993	980	89	1	890	1	1	0
1994	1.824	53	0	1.771	4	0	4
1995	5.606	147	0	5.459	13	0	13
1996	7.023	1.032	9	5.982	53	9	44
1997	7.056	1.261	15	5.780	50	15	35
1998	6.802	1.028	12	5.762	48	11	37
1999	7.541	1.307	25	6.209	69	25	44
2000	7.377	3.094	18	4.265	62	17	45
2001	5.660	1.536	5	4.119	40	5	35
2002	7.869	956	8	6.905	57	8	49
2003	22.264	4.420	25	17.819	110	25	85
2004	18.989	18.490	35	464	250	35	215
Total**	98.991	33.413	153	65.425	757	151	606

Source: ČEKIA and authors' calculations

* A bad firm means a firm that went bankrupt at the one-year horizon, whereas a good firm for the given period means a firm that did not go bankrupt the following year.

** The "Total" row contains the number of observations for the given set of firms. On the full data sample this figure does not equal the total number of firms, because in the selection each company is monitored for several accounting periods.

Table 3 shows the breakdown of firms by size in the data sample. This is based on corporate assets and conforms to the European Commission categorisation.[129] Nonetheless, we should mention that the European Commission also offers other enterprise size categorisations (according, for example, to number of employees or sales).[130] The

127 A summary of the methods can be found, for example, in Heckman et al. (1997).

128 For the estimation of the scoring function, an alternative sample constructed in the same way but with a new random selection for the good firms was used in the robustness tests – see section 5, where we discuss the results of the model.

129 Commission Regulation (EC) No 70/2001 as amended by No 364/2004. The enterprise size boundaries were converted from EUR to CZK using the approximate exchange rate 1 EUR = 30 CZK.

130 The Czech Statistical Office also uses a breakdown by number of employees.

enterprise size definition chosen by us and used in Table 3 was based on the available data, which were part of the data source used. The source contained corporate assets, and not numbers of employees. Sales information did form part of the database, but had been filled in for only some companies, so it could not be used. Under the definition we used, micro-enterprises with assets not exceeding CZK 60 million have the largest representation in the data sample, while large enterprises with assets exceeding CZK 1,290 million have the lowest representation. However, large enterprises account for more than 80% of the aggregate assets of the firms represented in the sample.

Table 3 – Description of data sample used

		Good firms			Bad firms		
Type	**Assets (CZK millions)**	**Number of firms**	**Share according to number of firms (%)**	**Share according to assets of firms (%)**	**Number of firms**	**Share according to number of firms (%)**	**Share according to assets of firms (%)**
Micro firms	< 60	292	48.2%	0.8%	70	46.4%	1.0%
Small firms	61-300	138	22.8%	3.5%	36	23.8%	5.4%
Medium firms	301-1.290	90	14.9%	10.8%	24	15.9%	14.7%
Large firms	>1.291	86	14.2%	84.9%	21	13.9%	78.9%
Total	**-**	**606**	**100.0%**	**100.0%**	**151**	**100.0%**	**100.0%**

Source: ČEKIA and authors' calculations

5. RESULTS OF THE MODEL

The resulting model (3) confirmed the relationships between the liquidity, solvency, profitability and activity indicators and business failure. The best statistical properties were shown by the model containing seven statistically significant indicators (of the 22 considered in all). These included three solvency indicators (*leverage I* and *II* and *interest coverage*), two profitability indicators (*return on equity* and *gross profit margin*), one liquidity indicator (*cash ratio*) and one activity indicator (*inventory ratio*). The resulting model takes the following form:

$$score = \frac{1}{1+e^{-(b_0+b_1r_3^*+b_2r_4^*+b_3r_5^*+b_4r_7^*+b_5r_{12}^*+b_6r_{19}^*+b_7r_{20}^*)}} \qquad (3)$$

where

score - expresses the risk of the firm, which is linked to the probability that the firm will go bankrupt at the one-year horizon,
r_i - denotes the individual financial indicators of the firm,
b_i - denotes the coefficients of the relevant scoring function indicators,
* - denotes the relative order operator in per cent, which returns the relative order of the value of a given indicator for a given firm vis-à-vis the full data sample used to estimate the model.[131]

131 The relative order operator returns a number in the range of 0–1. It is analogous to seeking a quantile on the given data sample, except that the value for which we are seeking the position in the given sample is not part of the sample. In practice, we calculate the value of a given financial indicator, such as the *cash ratio*, and seek the two closest indicator values in the data sample between which the value sought lies. From the relative order of these two values we calculate the relative order for the sought value by linear interpolation. If, for example, the *cash ratio* takes the value 0.2, the relative order operator for it is calculated by linear interpolation of the relative order of the two closest values to 0.2 occurring in the data sample used for the estimation of the model, namely 0.1996 and 0.2015, whose relative orders are 0.5733 and 0.5746. We then obtain the resulting relative order value using the following relationship:

$$0.5733 \cdot \frac{0.2015-0.2}{0.2015-0.1996} + 0.5746 \cdot \frac{0.2-0.1996}{0.2015-0.1996} = 0.5736, \text{ i.e. } 0.2^* = 0.5736.$$

This means that in the original data sample on which the model was estimated, 57.36% of the values of this indicator are less than 0.2.

As the model is based on the relative order of the indicators in the sample, the estimated coefficients of the function express their relative importance. The larger is the indicator's coefficient (in absolute terms), the larger is its weight in the scoring function.[132] From this perspective, *interest coverage, cash ratio* and *leverage I* appear to be the most important indicators (Table 4).

The estimated scoring model confirmed our expectations regarding the impact of the individual indicators on business failure. It is clear that a higher debt ratio increases the probability of default (*see leverage I* and *II*), whereas a higher ability to repay debts (see the *interest coverage*) reduces this probability. Likewise, higher profitability (see *gross profit margin* and *return on equity*) and higher liquidity (see *cash ratio*) increase the financial stability of the firm and reduce its probability of default. By contrast, lower efficiency (see *inventory ratio*) implies lower financial stability of the firm.

Table 4 – Estimated scoring model

Variable	Type	Indicator Notation	Coefficient Notation	Coefficient	Standard Error	Significance
Constant	-	-	b_0	2.4192	0.9289	0.009207
Leverage I	Solvency	r3	b_1	2.5779	0.3788	0.000000
Leverage II	Solvency	r4	b_2	1.7863	0.5727	0.001813
Cash-flow I	Solvency	r5	b_3	-3.4902	1.0005	0.000486
Gross profit margin	Profitability	r7	b_4	-2.4172	0.4802	0.000000
Inventory ratio	Actitvity	r12	b_5	1.7679	0.4033	0.000012
Cash ratio	Liquidity	r19	b_6	-3.3062	0.4246	0.000000
Return on equity	Profitability	r20	b_7	-2.2491	0.5621	0.000063

Source: Authors' calculations

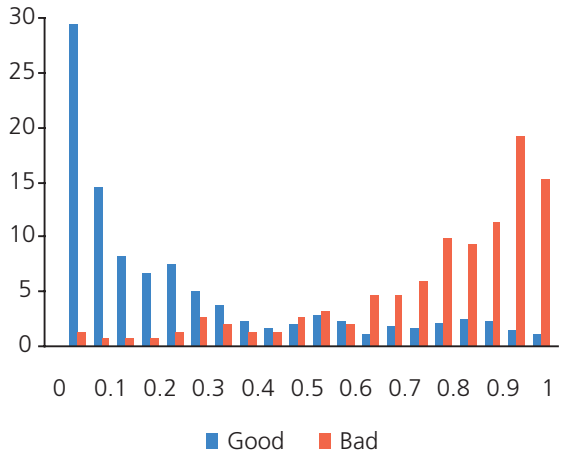
Although the model confirmed some of the expected results, for example that solvency and liquidity ratios are the most important for predicting corporate bankruptcy, one surprising result is the importance of inventories, as contained in the *inventory ratio* (i.e. the number of days a company has goods in stock in the form of inventories). The higher this indicator is, the longer goods lie in the company's store and the less saleable its inventories are.[133] One possible explanation for the importance of this indicator is the high stock of unsaleable inventories typical of businesses heading towards bankruptcy. This argument is supported by the fact that the *total liquidity* indicator, which includes inventories in current assets, proved to be insignificant. Conversely, the *cash ratio*, which does not include inventories in current assets at all, appears to be significant. This implies that the saleability of inventories – among other indicators – plays an important role in the prediction of corporate bankruptcy.

The aim of the scoring model is to correctly separate good and bad firms. This property expresses the quality of the estimated function. To measure it, one can use the Gini coefficient, for example. The value of this coefficient should be as close as possible to 1, which would mean a 100% ability to separate firms in terms of their quality using the scoring function. The quality of the model can be demonstrated graphically by means of a histogram (Chart 1) or a Lorenz curve (Chart 2).

132 The relative order operator applied to the individual financial indicators used in the scoring function ensures that the model is robust to extreme values.

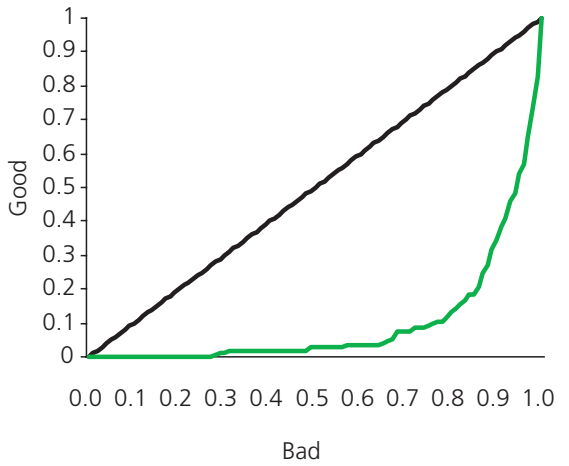
133 Nevertheless, we should point out that different industries display different *inventory ratios*. For example, this indicator is high for ship manufacture, but very low for retail trade.

Chart 1 – Histogram of estimated scoring function



Source: Authors' calculations

Chart 2 – Lorenz curve of estimated scoring function



Source: Authors' calculations

Chart 1 shows the firm distribution of the data sample used according to score and according to whether bankruptcy occurred. The blue columns express the percentage of good firms and the red columns the percentage of bad firms for each score interval. The ideal situation would be if all the bankrupt firms were assigned a score of 1 and all the healthy ones a score of 0. This, however, does not happen in practice, as we are unable to observe the complete characteristics of the firm and so we are working with imperfect information. This implies that the function cannot fully separate the firms according to their quality. There is always a set of bad firms that are classified as good ones, and vice versa. The aim is to keep such cases to a minimum.

Chart 2 depicts the cumulative distribution of the scores of good and bad firms. In the ideal case, guaranteeing a 100% rate of separation, this curve would take the form of a right angle. From the Lorenz curve one can compute the "Gini coefficient" as the ratio of the area enclosed by the green curve and the black diagonal and the total area below that diagonal. The generally accepted Gini coefficient for this type of model fluctuates above 60% depending on the data used and the purpose of the scoring (Mays, 2001). With a Gini coefficient of 80.41%, our estimated model satisfies the requirement of a sufficient rate of separation of the firms on the data sample used.

The estimation of the model for the alternative data sample, constructed according to the same rules as the sample used, confirmed that our estimate is sufficiently robust. The robustness of the model was also tested on another alternative data sample consisting of good clients selected entirely at random, and their representation according to the breakdown by assets was different from both the alternative and original data samples. In this case, a slight change was made to the model (two of the seven indicators were replaced with others[134]), but when the model was applied to aggregate data on financial corporations (discussed in section 6), similar results were obtained (the resulting score was different owing to a different ratio of good to bad clients in the sample, but the time profile of the score was similar). The quality of the model as measured by the Gini coefficient was also almost identical.

6. USE OF THE MODEL TO ASSESS THE FINANCIAL STABILITY OF THE ECONOMY

Financial scoring is routinely used to assess the creditworthiness of individual firms. If we have aggregated data for the whole non-financial sector, we can imagine this sector as one large hypothetical firm with an aggregated balance sheet. Alternatively, given the use of relative indicators only, we can view the aggregated indicators as characteristics of the average firm in the sector. Assuming a degree of homogeneity, the estimated model can be applied to the aggregated indicators of non-financial corporations. If the situation in the sector takes a turn for

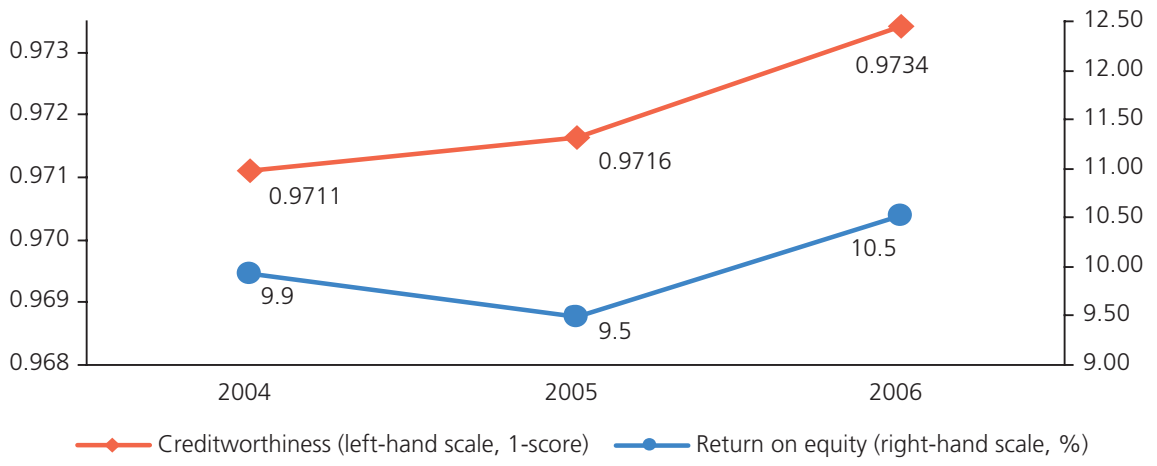
134 *Retained profit* and *cash flow I* were replaced with *gross profit margin* and *interest coverage*.

the worse, the financial indicators of firms will deteriorate on average. This will be reflected in a falling score of the average representative firm. However, the scope and inhomogeneity of the sample of firms on which the model was estimated place some limitations on the model. We could get better results by decomposing the sample into several more homogeneous segments and then estimating the model for these groups of firms separately. In the ideal scenario, we would decompose the firms by size and area of economic activity. Owing to the small number of bad firms in the data source used, however, this is not possible.

An aggregated balance sheet can be obtained for Czech firms from the publicly available data of the Czech Statistical Office, which has data containing the economic results of non-financial corporations. This data is published in a sufficiently detailed structure (to enable the construction of the seven aforementioned indicators included in the model) only for corporations with 100 employees or more. The seven indicators obtained in this way (r_3, r_4, r_5, r_7, r_{12}, r_{19} and r_{20}) are substituted into equation (3) to give an aggregated score representing the level of risk of the entire sector.

The resulting score was computed for 2004–2006.[135] The value of the creditworthiness indicator (the 1-score) for 2004–2006 (see Chart 3) can be interpreted as the creditworthiness of the non-financial sector for the one-year forecast horizon. This indicator is related directly to the probability of default of the corporate sector. By contrast with the original data sample, the model is only applied to data on firms with 100 employees or more, but one can get some idea of the evolution of the corporate sector over time. Given the aforementioned limitation, the resulting score is probably underestimated and thus the creditworthiness is overestimated, owing to the higher level of risk of the small enterprises excluded from the aggregate data. For financial stability purposes, however, the dynamics of this indicator over time are more important than its absolute level. The results suggest a steady improvement in the creditworthiness of the non-financial sector between 2004 and 2006 in line with the positive macroeconomic trend. Although there was a slight decline in *return on equity* and the *gross profit margin* in 2005, the positive development of the other five indicators (a falling debt ratio, rising liquidity, increasing interest coverage and a decreasing inventory ratio) outweighed this effect and the resulting creditworthiness score increased slightly compared to 2004. A positive shift and a reduction in the risk of the sector occurred in particular in 2006, which saw improvements in five out of the seven financial indicators studied (the only deteriorations were recorded by *leverage I* and *II*). The biggest improvements were shown by *interest coverage* (a year-on-year improvement of 24.2% to 11.78), *cash ratio* (a year-on-year increase of 24.2% to 0.385) and *return on equity* (a year-on-year improvement of 10.7% to 0.105). The results of the model are consistent with the conclusions contained in the 2006 Financial Stability Report, according to which 2006 was an extraordinarily successful year for the large corporations sector and the outlook for 2007 was favourable (CNB, 2007). The constructed indicator offers a more comprehensive aggregate view of the riskiness of the sector as a whole going forward.

Chart 3 – Creditworthiness of the non-financial corporations sector



Source: Authors' calculations and CZSO

135 Since some of the balance sheet items needed to calculate the necessary indicators were not monitored until after 2004, these values for 2004 were estimated from the available data for 2004 and 2005.

7. CONCLUSIONS

Financial scoring is a method used to assess the creditworthiness of obligors and thus is frequently used by lenders when deciding whether or not to provide credit products. This study showed that it is possible to use these traditional methods to monitor the financial stability of the corporate sector. Using accounting data on Czech firms, a scoring model based on seven financial indicators was estimated using logistic regression. By applying this model to the aggregate financial results of non-financial corporations, the scores of the Czech corporate sector as a whole – corresponding to its level of risk for the one-year forecast horizon – were calculated for 2004–2006. The results of our study suggest that the creditworthiness of the Czech non-financial corporate sector improved between 2004 and 2006. This indicator will be incorporated into the quantitative system used by the Czech National Bank to assess financial stability. The calculated score will be used each year as auxiliary information for evaluating the probability of the corporate sector running into difficulties at the one-year forecast horizon.

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COMPETITION AND EFFICIENCY IN THE CZECH BANKING SECTOR

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This article offers empirical evidence on the evolution of competition in the banking sector and its relationship to the cost efficiency of banks in the Czech Republic between 1994 and 2005. First, we measured the level and evolution of competition and cost efficiency. Competition was measured with the Lerner index on the loan market, using quarterly data on loan prices. Then we investigated the relationship and causality between competition and efficiency using the Granger-causality test. This supported a negative causality running from competition to efficiency (the "banking specificities" hypothesis). By contrast, our results reject the "quiet life" hypothesis for the Czech banking sector, according to which competition should positively influence efficiency.

1. INTRODUCTION

Banking competition is expected to provide welfare gains by reducing monopoly rents and cost inefficiencies. A higher degree of banking competition should result in a lower monopoly power of banks, and therefore a decrease in banking prices. Since investment is particularly sensitive to a decrease in commercial interest rates, a reduction of monopoly rents should consequently impact positively on investment and economic growth. These expected gains are a particularly major issue for countries in which bank credit represents the largest source of external finance for companies, as is the case in the Czech Republic (Reininger et al., 2002). Heightened competition should also encourage banks to reduce their operating costs, i.e. their cost inefficiencies. This latter channel is particularly promising in terms of welfare gains, as the order of magnitude of the banking sector cost inefficiencies has been estimated in the past to average between 30% and 50% in European transition countries (e.g. Hasan and Marton, 2001; Fries and Taci, 2005) and 40% in the Czech Republic (Podpiera and Podpiera, 2005).[136] However, some studies emphasise some potential negative effects of growing banking competition through excessive risk-taking by banks, which may hamper financial stability (Allen and Gale, 2004; Carletti and Hartmann, 2002).

The aim of this research is twofold. First, we provide empirical evidence on the level and evolution of competition in the Czech banking sector between 1994 and 2005. In previous studies for the Czech banking sector, competition has been measured using concentration indices such as the Herfindahl index, with higher concentration signalling lower competition and vice versa. This approach is based on the traditional Industrial Organisation (IO) literature, which uses structural tests to assess banking competition based on the SCP model derived in Bain (1951). The SCP hypothesis argues that greater concentration causes less competitive bank conduct and leads to greater profitability (meaning lower performance in terms of national welfare). According to this theory, competition can be measured by concentration indices such as the market share of the five largest banks, or by the Herfindahl index. These tools were applied until the 1990s. However, they suffer from the fact that they infer the degree of competition from indirect proxies such as market structure or market shares.

The new empirical IO approach is based on non-structural tests to circumvent the problems of measuring competition by the traditional IO approach. The new empirical IO theory determines banks' conduct directly. Furthermore, it allows us to consider the actual behaviour of banks by taking contestability into account. Indeed, as observed by Claessens and Laeven (2004), the actual behaviour of a bank is related not only to market structure, but also to barriers to entry, influencing the likelihood of the entry of new competitors and therefore the behaviour of incumbents.

In this study we measure competition with the Lerner index, using data on output prices.[137] The Lerner index has been computed in several empirical studies on banking competition (e.g. Angelini and Cetorelli, 2003; Fernandez

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* This article is based on Podpiera, A., Weill, L., Schobert, F. (2007): *Market Power and Cost Efficiency in the Czech Banking Sector,* CNB Working Paper 5/2007.

136 The numerical data describe the excess costs of the average bank relative the most efficient bank for producing the same bundle of outputs.

137 The most commonly applied tool for assessing competition emanating from the new empirical IO approach is the Rosse-Panzar model. This non-structural test is based upon the estimation of the H-statistic, which aggregates the elasticities of total revenues to input prices. It has been applied in Western European countries by several authors (Bikker and Haaf, 2002; Weill, 2004; Gelos and Roldos, 2004). Gelos and Roldos (2004) includes three transition countries (the Czech Republic, Hungary and Poland) and concludes in favour of monopolistic competition in these three countries' banking markets and also of the absence of a significant change in banking competition between 1994 and 1999.

de Guevara et al., 2005). In this study we focus exclusively on the loan market, which represents by far the greatest share of assets for the Czech banking sector. We are therefore able to measure the degree of monopoly power for each bank in the loan market and the evolution of competition over the period 1994–2005.

The second aim is to investigate the relationship and causality between competition and efficiency. Indeed, in spite of the commonly accepted view favouring a positive relationship, there does exist empirical literature supporting a negative link (Berger, 1995; Goldberg and Rai, 1996; Weill, 2004). The theoretical literature provides arguments for both directions of the causality. The intuitive "quiet life" concept (Hicks, 1935) suggests that competition positively influences efficiency. In other words, this concept suggests that monopoly power allows a relaxing of efficiency efforts.[138] By contrast, the "efficient-structure" hypothesis, proposed by Demsetz (1973), predicts a negative impact of efficiency on competition, as the most efficient banks would benefit from lower costs and therefore higher market shares.

On the other hand, the specificities of banking competition may give rise to a negative impact of competition on efficiency. The theoretical literature in banking suggests that imperfect competition in banking markets may result from the information asymmetries between bank and borrower in credit activity. As a consequence, banks have to implement some mechanisms to resolve the resulting problems such as adverse selection and moral hazard. One way out is the implementation by the bank of a customer relationship, meaning a long-term repeated relationship, to gain better information on the borrower and reduce the information asymmetries. According to Diamond (1984), banks have a comparative advantage in the ex post monitoring of borrowers, in comparison to investors, because of the existence of economies of scale resulting from their role of delegated monitor. In this case, competition may make it impossible to realise such economies of scale. As a consequence, competition may increase monitoring costs and potentially reduce the length of the customer relationship, further decreasing the cost efficiency of banks. In other words, the specificities of the banking industry provide some additional arguments in favour of a negative relationship between competition and cost efficiency. This assumption will be called the "banking specificities" hypothesis in the following text. This hypothesis may be more relevant in transition economies than in developed market economies. Indeed, banks suffer more from information asymmetries in transition countries, because of uncertainties of accounting information and the relative lack of credit risk analysis know-how of bank employees, owing to the short history of the market economy.

We perform Granger-causality-type estimations in order to get information on the sense of the causality between competition and efficiency in banking. An analysis of this type will enrich the debate on the conflicting hypotheses described above. Such an analysis is also important to provide the normative implications of competition policy in the banking industry. Specifically, a negative relationship between competition and efficiency would mean a trade-off between these two objectives.

2. METHODOLOGY

Measurement of Competition

The Lerner index is defined as the difference between the price of output (loans) and marginal cost divided by price. The price of loans is computed as "Total interest revenues" divided by "Total net loans". "Total net loans" represents "Total loans" from which non-performing loans have been subtracted.[139] The marginal cost is based on the estimation of the cost function. We estimate a cost function with one output and three input prices. One cost function is estimated for each year by introducing fixed effects for individual banks. We impose the restriction of linear homogeneity in input prices by normalising total costs and input prices by one chosen input price. The cost function is specified as follows:

138 This argument is summarised in the famous sentence from Hicks: "The best of all monopoly profits is a quiet life".

139 Revenues are not likely to come from non-performing loans, so the inclusion of non-performing loans in the Lerner index calculation would understate the price for banks having significant proportions of non-performing loans.

$$\ln\left(\frac{TC}{w_3}\right) = \alpha_0 + \alpha_1 \ln y + \frac{1}{2}\alpha_2 (\ln y)^2 + \alpha_3 \ln\left(\frac{w_1}{w_3}\right) + \alpha_4 \ln\left(\frac{w_2}{w_3}\right) + \alpha_5 \ln\left(\frac{w_1}{w_3}\right)\ln\left(\frac{w_2}{w_3}\right) +$$
$$\frac{1}{2}\alpha_6\left(\ln\left(\frac{w_1}{w_3}\right)\right)^2 + \frac{1}{2}\alpha_7\left(\ln\left(\frac{w_2}{w_3}\right)\right)^2 + \alpha_8 \ln y \ln\left(\frac{w_1}{w_3}\right) + \alpha_9 \ln y \ln\left(\frac{w_2}{w_3}\right) + \varepsilon \quad (1)$$

where TC denotes total costs, y loans, w_1 the price of labour, w_2 the price of physical capital, and w_3 the price of borrowed funds. The indices for each bank have been dropped from the presentation for the sake of simplicity.

The estimated coefficients of the cost function are then used to compute the marginal cost.

The marginal cost can be expressed as follows:

$$MC = \frac{TC}{y} \cdot \frac{d \ln TC}{d \ln y} \quad (2)$$

The derivative of the logarithm of the total cost with respect to the logarithm of output is computed using the cost function specified in equation (1):

$$\frac{d \ln TC}{d \ln y} = \alpha_1 + \alpha_2 \cdot \ln y + \alpha_8 \cdot \ln(\frac{w_1}{w_3}) + \alpha_9 \cdot \ln(\frac{w_2}{w_3}) \quad (3)$$

Measurement of Efficiency

We measure efficiency on the basis of cost efficiency, meaning that we measure how close a bank's cost is to what the most cost-efficient bank's cost would be for producing the same bundle of outputs. It then provides information on losses in the production process and on the optimality of the chosen mix of inputs. Several techniques have been proposed in the literature to measure efficiency with frontier approaches. In this study, we adopt a distribution-free approach (DFA), in this way circumventing the main critique attached to the widely used stochastic frontier approach, namely its reliance on distributional assumptions. The DFA assumes the cost function $TC = f(Y,P) + \varepsilon$ where TC represents total cost, Y denotes output, P is the vector of input prices and ε is the error term. According to this cost function the efficiency of each bank is constant over time and the random error for each bank tends to cancel out over time. Bauer et al. (1998) distinguish three different techniques through which DFA could be implemented in practice. In this study, we focus on DFA-P WITHIN, which is a fixed-effects model that estimates inefficiency from the value of a bank-specific dummy variable; each bank's efficiency is then computed as the deviation from the most efficient bank's intercept term. We estimate the translog cost function presented in equation (1) for each year (four quarters), where we assume that the random error cancels out over the four quarters.

Testing the Relationship between Competition and Efficiency

We analyse the link between competition and efficiency in the Czech banking industry in a Granger-causality framework, formally specified in equations (4) and (5) as follows:

$$y_{it} = \alpha_0 + \sum_{l=1}^{m} \alpha_l^y y_{it-l} + \sum_{l=1}^{m} \delta_l^y x_{it-l} + f_i^y + u_{it}^y \quad (4)$$

$$x_{it} = \beta_0 + \sum_{l=1}^{m} \alpha_l^x y_{it-l} + \sum_{l=1}^{m} \delta_l^x x_{it-l} + f_i^x + u_{it}^x \quad (5)$$

where y represents *"Efficiency"* and x the *"Lerner index"*. f_i represents the bank's "individual effect".

Efficiency and *Lerner index* are the yearly averages of the cost efficiency score and the Lerner index respectively. i and t represent the indices for the bank and the time (year) respectively. Each dependent variable is regressed on its lags and on those of the other variable. We use yearly averages in order to be able to capture the genuine effect, if any, of competition on efficiency and vice versa. In other words, we believe that it takes time for the effect of competition on efficiency and vice versa to become apparent, hence such an effect could be revealed by analysing yearly data rather than quarterly data, which are obviously more volatile. Following Berger and De Young (1997) we adopt a maximum lag of four years.

Having at our disposal a panel, we do not employ a standard Granger-causality analysis but resort to panel-specific methodology to estimate the dynamic equations (4) and (5). To estimate the dynamic equations represented in (4) and (5) we employ the Generalised Method of Moments (GMM) as designed by Arellano and Bond (1991).[140]

3. DATA AND VARIABLES

In the analysis we used monthly data reported to the Czech National Bank (CNB) for all Czech commercial banks[141] during the period 1994–2005, and transformed them into quarterly data.[142] Two approaches are proposed in the banking literature for the definition of inputs and outputs. The *intermediation approach* assumes that the bank collects deposits to transform them, using labour and capital, into loans. The *production approach* views the bank as a production unit using labour and capital to produce deposits and loans. As our focus is on lending activity, we adopted the *intermediation approach*.

Table 1 – Descriptive statistics

	Median	Mean	Standard Deviation
Output			
Loans (CZK billions)	14.4	53.9	92.8
Input prices			
Price of labour (CZK thousands)	85.9	116.3	93.7
Price of physical capital	0.09	0.137	0.122
Price of borrowed funds	0.012	0.015	0.011
Other characteristics			
Assets (CZK billions)	20.12	81.09	146.3
Total costs (CZK millions)	305.4	981.8	1 727.8
Price of loans	0.021	0.023	0.0122

N=1110 observations.

One output – loans – is adopted in the cost function and the cost efficiency frontier. The inputs include labour, physical capital and borrowed funds. The price of labour is measured by the ratio of personnel expenses to the number of employees. The price of physical capital is defined as the ratio of expenses for physical capital to total fixed assets. The price of borrowed funds is measured by the ratio of expenses for borrowed funds to borrowed funds. Total costs are the sum of expenses for personnel, physical capital and borrowed funds. The price of loans is computed using the ratio of interest received on loans to net loans. Summary statistics for the period 1994–2005 are reported in Table 1.

140 Attanasio et al. (2000) mention that most studies seeking Granger-causality type estimation with fixed effects use estimators such as those proposed by Holtz-Eakin, Newey and Rosen (1988) and Arrelano and Bond (1991) (hereinafter "AB").

141 Mortgage banks are not included, as their production function most likely differs from that of commercial banks.

142 We performed a careful investigation of the data to find and drop outliers. For the failed banks, the observations for the year of failure were dropped, as the data for the quarters preceding the failures were mostly chaotic. Furthermore, for each bank and for each year, we tried to have complete data for all four quarters. The result is an unbalanced panel.

4. RESULTS

The Evolution of Banking Competition

The results of the computation of the Lerner index for each year are displayed in Table 2. The Lerner index is an inverse measure of competition, i.e., a greater Lerner index means lower competition. Table 2 also shows the Herfindahl indices[143] to allow comparison of our measure of competition with one used routinely in practice.

Table 2 – Lerner indices and Herfindahl indices

	Lerner indices				
	No. of observations	Median	Mean	Standard Deviation	Herfindahl indices
1994	87	60.13	59.01	30.97	1381.78
1995	110	16.94	13.6	49.48	1233.47
1996	99	14.73	2.46	71.12	1204.91
1997	106	-14.38	-26.88	83.67	1150.33
1998	86	8.77	10.94	24.26	1045.26
1999	99	32.16	30.76	31.73	1002.98
2000	100	30.37	31.11	23.96	951.89
2001	92	24.4	29.12	24.79	1071.03
2002	92	17.1	17.03	27.7	1321.18
2003	88	50.95	43.44	30.93	1285.35
2004	75	55.11	45.74	27.66	1250.70
2005	76	44.8	42.09	26.67	1232.43

All indices are in per cent.
Note: The negative figure for the year 1997 probably comes from the fact that on average the MC was higher than the price of loans that year. This was due to the high interbank rates triggered by the financial turmoil in 1997.

The fact that the results show a negative figure for the Lerner index in 1997 make interpretation of the trend difficult for the period 1995–1998. The drastic increase in the Lerner index from 1998 to 1999 was to some extent triggered by a decrease in banks' marginal costs related to a decline in interest rates on the interbank market after 1998. The obvious increase in competition during the period 1999–2002 can be attributed to the entry of foreign banks into the Czech banking industry, which considerably increased from 1999 onwards with the launch of the privatisation of major banks. The subsequent (2003–2005) decrease in our measure of competition contradicts the common belief of rising competition in banking. This might actually have been a result of a temporary absence of the acute threat of a new competitor entering the Czech banking market. As all the big banks were now privatised, and as there was already a relatively high number of branches of foreign banks active in the market, the threat of entry of a new bank seemed very low. Consequently, the competitive pressures on banks were limited. At the same time, we have to recall that our measure of competition does not account for the riskiness of banks' products. The price of output is the average for all types of loans regardless of their riskiness. The rise in the Lerner index during the period 2002–2005 may have been due to some extent to the fact that after 2002 banks offered a wider spectrum of products, some of them relatively riskier and pricier.

According to the Herfindahl index, concentration fell continuously from 1994 to 2000 and then strongly increased from 2000 until 2002, followed by a slight decrease between 2003 and 2005. Our measure of competition and the Herfindahl index display common turning points: minimum competition in 2000 and maximum competition in 2002. Also, the period 2003–2005 is characterised by decreasing competition on both scales, although the decline is rather smaller in the case of the Herfindahl index.

143 The Herfindahl index is the sum of the squares of the market shares of the individual market participants. It ranges from 0 to 10 000, with a higher index signalling higher concentration.

The results of the GMM estimation of the dynamic equations represented in (4) and (5) are displayed in Table 3. The Sargan test and the first- and second-order auto-correlations in the differenced residuals (AR1 and AR2) satisfy the necessary conditions specified in Arellano and Bond (1991). The table reports the coefficients of the lags of the dependent and independent variables. Of primary interest for our hypothesis are the coefficients of the lag of the independent variable. For both equations (4) and (5), we test the hypothesis that $\delta_1 = \delta_2 = ... = \delta_m$ are equal to zero, which signals whether the independent variable Granger-causes the dependent variable. The sum of these coefficients, which gives an overall measure of the effect on the dependent variable, is also presented for an assessment of the sign of the relationship.

Table 3 – Granger-causality tests

	Dependent variable: $Efficiency_t$		Dependent variable: $Lerner_t$	
	Coefficient	Std. err.	Coefficient	Std. err.
Intercept	-0.06***	0,011	0.06***	0.02
$Efficiency_{t-1}$	-0.6***	0,12	0.11	0.15
$Efficiency_{t-2}$	0.05	0,12	0.28*	0.17
$Efficiency_{t-3}$	-0.18**	0,09	-0.11	0.14
$Efficiency_{t-4}$	0.05	0,09	-0.05	0.14
$Efficiency_{t-1}$= $Efficiency_{t-2}$=	chi2(4) = 32.94		chi2(4) = 4.33	
= $Efficiency_{t-3}$= $Efficiency_{t-4}$=0	Prob > chi2 = 0.0000		Prob > chi2 = 0.3629	
$\sum AR$ Efficiency coefficients	-0.69***	0.24	0.24	0.32
$Lerner_{t-1}$	0.2***	0.07	-0.33***	0.11
$Lerner_{t-2}$	0.29***	0.08	-0.17	0.12
$Lerner_{t-3}$	0.29***	0.08	-0.15	0.11
$Lerner_{t-4}$	0.12**	0.06	-0.12	0.10
$Lerner_{t-1}$= $Lerner_{t-2}$= $Lerner_{t-3}$=	chi2(4) = 32.69		chi2(4) = 11.99	
= $Lerner_{t-4}$=0	Prob > chi2 = 0.0000		Prob > chi2 = 0.0175	
$\sum AR$ Lerner coefficients	0.898***	0.16	-0.77***	0.24
p- value AR1/AR2	0.05 / 0.13		0.000 / 0.24	
p- value Sargan	0.003		0.04	
Number of observations	1085		1085	

*, **, *** denote estimates significantly different from zero at the 10%, 5% and 1% levels respectively.
AR means auto-regressive lag.

The results show that the Lerner index positively Granger-causes efficiency – hence competition negatively Granger-causes efficiency – but efficiency does not Granger-cause competition.[144] This result is consistent with the "banking specificities" hypothesis, according to which greater competition should reduce the cost efficiency of banks through increased monitoring costs.

Our work thus supports the literature regarding the trade-off between banking competition and financial stability (Allen and Gale, 2004). Our analysis provides another channel of transmission for the negative effects of competition on financial stability, namely the negative effects of competition on the cost efficiency of banks.

144 In the equation explaining *Efficiency* the coefficients of the lags of the Lerner index are jointly statistically different from zero (Prob > chi2 = 0.0000). In the equation explaining the *Lerner index,* the coefficients and the lags of *Efficiency* are not jointly different from zero (Prob > chi2 = 0.3629).

5. CONCLUSIONS

This research focuses on the relationship between competition and efficiency in the Czech banking sector during the economic transition period. Our measure of competition shows an absence of increased competition in the Czech banking market between 1994 and 2005. Using the Lerner index we find an increase in competition during the privatisation period (1999–2002). This was followed by a decrease in our measure of competition in 2003–2004 and a slight revival in 2005. This may seem a surprising finding, as one may have expected that the massive entry of foreign investors into the Czech banking industry would have contributed to enhancing the degree of banking competition. On the other hand, the decrease in competition or increase in the Lerner index in 2002–2005 might have been due to the fact that after 2002 banks also offered some riskier and pricier products.

Our analysis of the relationship and causality between our measure of competition and estimated cost efficiency suggests that competition has negatively affected cost efficiency in the Czech banking sector. Although it may appear counterintuitive, this finding is in accordance with the part of the literature which supports the existence of a negative link between competition and efficiency. It can be explained by the fact that increased competition leads to greater monitoring costs for banks (economies of scale mean that a higher number of banks leads to higher costs) and a reduction of the length of the customer relationship between the bank and the borrower, which reduces efficiency.

Our findings have potentially important implications, as they reveal that efforts to increase competition might be balanced by a decrease in the cost efficiency of banks, which could result in higher loan rates.

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OPERATIONAL RISK AND ITS IMPACTS ON FINANCIAL STABILITY

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This article illustrates the nature and significance of operational risk with regard to financial stability, using specific examples of major operational risk events in the Czech Republic and in other countries, and identifies the impacts of the newly introduced capital regulation of operational risk. It looks in detail at the incipient practice of risk-sensitive operational risk measurement using methods based on financial institutions' internal models. We also explore the issue of calculating the mandatory capital coverage for unexpected operational risk losses using group-wide models.

1. INTRODUCTION

January 2008 saw the introduction of a new obligation on all banks and credit unions and selected investment firms in the Czech Republic to ensure adequate capital coverage for operational risk in addition to credit risk and market risk. This requirement stemmed from the incorporation of Basel II – the new capital framework of the Basel Committee on Banking Supervision (BCBS) – into the European legislation and subsequently into Czech law.

This article sets out to clarify the nature, aims and practical forms of operational risk management and regulation and the implications for financial stability. In the individual sections we therefore describe:

- the key concepts, starting with the definition of operational risk and a description of its links to the principal financial risks, i.e. credit risk and market risk (section 2);
- the prudential requirements in the operational risk area and selected impacts thereof (section 3);
- the advanced approaches for operational risk measurement, emphasising the elements thereof having potential impacts on banks' capital adequacy and thus on their financial condition and stability, focusing specifically on the mechanisms for allocating capital to subsidiaries in the Czech Republic and on insurance as an important technique for mitigating operational risk in the banking sector (section 4).

2. OPERATIONAL RISK

Just as in any other field of business, factors such as people, internal processes, technological systems and external events play a key role in financial institutions. It is in the natural interests of every financial institution to ensure that such factors provide it with maximum support in achieving its business goals. However, these factors inherently involve various risks stemming from potential failures which can affect the operations and thus also the outputs and results of a financial institution.

This leads to the widely accepted definition of operational risk in the banking sector: **"Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events, including legal risk"**. This definition, confirmed by best practices,[145] is usually followed immediately by an explicit statement that operational risk excludes strategic and reputational risk.

As is evident from its definition, operational risk, unlike the key financial risks (credit risk and market risk), is not linked primarily with a financial institution's portfolios (credit, trading, investment), but instead relates to its processes and operations and the main elements thereof – people, systems and technology.[146]

145 Seven basic types of loss events, or areas of occurrence of operational risk, have been pinpointed from previous best practices: (1) internal fraud, (2) external fraud, (3) employment practices and workplace safety, (4) clients, products and business practices, (5) damage to physical assets, (6) business disruption and system failures, (7) execution, delivery (including outsourcing) and process management.

146 Under the regulatory rules, events having the character of operational risk associated with market or credit activities, such as credit fraud, exceeding of trading limits, legal shortcomings in the contractual guarantees of receivables, damage resulting from professional shortcomings in the preparation of new products, programme deficiencies, valuation errors, etc., are also deemed part of operational risk monitoring.

Owing mainly to events such as 9/11, the collapse of energy giant Enron, the rogue trading of a "lone wolf" currency trader at a U.S. subsidiary of Allied Irish Banks and the subsequent failure of that subsidiary, and the recent events at Société Générale, it is no exaggeration to say that literally everyone now has a basic, or at least intuitive, awareness of operational risk in the financial sector. It is also clear that operational risk events can also significantly affect the reputation, risk profile and financial standing of an institution, as illustrated by the examples of operational risk events given in the following table.

Table 1 – Selected operational risk events around the world and in the Czech Republic

Cause - Event (Institution)	*Impact[1] / Year*
Cheque fraud (group of U.S. retail banks)	$12,000 m / 1993
Failure to ensure segregation of operations – fraud (Barings)	$1,600 m / 1995
Insider trading (Merrill Lynch)	$100 m / 1997
Inadequate trading limits and controls (Nomura Securities)	$48,000 m / 1998
Misuse of client accounts by bank employees (ABN AMRO)	$140 m / 1998
"Computer" fraud by employees (WGZ Bank)	$200 m / 1998
Credit fraud by client – forgery of loan documents (Citibank)	$30 m / 1999
Auction system failure (Ebay)	$5,000 m / 1999
Terrorist attack on World Trade Center (WTC)	[2] / 2001
Rogue trading (Société Générale)	$7,300 m / 2008
CR[3] – Credit fraud - B.C.L. case (KB)	up to $180 m / 1999
CR – Non-compliance with dealing procedures (ČSOB)	$35 m / 2001
CR – Floods (numerous financial institutions)	[4] $2,100 m / 2002
CR – Sporoservis failure – credit fraud (ČS)	$40 m / 2006
CR – Cash theft at agency providing services mainly to financial institutions	$30 m / 2007
CR – Fee rounding errors in IT system (KB)	$10 m / 2007

1) Amounts converted at exchange rate valid at time of occurrence or discovery of event.
2) Published estimates of impacts vary.
3) Sources of information on events in Czech Republic (in same order as in table): Hospodářské noviny (HN) 27 February 2008, HN 6 December 2001, Mladá fronta (MF) 24 February 2003, MF 5 April 2006, HN 4 December 2007, Euro 28 January 2008.
4) Figure for Czech Republic as a whole, institutions and households.
Sources of information on events outside Czech Republic: Operational Risk Magazine, Risk Magazine, Incisive Media Ltd., UK.

The growing media coverage of the events mentioned here and of similar events has also encouraged more comprehensive awareness and analysis. This has gradually led to a higher degree of systemisation of the operational risk management approaches used by businesses, their regulators and supervisors and by other institutions specialising in financial system soundness and stability. The causes and nature of operational risk events, however, have a history as long as the finance business itself. The well-known tools and processes widely used in practice to **prevent or limit operational risk events and mitigate their impacts** also remain similar. Examples include the segregation and restriction of decision-making and executive processes and powers, screening of fitness for certain professions, various checks and balances, security and management of access to information and other assets, mandatory testing and backing-up, contingency and crisis planning, as well as the creation of budgetary and other internal provisions for operational losses and various types of insurance.

So, as far as the rather abstract concept of operational risk is concerned, we are talking not about a "newly discovered" risk, but rather about its newly emerging manifestations – for example operational risk associated with outsourcing or with the electronic distribution of financial products and services. We can also say that higher quality (more systematic and comprehensive) and more sophisticated operational risk management methods are now being applied. Financial institutions are gradually introducing **integrated operational risk management systems** that conform to best practices. At the same time such systems are helping these institutions to comply with the recently introduced mandatory regulation of operational risk.

3. REGULATION OF OPERATIONAL RISK

3.1. Operational risk management

As with other risks, managing operational risk involves defining an institution's overall approach to the risk and operating appropriate internal systems and processes. These systems and processes should ensure that operational risk is identified, assessed, monitored, declared and controlled and/or mitigated. Operational risk mitigation techniques include ensuring adequate capital coverage for unexpected losses (see section 3.2.) and alternatively taking out commercial insurance.

From the operational risk management perspective, it is desirable to pay attention – among other things – to operational risk events that do not have a direct financial impact. For example, the attempt by two Czech businessmen to commit a credit fraud with a calculated potential impact of $3,500 million against a well-known Swiss bank (2006)[147] illustrates just how well-founded this requirement is.

The following four key principles are widely regarded as essential for a sound and effective operational risk management system:[148]

- the creation and development of an appropriate permanent environment (framework) for the systematic management of operational risk;
- the introduction and application of efficient and effective firm-wide and specialised operational risk processes and tools, including adequate capital coverage for unexpected losses due to operational risk;
- independent internal and external review and assessment of operational risk management;
- transparency, i.e. disclosure of information on operational risk and operational risk management.

3.2. Capital regulation of operational risk

As mentioned earlier, one of the key operational risk management tools is to maintain adequate capital coverage for unexpected losses due to operational risk. Apart from recommended[148] individual operational risk capital coverage, operational risk now ranks alongside credit risk and market risk as one of the three risks with mandatory capital regulation. The former (Basel I) and current (Basel II) breakdown of regulated banking risks is illustrated by the following diagram.

Basel I

Basel II

147 Hospodářské noviny, 7 February 2008

148 For more details, see, for example, *Sound Practices for the Management and Supervision of Operational Risk*, Basel Committee for Banking Supervision (2003).

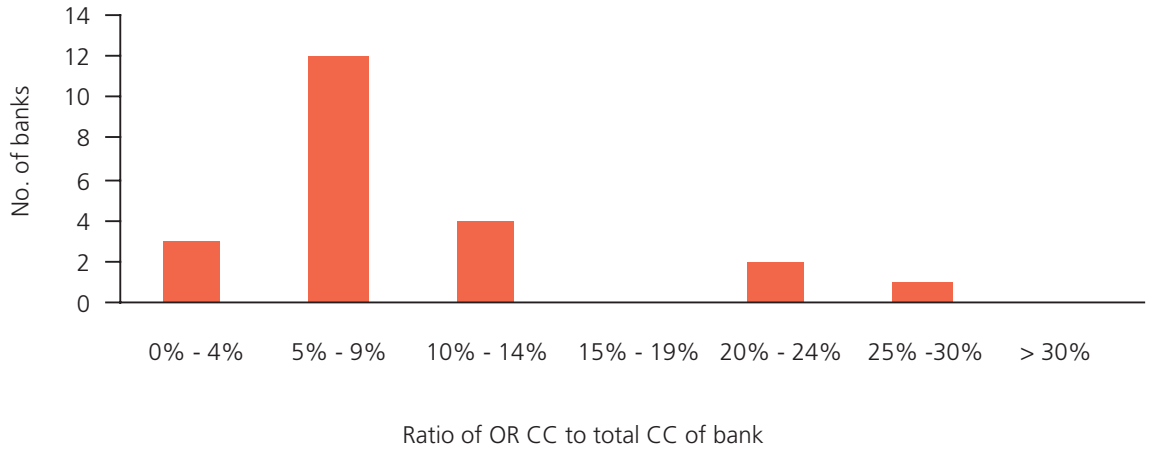
It is useful at this point to recall some of the basic requirements and aims of Basel II:

- one aim is to raise the quality of systems, processes and methods for risk measurement and management generally, leading eventually also to a reduction of the previous capital charges for credit and in some cases also for market risk, so that the total capital charge does not generally increase after incorporation of the new separate operational risk capital charge;
- institutions can choose from among at least three different approaches for determining operational risk capital charges, with the simultaneous use (combination) of various approaches permitted under certain conditions;
- institutions are not allowed to revert from a more advanced approach for determining operational risk capital charges to a simpler approach without good reason (in order to prevent any attempts at capital arbitrage);
- according to surveys (mostly conducted by the Basel Committee on Banking Supervision), the ratio of the new operational risk capital charge to the total capital charge is estimated at around 10–15% globally in the long term.

The impacts of Basel II on the Czech banking sector have also been estimated. According to the QIS 5 survey conducted in 2005, the ratio of the new operational risk capital charge to the total capital charges of banks in the Czech Republic was expected to be around 8%.

Real data on operational risk capital charges for the entire Czech banking sector are available from the start of 2008. The specific impact of the new mandatory operational risk capital charge on total capital charges is shown in the following chart.

Chart 1 – Ratios of operational risk capital charge (OR CC) to total capital charges for the Czech banking sector as of 31 January 2008 (sector average: 10%)



Source: CNB, 2008

The ratio of the operational risk capital charges to the total capital charges for the Czech banking sector as a whole was 10% at the start of 2008. This figure is broadly in line with the long-term estimates and predictions of the Basel Committee on Banking Supervision. So, compared to the surveys of the predicted impacts of Basel II in the Czech Republic conducted in 2005, the ratio of the operational risk capital charges to the total capital charges for the sector as a whole is around 2 percentage points higher (up from 8% to 10%). This increase is probably due mostly to an increase in the proportion of banks using the simplest – and hence the more capital-intensive – approach for determining the operational risk capital charge as compared to the proportion of such banks in the survey conducted in 2005.

Specifically, banks in the Czech Republic have the following categories of approaches available for determining their minimum operational risk capital charges:

- the Basic Indicator Approach (BIA)
- the Standardised Approach (TSA) or the Alternative Standardised Approach (ASA)
- the Advanced Measurement Approaches (AMA).

The first two approaches are based on the assumption that the size of operational risk (the exposure of the institution to operational risk) is directly proportional to the value of a particular indicator. The indicator is uniformly defined and based either on income (the BIA and TSA[149]) or on the volume of loans provided (the ASA). The capital charge corresponds to a fixed percentage of the value of the indicator (12, 15 or 18%). These simpler approaches are fully standardised, predefined and laid down bindingly and uniformly in the Czech Republic in a legal rule,[150] so they are not described in any further detail here.

The most complex and sophisticated approaches are those based on internal models (the advanced approaches, or AMA), which will be examined in more detail in the following section. Generally, the parameters of the AMA reflect the most advanced operational risk management and measurement practices and in this sense offer a guide for all banks.

4. THE ADVANCED APPROACHES TO OPERATIONAL RISK MEASUREMENT

The fundamental quantitative requirement for an AMA operational risk measurement system is that it must have the following elements: internal data, external data, scenario analysis and business environment and internal control factors. However, more detailed rules – defining, for example, how these mandatory elements should be incorporated into the AMA, how they should be combined and what weights they should have in the overall measurement of operational risk – are not laid down in the regulations.

Qualitative requirements are also defined for the AMA. Financial institutions' operational risk management systems and processes must comply with explicit "advanced" requirements. These requirements are in principle in line with internationally recognised best practices for operational risk management.

The most valued feature of the AMA is that the quantitative requirements (the main ones are described in more detail below) are relatively general, which means that institutions can use their tried and tested operational risk measurement methods. On the other hand, the generality and flexibility of the regulatory requirements may simultaneously be the biggest barrier to the use of the AMA, especially for smaller or less sophisticated institutions, as tried and tested methods that can be applied directly under the AMA have not been fully introduced yet.

Another feature of the AMA which is also appreciated in practice is that the regulations explicitly allow it to be developed and used on a group-wide basis, i.e. a common model can be created for an entire consolidated group, enabling the group to take advantage of the effects of spreading its operational risks. Consequently, the group model can be used for calculating the operational risk capital charge both for the group as a whole and separately for the individual members of the group. However, an allocation mechanism – whereby the capital charge is derived from the group calculation – is much more frequently used to determine the capital charges for the individual members of a group. As this approach is easily the most prevalent in the Czech Republic, it will be described in more detail in section 4.3.

The last specific feature of the AMA to be addressed in more detail in this article is the option of using operational risk mitigation techniques, most notably insurance, to reduce operational risk capital charges.

149 The standardised approach for calculating the operational risk capital charge is based on the assumption that operational risk exposure expressed by means of a universal income-based indicator depends additionally on the nature of an institution's business activities. For this purpose, bank's business activities are divided into eight business lines and three categories with a rising level of operational risk (the risk weight, referred to as beta, is given in parentheses): (1) retail brokerage, retail banking and asset management (12%), (2) commercial banking and agency services (15%), (3) corporate finance, trading and sales, and payment and settlement (18%).

150 Decree No. 123/2007 Coll.

4.1. Elements of the AMA

Internal data
Comprehensive information on individual operational risk events (in particular realised losses) is the cornerstone of operational risk management, and so all institutions should have such an overview no matter what approach they use to calculate their operational risk capital charges. If an AMA is used, this overview must include an appropriate valuation of the size of the losses ensuing from such events.

The most frequently used data collection system is based on correspondents, i.e. workers who are responsible, among other things, for collecting information on internal operational risk events and recording them in the relevant operational risk system or database. The information obtained is then used for further data analysis and, where relevant, for assessing specific events. This system, based on the collection of information "in the field", is more difficult to organise and more costly and often fails to ensure that data of the required completeness are collected. On the other hand, the advantages of this system are that it allows all event-related costs to be taken into account more accurately and it enables the institution to acquire and assess more operational risk information and events, including potential losses, indirect costs and events that do not lead directly to operational risk losses.

Another fairly frequently used data collection system is based on the use and analysis of accounting records. For this approach, the first step is to select the accounts on which operational risk events are or can be recorded. These accounts are then periodically analysed and any operational risk-related changes on them are transferred to an operational risk event database. The advantages of this approach are that it ensures more complete collection of events with an accounting impact, provided that due care is taken during the initial selection of the tracked accounts, and the data collection process is less costly. The weaknesses of this system compared to the previous approach are that a time lag may arise between the occurrence of an operational risk event and the date it is recorded in the accounts, there is a smaller amount of accompanying analytical information on individual events, and it involves the exclusive use of book valuation of individual events. This valuation method can be too inaccurate for operational risk management purposes, for example for events related to long term assets where the accounting depreciation does not reflect the true value of the asset in question.

With regard to the completeness, accuracy and timeliness of the information recorded, preference is given in current practice, including in the Czech Republic, to data collection systems based on a limited number of correspondents with subsequent checks of the completeness of recorded events with data in the accounting system; the size of the loss may differ for the reasons mentioned above (in such case the difference should be explained).

External data
External data are included in the AMA primarily to provide additional information on significant, yet infrequent operational risk events. The data are obtained, for example, from other institutions via membership in a consortium of institutions that pool information on internal operational risk events, via commercial databases or via internal event monitoring using the press or other public information sources (owing to increasing media coverage, the probability of catching a loss event rises with loss size).

One of the main ways of using external data in the AMA is to incorporate them directly into the internal data. With this approach, it is essential to ensure that the external data do not unduly skew the internal data distribution. Such skewness can have several different causes; for example, consortium or commercial databases only contain losses exceeding a certain threshold, and this threshold is usually higher than the one used for internal data. One possible solution to this problem is to compare the shape of the distribution of the internal losses in a risk category that can reasonably be expected to contain very severe losses with the external data distribution, and on the basis of that comparison eliminate the skewness of the external data in other risk categories.

Another very frequently used solution is to apply an appropriate scaling factor to the external data, i.e. to adjust the amount of the loss recorded by an external institution according to a factor available for one's own institution and an external one.[151] However, one should proceed with caution when scaling, because not every event type or

151 The indicators used for scaling include the ratio of total assets and the ratio of number of employees.

loss amount depends on such factors; for example, losses associated with human error in financial market trading or certain losses resulting from legal disputes are not necessarily related to institution size.

Scenario analysis
The incorporation of scenario analysis serves a similar purpose as that of external data. These two mandatory elements are meant to ensure that the AMA captures extraordinary events with very severe losses, events which – given the limited internal data time series used for modelling purposes – may not be recorded among the internal data. Unlike internal and external data, scenario analysis takes into account expert opinion regarding the potential future evolution of operational risk. As a result, it is possible to incorporate into the AMA potential "new" losses and other projected trends in an institution's operational risk exposure.

Given the aforementioned similarity of the reasons for including external data and scenario analysis, these two elements are often combined and incorporated jointly into the AMA. The classic example of this approach is the derivation of potential severe impacts in scenario analyses, where available external data are provided to the experts as a source of inspiration in their assessment. Even in this case, however, the experts must not ignore potentially severe loss types specific to the given institution.

Business environment and internal control factors
The last mandatory element of the AMA consists of methods for incorporating various changes in the business or internal control environment into the measurement. These methods allow an institution to adjust the capital charge calculated on the basis of the previous elements and thereby eliminate the shortcomings inherent primarily in the internal data (i.e. the assumption that past experience is the best tool for estimating future losses). By incorporating such factors, the capital charge can be reduced if, for instance, new control mechanisms are introduced which have a provable impact on the institution's risk profile. Or, conversely, the charge will need to be increased if, for example, there is significant increase in the institution's activities or it commences new operations or launches new products. This mandatory element, like scenario analysis, is meant to make a bank's risk measurements more forward-looking and allow it to take account of changes in qualitative factors.

For this purpose, key risk indicators are used most often in practice. They allow a bank to estimate the future level of the risks it undertakes. Examples include the number of particular transactions processed by a single employee and the number of open legal disputes. Although large sets of such indicators are mentioned in the literature, the number of risk indicators chosen as key indicators is usually in single or, at most, double figures. Determining the specific set of key risk indicators appropriate for a particular financial institution is therefore quite a difficult process and needs to take account of the institution's specific situation. Another potential tool for assessing changes in the control environment is the application of risk self-assessments, which involve contacting individual process owners tasked with identifying specific process risks, evaluating the adequacy of the existing controls and assessing the residual risks, i.e. those not captured by the controls already in place.

Both tools (risk indicators and risk self-assessments) require "backtesting" to assess the key indicators' risk-prediction ability or the experts' estimation accuracy in risk self-assessments. The predictions are also compared against the internal losses actually realised. Significant deviations should be recorded and explained and, where relevant, the use of these tools should be modified so as to ensure better agreement in future backtesting.

4.2. Combinations of mandatory AMA elements

Internal data-based AMA – LDA model
As for the methodology applied to calculate capital charges using the aforementioned AMA elements, the dominant approach currently used in the Czech Republic and elsewhere is based on the tracking of internal operational risk events and the subsequent derivation of a mathematical apparatus based on those internal data. This approach is known as LDA.[152]

If we have access to sufficient internal loss information of the required quality, we can create a model for estimating the total loss. Since, however, individual operational risk events are highly diverse, we first need to create a set of homogeneous data that can be expected to be based on the same statistical distribution. Although

152 Loss distribution approach.

this is not specifically required by the regulations, the data are often distributed into risk classes corresponding to the combination of seven event types[145] and eight business lines[149] (i.e. 56 risk classes in all). In this case, the events within each of these classes are regarded as events generated from the same distribution and less strict requirements are usually imposed on the statistical tests of the homogeneity of the data. However, since individual institutions (from the economic perspective fortunately) do not have enough data for statistical modelling purposes, selected risk classes are merged. For such mergers, tests have to be conducted to determine the homogeneity of the data in each risk class. In practice, one often encounters the solution where the data are split into categories according to event type and further broken down by business line for any categories containing a sufficient number of observations.

The estimation of the total loss in each risk class is given by the sum of independent, equally distributed random variables representing the individual loss amount. As the number of events is also a random variable, we are not talking about a deterministically determined number of summands. We are talking about a random sum where the number of summands corresponds to the realisation of a random variable with a discrete distribution. At the same time, independence between the number of events and the individual loss amounts is assumed.

A quantile (usually at the 99.9% level) is determined from the total loss distribution. This quantile forms the basis for the calculation of the operational risk capital charge.

In some cases this problem is not easy to solve, because it is difficult to fit the observed data using a theoretical distribution function matching the observed values sufficiently accurately across the whole range of losses. Therefore, combinations of several distributions or, for distributions of large losses, functions based on the theory of extreme values[153] are also used. Since the derivation of the theoretical distribution function of the random variable of the total loss is associated with various problems, Monte Carlo simulation is usually employed.

Given the aforementioned dominance of "group" AMAs, this part of the AMA is usually conducted only in parent institutions, i.e. outside the Czech Republic, and since the theoretical underpinnings of the models, including the methods for selecting suitable distribution functions and related tests and for calculating the total capital charge across the individual risk cells, are adequately described in various sources (see, for example, Cruz, 2002, and Moscadelli, 2004), no further space will be devoted to this issue here.

The aforementioned model incorporates internal data only. The other mandatory elements can be incorporated into the approach in several ways, but the authors have not noted any dominant approach that it would be useful to describe in this article.

Scenario analysis-based AMA – SBA model
To the best of the authors' knowledge, the second most common approach is one based on scenario analysis,[154] although, as emphasised above, it is possible to apply approaches based on other methodologies.

This approach, unlike the scenario analysis used in the LDA method, employs far more scenarios with the aim of covering lower risk events as well. Individual experts therefore estimate first the distribution functions of the severity and frequency of the losses and then the parameters of the chosen distributions. Internal data can then be used, for example, to test whether the scenarios created in an area where there is sufficient internal data correspond to the scenario analysis estimates.

4.3. Capital allocation using the group AMA approach – potential impacts on the Czech financial sector

All institutions in the Czech Republic that are using or planning to use an AMA in the near future are part of large international financial institutions. The parent companies, as mentioned earlier, are predominantly developing the group-wide approach. Individual group members thus contribute all the required data to the model, and these data are used to calculate the capital charge at group level, including group diversification effects. This capital charge is then distributed across the individual institutions using allocation algorithms often based on readily available indicators such as total assets, gross profit or number of employees. If, however, the diversification

153 The POT (peaks over threshold) approach.
154 The SBA (scenario based approach).

effects implicitly included in the group calculation are not removed prior to allocation, it is necessary to verify whether the allocated capital is commensurate with the size of the risk undertaken by the specific subsidiary (here meaning a subsidiary bank operating in the Czech Republic, although the information given below is universally applicable). For the Czech banking sector, this problem is particularly important, because the vast majority of banks are subsidiaries of major European banks, some of which already use an AMA or are preparing intensively to do so.

The problem of allocation associated with diversification effects can be illustrated using the following example, which sets out to compare the individually calculated capital charge with the result derived from the group calculation[155] with subsequent application of the now common allocation mechanism with no adjustment for diversification effects.

For the purposes of the simulation, the frequently employed distribution functions were chosen – the Poisson distribution for the distribution of the number of events and the log-normal distribution for the distribution of the individual loss amounts. For the sake of simplicity, we assumed that the group consists of three identical institutions. Hence, the same distribution functions describing the operational risk level were chosen for both the individual and group calculation, with relevant adjustment of the parameters in the case of the determination of the number of losses. For the same reason, an allocation ratio of one-third of the group capital charge was set for the allocation of the group capital charge to each of the institutions, in line with simple allocation mechanisms.

The specific parameters used in the simulation were the following:

Log-normal distribution (loss amount)[156]	parameter $\mu = 10$
	parameter $\sigma = 2$[157]
Poisson distribution (number of events):	parameter $\lambda = 5$ (individual calculation)[158]
	parameter $\lambda = 15$ (group calculation).

Using the chosen parameters, a Monte-Carlo simulation was performed separately for the group and individual calculation. In the simulation the following series of steps was followed in both cases:

1) the total loss amount for the period was simulated 100,000 times, and in each step
   a) the number of events (the random variable from the Poisson distribution with the relevant parameter) was generated,
   b) according to the value of the random variable from the previous step, the corresponding number of individual losses from the log-normal distribution was generated,
   c) the total loss in this step was determined,[159]

2) the quantile was calculated from the total losses generated in step 1 at a confidence level of 99.9%, which corresponds to the regulatory requirement for the operational risk capital charge,

3) for the simulation of the group calculation, the resulting quantile was multiplied by 1/3 as explained above, due to the subsequent use of the allocation mechanism.

The outcome of the above simulation is that an institution which is not a group member or which performs the calculation itself would have to maintain operational risk capital coverage of around 26 million currency units in the case of the individual calculation, while an institution incorporated into the group calculation with subsequent allocation would be able to maintain capital of just 16.5 million currency units thanks to group diversification effects.

155 The calculation performed at group level using data from the individual group members.

156 These parameter values are only illustrative, but similar values are also used in practice.

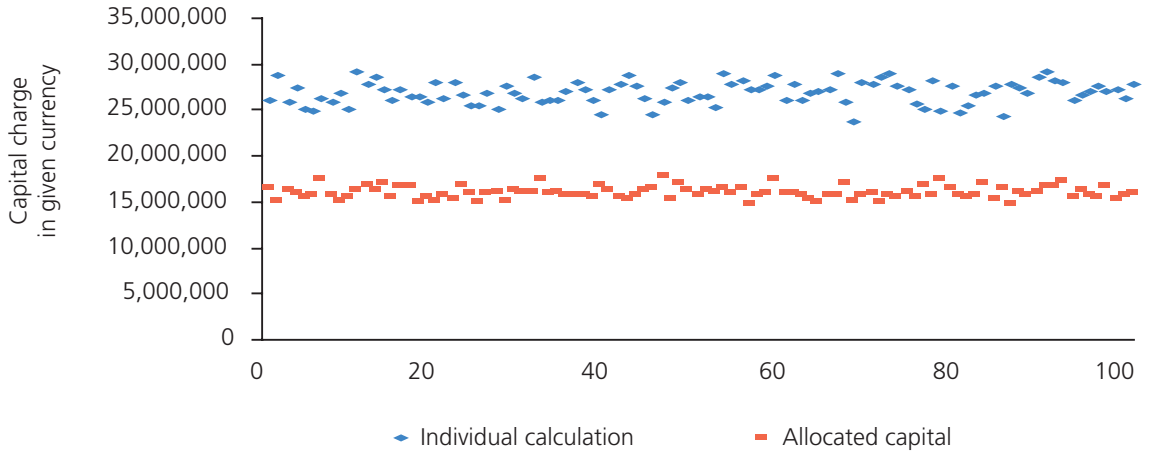
157 The mean of this random variable is equal to $\exp(\mu + \sigma^2/2)$ and the variance $\exp(2\mu + \sigma^2)\exp(\sigma^2-1)$.

158 The mean and variance of this random variable are equal to parameter λ.

159 In terms of symbols $s = \sum_{i=1}^{Y} x_i$, where S is the total loss amount for the period, Y is the random number of events for the period and X_i is the random amount of one loss.

In order to reduce the statistical error of adopting a conclusion based on just one simulation, the aforementioned simulation was repeated 100 times. The result is shown in the chart.

Chart 2 – Simulated OR capital charge



Source: CNB

The repetition of the simulation confirmed the validity of the above conclusion that the group-wide calculation with subsequent allocation leads to a significantly lower capital charge than the individual calculation. It is also worth mentioning that according to the results presented in the chart even the highest capital charge calculated using the allocation mechanism is 25% lower than the lowest capital charge calculated on an individual basis.

Since parent companies do not usually provide group members with any legally binding guarantees to provide additional capital where necessary to cover losses due to operational risk, this capital saving within the group as a whole is not sufficiently justifiable from the subsidiary's perspective. It is therefore necessary to perform tests of the adequacy of the capital allocated from the point of view of the individual group members, especially when allocation mechanisms are applied that do not eliminate group diversification effects.

Clearly this is just an illustrative example and the capital saving may be different in practice. However, the example demonstrates that if group diversification effects are not eliminated prior to applying the allocation mechanism, the capital charge can be significantly underestimated from an individual perspective for individual subsidiaries. One of the specific responses of the CNB supervisory authority to this fact has been to set a prudential benchmark (threshold) for the operational risk capital charge.[160]

4.4. Insurance as an eligible technique for reducing the operational risk capital charge

When using the AMA, unlike all the other available approaches for calculating operational risk capital charges, a bank is allowed to reduce its calculated capital charge if some of its operational risks are insured and transferred to insurers outside its financial group, provided that the insurance policies meet other specified conditions. In such case, the operational risk capital charge can be reduced by up to 20%. Besides insurance, other operational risk mitigating techniques can be applied, although their use for reducing capital charges is conditional on prior supervisory assessment and approval. The application of derivatives is most often mentioned in this context, but this option is little used in practice as yet.

160 Official Information of the Czech National Bank of 16 November 2007 regarding the prudential rules for banks, credit unions and investment firms – a benchmark for the operational risk capital charge.

In the Czech Republic, too, insurance mitigation is the only such technique being considered at present. Its impact is so far relatively insignificant and the savings being achieved are only a few per cent of the operational risk capital charge. Although the technique only involves the transfer of risk out of the relevant institution or group, and not out of the financial sector, this issue is not currently a priority with regard to the financial sector as a whole. However, it requires continued vigilance.[161]

5. CONCLUSIONS

The main results of the study include an initial assessment of the real impacts of the newly introduced mandatory operational risk capital charge on the total capitalisation (capital adequacy) of banks in the Czech Republic and a comparison with earlier estimates and predictions. Importantly, we have demonstrated that the operational risk capital charge is potentially underestimated where a group-wide operational risk measurement model is used and capital is subsequently allocated to banks in the Czech Republic. Other important findings include confirmation of the potential of operational risk to significantly affect financial institutions' risk profiles, as well as the limited scope for limiting the impacts of operational risk on the financial sector as a whole given the dominant status of insurance as an eligible technique for mitigating operational risk in the banking sector.

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161 See, for example, Joint Forum (2003).

GLOSSARY

Asset-Backed Security (ABS)
A type of debt security whose yield is secured with cash flows from a set of underlying assets (mortgage loans, income from payment cards issued, car purchase loans, etc.). ABSs backed by payments from mortgage loans on residential property are called Residential Mortgage-Backed Securities (RMBS). Asset-Backed Commercial Papers (ABCP), which are issued to obtain short-term credit, are a variant of ABSs.

Balance-sheet liquidity The ability of an institution to meet its obligations in a corresponding volume and term structure.

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*).

Carry trade A speculative strategy on the financial markets where an investor borrows money in a currency with a lower interest rate and invests it in a currency with a higher interest rate in order to realise the profit arising from the interest rate differential (a similar transaction can be carried out using financial derivatives). However, this profit can only be realised on the assumption that any movement of the exchange rate between the financing currency and the investment currency does not eliminate the gain from the interest rate differential.

Collateralised debt obligation (CDO)
A security backed by debt, with various debt receivables serving as the underlying portfolio. By contrast with traditional debt-backed securities, several risk variants (tranches) of debt securities, characterised by specific risk profiles and yields, are issued against a single underlying portfolio. Riskier tranches offer higher yields but also result in higher losses in the case of default in the underlying portfolio. CDSs can also be used as underlying assets; such obligations are called synthetic CDOs.

Conduits Special-purpose vehicles established by banks. Like SIVs, they sell short-term liabilities (commercial papers) and use the funds raised to buy long-term asset-backed assets (mortgage loans, car purchase loans, income from payment cards issued, etc.). Banks use them to securitise loans provided and to a large extent guarantee their operations.

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.

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 number of new defaulters over a 12-month reference period as a proportion of the total number of entities existing in that period. The default rate can also be defined analogously in terms of volume based on the obligations assumed by debtors.

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.

Flight to quality A situation on the financial markets where investors sell en masse all risky assets and buy only high-quality government bonds of advanced countries with very low risk.

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.

Interest rate spread Also interest rate differential; the spread between the interest rate on a contract (deposit, security) and a reference interest rate.

IRB approach Internal Rating Based Approach – an approach to the calculation of the capital requirement in relation to the credit risk of the investment portfolio and the risk of diffusion of the portfolio, based on internal ratings. It is one of the most important innovations under the new capital framework. The IRB approach is laid down in CNB Decree No. 123/2007 Coll., on prudential rules for banks, credit unions and investment firms.

Leveraged loans Loans with a high degree of leverage, granted to companies whose external debt exceeds a level that is considered normal. These loans have a higher probability of default and banks charge relatively high interest rates on them. They are often used for a specific purpose – typically to acquire a controlling interest in a corporation using borrowed money (leveraged buy-out, LBO).

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.

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.

Monoline insurers Specialised institutions insuring against the risk of default on bond issues and securing high ratings for them (originated primarily to insure municipal bond issues). This relatively small sector attracted increased attention during the credit crisis in 2008, as it also started insuring credit derivatives, including those created through the securitisation of subprime mortgages, in a search for yield.

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*.

Originate-and-distribute model
A bank business model under which the bank first provides loans or funds for lending to an intermediary and subsequently sells on these loans by means of securitisation, thereby distributing the original credit risk among other entities.

Over the counter (OTC) operations
Operations not conducted on an organised market.

Present value of a basis point (PVBP)
The change in the real value of an instrument given a parallel shift in the interest rate curve of 1 basis point, i.e. 0.01%.

Price-to-income The ratio of the price of a flat (68 m^2) to the average annual wage in a given region.

Price-to-rent The ratio of the price of a flat to the annual rent. The price-to-rent ratio is the inverse of the rent 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 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.*

Rent return The ratio of the annual supply rent to the supply price of the flat. It is the inverse of the price-to-rent indicator.

RMBS See Asset-Backed Security

Securitisation A credit risk transfer method creating a new marketable security from a set of illiquid assets. The cash flows from the security depend on the cash flows from the underlying assets. Securitisation takes place through an SPV (Special Purpose Vehicle). The original owner transfers the underlying assets to this company against cash payment and the SPV issues new securities based on the underlying assets (called asset-backed securities, ABSs) and sells them to investors. Credit risk is thus transferred from the original owner of the receivables to ABS holders.

Shadow banking system A relatively new term that started to be used on a larger scale in connection with the credit crisis in 2007. It is a heterogeneous group of financial institutions that enable the banking sector to provide more loans with a given level of capital or grant various forms of loans themselves. According to Wikipedia, for example, the shadow banking system or shadow financial system is largely formed by non-bank financial institutions that have short-term and liquid liabilities and long-term and less liquid assets. The system includes SIVs, conduits, money market funds, investment banks, hedge funds, monoline insurers and other non-bank entities. These institutions are subject to market risk, credit risk and especially liquidity risk in respect of the rollover of securities or the loans used to finance them. As they are not depositary institutions, they do not have access to the central bank's lender-of-last-resort support. In the event of liquidity problems, they could go bankrupt if unable to refinance their short-term liabilities.

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.

Structured Investment Vehicles (SIVs)
Special-purpose companies acting as funds, raising money by issuing short-term securities (commercial paper), investing it by purchasing long-term securities and making profit from the difference between the interest rates on short-term liabilities (asset-backed securities or corporate bonds) and long-term assets. SIVs have an open structure, i.e. they operate continuously, buying new assets as others mature. By contrast with conduits, they cannot rely directly on obtaining liquidity from their parent banks at times of financial turbulence.

Subprime A relatively risky segment of clients with worse expected payment discipline (e.g. clients with a poor credit history, a higher risk of loss of employment, etc.).

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.

Total population increase The sum of the natural population increase and net migration in the same period of time in a given area. Net migration is the difference between immigration into and emigration from a given area in the same period of time. See also *Natural population increase*.

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

ABCP	asset-backed commercial paper
ABS	asset-backed securities
AFAM ČR	Association of Funds and Asset Management of the Czech Republic
AKAT	Czech Capital Market Association
APF ČR	Association of Pension Funds of the Czech Republic
ATM	automated teller machine
b.p.	basis point
ČAP	Czech Insurance Association
CAR	capital adequacy ratio
CCR	Central Credit Register
CDO	collateralised debt obligation
CDS	credit default swap
CEBS	Committee of European Banking Supervisors
CEIOPS	Committee of European Insurance and Occupational Pensions Supervisors
CERTIS	Czech Express Real Time Interbank Gross Settlement System
CESR	Committee of European Securities Regulators
ČLFA	Czech Leasing and Finance Association
CNB	Czech National Bank
CSD	Central Securities Depository
CZ-NACE	Industrial Classification of Economic Activities
CZEONIA	Czech OverNight Index Average (reference O/N interest rate on the interbank market)
CZK	Czech koruna
CZSO	Czech Statistical Office
EC	European Commission
ECB	European Central Bank
EEA	European Economic Area
EIB	European Investment Bank
EMBI	Emerging Market Bond Index
EONIA	Euro OverNight Index Average (reference O/N interest rate on the interbank market)
ESCB	European System of Central Banks
EU	European Union
EU-12	euro area countries before 2007
EUR	euro
EURIBOR	Euro InterBank Offered Rate (reference interest rate on the interbank market)
FED	Federal Reserve System (the US central bank)
FRA	forward rate agreement
GDP	gross domestic product
HI	Herfindahl index
HUF	Hungarian forint
IBRD	International Bank for Reconstruction and Development
IF	investment firm
IMF	International Monetary Fund
IPB	Investiční a Poštovní banka, a. s.
IRB	Internal Rating Based Approach, an approach within the Basel II framework for capital adequacy of banks

IRI	Institute for Regional Information
IRS	interest rate swap
JPY	Japanese yen
LGD	loss given default
LIBOR	London InterBank Offered Rate (reference interest rate on the interbank market)
LTV	loan-to-value ratio
MCR	minimum capital requirement – the minimum required capital for calculation of the solvency of insurance companies and reinsurers
MF ČR	Ministry of Finance of the Czech Republic
MiFID	Markets in Financial Instruments Directive
MNB	Magyar Nemzeti Bank (the Hungarian Central Bank)
MRD	Ministry for Regional Development
O/N	overnight
OECD	Organisation for Economic Cooperation and Development
OMF	open-ended mutual fund
OR	operational risk
OTC	over-the-counter
p.p.	percentage point
PD	probability of default
PLN	Polish zloty
PRIBOR	Prague InterBank Offered Rate (reference interest rate on the interbank market)
PX (PX-Glob)	Czech stock market index
QIS	quantitative impact study
RMBS	residential mortgage-backed securities
RoA	return on assets
RoE	return on equity
RoS	return on sales
SCR	solvency capital requirement – the minimum solvency requirement for risks undertaken by insurance companies and reinsurers
SIVs	structured investment vehicles
SKD	Short-Term Bond System
SKK	Slovak koruna
SME	small and medium-sized enterprises
USD	US dollar
VA	value added
VAT	value added tax
WIG	Polish stock market index

Country abbreviations:

AT	Austria
AU	Australia
BE	Belgium
BG	Bulgaria
CA	Canada
CH	Switzerland
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GR	Greece
HU	Hungary
IE	Ireland
IT	Italy
JP	Japan
KR	Korea
LT	Lithuania
LU	Luxembourg
LV	Latvia
ME	Mexico
MT	Malta
NL	Netherlands
NO	Norway
NZ	New Zealand
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
TR	Turkey
UK	United Kingdom
USA	United States

Selected financial stability indicators

	2005	2006	2007	2008		
				January	February	March
Financial soundness of banks						
Capital adequacy (%)	11.9	11.4	11.5	11.6	11.9	12.3
Tier 1 capital adequacy (%)	11.3	10.0	10.3	11.0	11.2	11.6
Non-performing loans / total gross loans (%)	4.1	3.6	2.6	2.7	2.7	2.8
Sectoral breakdown of total loans (%)						
- households	32.2	35.0	37.5	37.7	38.0	38.1
- sole traders	2.8	2.5	2.2	2.2	2.2	2.2
- non-financial corporations	44.6	44.9	41.7	41.5	41.5	41.5
- other (incl. non-residents)	20.4	17.5	18.7	18.6	18.4	18.2
Return on assets (%)	1.4	1.2	1.3	1.5	1.4	1.4
Return on equity (%)	25.2	22.5	24.5	29.8	26.3	26.0
Quick assets / total assets (%)	32.8	30.4	24.0	25.9	24.8	25.3
Quick assets / client deposits (%)	50.5	45.5	36.6	39.2	37.1	38.5
Net open position in foreign exchange / capital (%)	0.1	0.3	0.0	1.9	0.9	0.9
Macroeconomic environment						
Real GDP growth (year on year, %)	6.4	6.4	6.5	…	…	…
Consumer price inflation (end of period, %)	2.2	1.7	5.4	7.5	7.5	7.1
Public finance deficit / GDP (%)	-3.6	-2.7	-1.6	…	…	…
Public debt / GDP (%)	29.7	29.4	28.7	…	…	…
Trade balance / GDP (%)	2.0	2.0	3.3	…	…	…
Balance of payments current account / GDP (%)	-1.6	-3.1	-2.5	…	…	…
Monetary policy 2W repo rate (end of period, %)	2.0	2.5	3.5	3.5	3.8	3.8
Financial markets						
1Y PRIBOR (average, %)	2.1	2.7	3.4	4.2	4.1	4.2
10Y government bond yield (average, %)	3.6	3.8	4.3	4.6	4.6	4.7
Eurobond spread (EMBI spread, b.p.)	17.0	23.0	26.0	32.0	35.0	44.0
CZK/EUR exchange rate (average)	29.8	28.3	27.8	26.1	25.4	25.2
Change in the PX stock index (% year on year, end of period)	42.7	7.7	14.2	-9.8	-1.7	-9.4
Real estate market						
Total change in residential property prices (transfer prices, % year on year)	4.9	2.9	3.96*	…	…	…
Change in flat prices (supply prices according to IRI, % year on year)	-2.3	11.3	34.7	…	…	28.2
Flat price / average annual wage	4.2	4.0	4.1	…	…	…
Flat price / rent	15.0	16.9	22.8	…	…	23.3
Non-financial corporations						
Return on equity (%)	9.5	10.5	10.1	…	…	…
Debt (% of total assets)	46.5	47.5	48.9	…	…	…
Debt (% of GDP)	40.9	39.3	41.7	…	…	…
- loans from Czech banks (% of GDP)	14.8	19.7	20.9	…	…	…
- loans from Czech non-bank financial corporations (% of GDP)	4.7	4.7	4.7	…	…	…
- other (incl. financing from abroad, % of GDP)	22.1	15.0	16.1	…	…	…
Interest coverage ratio (earnings / interest expense, %)	9.5	11.8	9.8	…	…	…
12M default rate (average, %)	2.6	2.1	2.8	…	…	…
Households (incl. sole traders, excl. 12M default)						
Debt / gross disposable income (%)	34.0	40.3	48.3	…	…	…
Debt / financial assets (%)	22.5	26.0	29.6	…	…	…
Net financial assets (total financial assets – total liabilities, % of GDP)	…	41.5	41.1	…	…	…
Debt / GDP (%)	17.3	20.3	23.4	…	…	…
- loans from Czech banks to households (% of GDP)	10.7	15.3	18.8	…	…	…
- loans from Czech non-bank financial corporations to households (% of GDP)	3.1	3.1	3.6	…	…	…

Selected financial stability indicators – continued

	2005	2006	2007	2008		
				January	February	March
Households (incl. sole traders, excl. 12M default)						
- loans from Czech banks to sole traders (% of GDP)	0.9	1.1	1.1	…	…	…
- loans from Czech non-bank financial corporations to sole traders (% of GDP)	0.4	0.4	0.5	…	…	…
- other (incl. financing from abroad, % of GDP)	2.2	0.3	0.1	…	…	…
Interest expenses / gross disposable income (%)	1.1	1.3	1.8	…	…	…
12M default rate of households (average, %)	…	…	2.9	…	…	…
Financial sector						
Assets / GDP (%)	134.4	133.0	141.9	…	…	…
Bank assets / GDP (%)	98.9	97.5	105.3	…	…	…
Banking sector						
Share in financial sector assets (%)	73.8	73.3	74.2	…	…	…
Client loans / bank assets (%)	39.5	45.2	48.4	46.8	48.0	48.0
Client deposits / client loans (%)	65.0	66.7	65.6	66.2	66.9	65.8
Growth in loans (%, end of period, year on year)						
total	16.7	19.9	26.4	25.4	24.8	24.5
households	34.0	30.4	35.1	34.9	34.5	33.2
- loans for house purchase	34.1	32.5	37.6	37.5	36.8	35.2
- consumer credit	36.8	26.5	26.1	26.7	27.2	26.6
sole traders	16.9	7.7	8.7	8.7	7.1	5.7
non-financial corporations	14.3	20.8	17.2	16.4	16.7	16.5
- loans for house purchase (CZ-NACE 70)	36.5	37.0	37.4	38.5	37.6	36.8
Non-performing loans / total loans (%)						
households	3.2	2.9	2.7	2.8	2.8	2.8
- loans for house purchase	1.6	1.6	1.5	1.6	1.6	1.6
- consumer credit	7.8	7.3	6.6	6.7	6.7	6.7
sole traders	10.7	9.2	7.2	7.6	7.7	7.8
non-financial corporations	5.1	4.4	3.1	3.2	3.2	3.4
Non-bank financial corporations						
Share in financial sector assets (%)	26.2	26.7	25.8	…	…	…
Premiums written / GDP (%)	3.9	3.8	3.7	…	…	…
Solvency of insurance companies: life insurance (%)	325	301	…	…	…	…
Solvency of insurance companies: non-life insurance (%)	339	327	…	…	…	…
Change in financial investment of insurance companies (%)	11.6	8.9	8.0	…	…	…
Return on equity of insurance companies (%)	13.5	24.6	21.7	…	…	…
Claim settlement costs / net technical provisions (life, %)	12.1	10.3	12.8	…	…	…
Claim settlement costs / net technical provisions (non-life, %)	69.4	71.7	61.4	…	…	…
Change in assets managed by pension funds (%)	20.9	18.2	14.6	…	…	…
Return on equity of pension funds (%)	…	121.8	111.7	…	…	…
Growth in loans from non-bank financial corporations engaged in lending (%)						
total	…	7.4	17.7	…	…	…
households	…	9.2	27.2	…	…	…
non-financial corporations	…	5.8	11.2	…	…	…
Composite indicators**						
Banking stability index (average for period)	0.6	0.5	0.3	…	…	…
Creditworthiness index for non-financial corporations (average for period)	0.971	0.973	0.972	…	…	…
Market liquidity index (average for period)	0.2	0.3	0.1	-0.3	-0.2	…

* 2007 H1

** see Part I of the report for the methodology and interpretation of the composite indicators

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