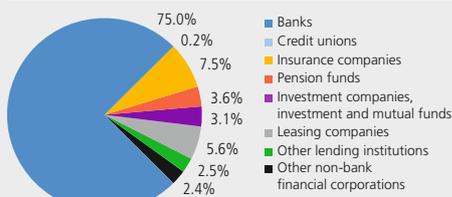


**CHART IV.1**  
Shares in financial sector assets  
(%; 2008)



Source: CNB, CZSO

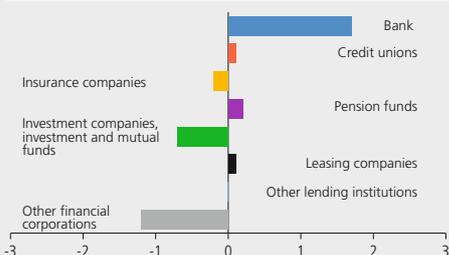
## 4 THE FINANCIAL SECTOR

The global financial crisis, which started in the summer 2007, escalated during 2008, resulting in the failure of several major financial institutions. The collapse of US investment bank Lehman Brothers in September 2008, which radically increased risk aversion, can be regarded as one of the peaks of the crisis in the financial system. As a result, liquidity problems occurred throughout the global financial system, including the emerging economies, which previously had not been significantly affected by the crisis. At the turn of 2009, the financial crisis entered a second phase associated with an emerging economic recession. The main risk to the global financial system going forward is an increase in non-performing loans in a situation where financial institutions enter the adverse phase of the credit cycle weakened by losses from holdings of toxic and other risky assets.

Governments and central banks responded to the build-up of losses in the global financial system with numerous measures aimed at bolstering the balance-sheet liquidity and solvency of key institutions. These measures include new liquidity-providing instruments, an easing of conditions for eligible collateral in liquidity-providing operations, increased (or unlimited) deposit insurance, capital injections, purchases of toxic assets and guarantees for bank liabilities such as bonds (see section 2.1). At the end of 2008, EU government obligations arising from guarantees of bank liabilities amounted to about 20% of GDP, while capital injections and other measures aimed at strengthening capital totalled around 5% of GDP.<sup>60</sup> The Czech Republic was one of the few OECD countries not forced to take any measures to strengthen the solvency of the banking sector. An increase in the deposit insurance limit thus remains the only measure implemented in the Czech Republic (except for the CNB's newly introduced liquidity-providing operations, see section 3.1).

**CHART IV.2**  
Growth (fall) in shares in financial sector assets over the last two years

(change between end-2008 and end-2006, percentage points)



Source: CNB, CZSO

Note: Mutual funds include investment funds and companies; other financial corporations include investment firms, money-changing companies and other non-bank financial corporations not mentioned above.

The Czech financial sector performed well during 2008, with banking and non-banking institutions maintaining relatively high profitability.<sup>61</sup> However, some major financial market entities saw declining profits owing to the write-off of some risky assets. The global financial crisis affected the Czech government bond market and money market (see section 3.1), but the Czech banking system recorded no major balance-sheet liquidity difficulties. Owing to the adverse price movements on asset markets over the past two years, the relative shares of the individual types of financial institutions in the Czech Republic also changed. Banks, which form the core of the financial system and which were not significantly affected by the adverse financial market developments, strengthened their position in the asset structure of the Czech financial system (see Chart IV.1). Small investors moved their funds out of mutual funds and investment portfolios managed by investment firms, which were losing value because of the falling value of assets on financial markets, and into koruna deposit accounts with banks (see Chart IV.2).

<sup>60</sup> See State Aid Scoreboard – Spring 2009 Update – Special Edition on State Aid Interventions in the Current Financial and Economic Crisis. European Commission, 2009.

<sup>61</sup> The return on equity of banks, insurance companies and pension funds amounted to 21.7%, 14% and 21.9% respectively in 2008.

The Czech banking sector remains in a very good position, supported by high profitability, good balance-sheet liquidity, a high deposit-to-loan ratio, a very low (zero in the case of households) proportion of foreign currency loans and independence of external funding. Concerns about potential spillover of problems from foreign parent institutions have not been confirmed. Maybe also thanks to the standard regulatory limitations already in force before the financial crisis, liquidity was not shifted from Czech subsidiaries to foreign parent banks during the crisis. Banks and other financial institutions continue to focus on the traditional conservative business model, which has so far generated sufficient income for foreign owners on the relatively unsaturated Czech financial market. However, the lending behaviour of banks in the Czech Republic has been affected to some extent by a tightening of credit standards at the level of the global financial groups to which Czech banks belong.

#### 4.1 FINANCIAL SECTOR DEVELOPMENTS

Although the Czech financial sector has so far weathered the impacts of the global financial crisis, the impact of the coming economic recession on banking portfolios remains a challenge. The banking sector recorded relatively high profits in 2008, amid slower growth in lending to the real economy. Hardly hit by toxic assets, insurance companies and pension funds were able to cover losses from the market revaluation of assets with their total profits and capital. However, they saw further growth in the costs of brokering new contracts, which might have negative effects on future profitability. Mutual funds suffered significant losses from the decline in asset prices, which led to a shift of part of their funds to bank deposits, where the insurance limit was increased. Like banks, leasing companies and other lending companies provided credit and loans at a slower rate.

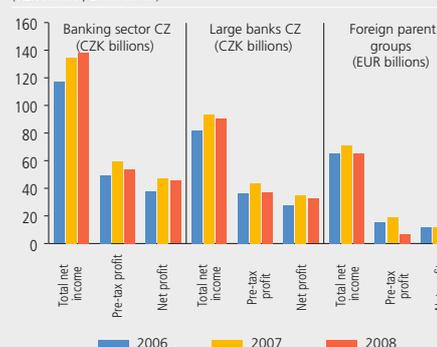
##### 4.1.1 The banking sector

The year 2008 was still a successful year for profitability in the banking sector. Unlike the foreign financial groups of which the major Czech banks are members, domestic banks suffered no significant losses from the revaluation of risky assets and their profits thus declined only slightly (see Chart IV.3). The banking sector generated a net profit of CZK 45.7 billion in 2008, down by just 3% compared to the record year of 2007. The relatively high return on equity (21.7%) and return on assets (1.2%) achieved in 2008 are consistent with this result. The main source of profits for most banks was growing income from financial activities (in particular, net interest income and net fee income), but asset impairment recorded an increase owing to a rise in non-performing loans.

As in the other new CEE EU Member States with predominantly foreign-owned banks, domestic banks' profits in many cases make up a large proportion of the consolidated profits of European bank groups. At the end of 2008, the worsening economic outlook in this region during 2008 H2 and the dependence of some of these economies on external funding of the credit expansion gave rise to concerns about the availability of external funds in a situation of high risk aversion. These concerns were exacerbated by depreciating national currencies

**CHART IV.3**  
Profit in the banking sector

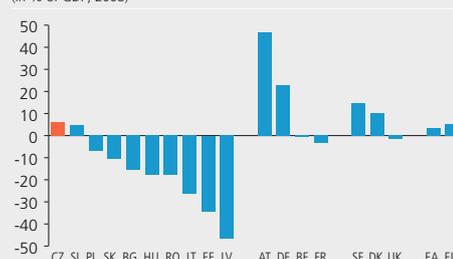
(CZK billions; EUR billions)



Source: CNB, published banking group results  
Note: Aggregated results of Erste, KBC, UniCredit and SG groups.

**CHART IV.4**  
Net external positions of selected EU countries' banking sectors

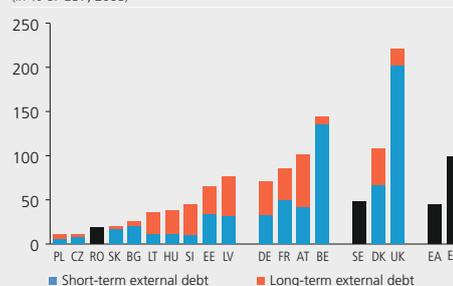
(in % of GDP; 2008)



Source: IFS IMF  
Note: EU is the weighted average for the EU countries, with shares in GDP used as the weights.

**CHART IV.5**  
Gross external debt of selected EU countries' banking sectors

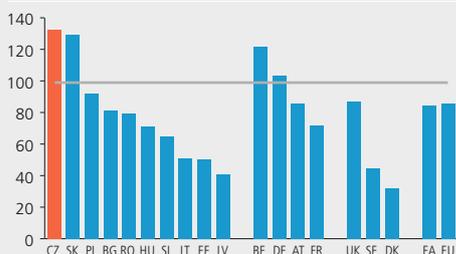
(in % of GDP; 2008)



Source: BIS, IMF  
Note: Maturity breakdown was not available for some EU countries; EU is the weighted average for the EU countries, with shares in GDP used as the weights.

**CHART IV.6**  
Deposit-to-loan ratios in selected EU countries

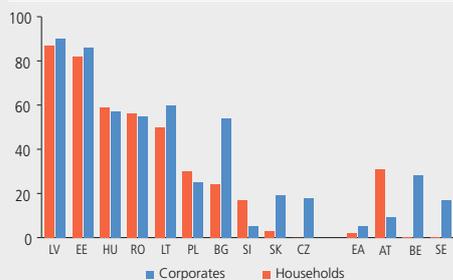
(%; 2008; resident loans and deposits; non-bank institutions)



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

**CHART IV.7**  
FX loans in selected EU countries

(% of total loans to given sector; 2008)



Source: BIS, ECB, national central banks  
Note: EA = euro area. SI - data as of February 2008; BE - households include only housing loans, corporates include all client loans excluding housing loans.

and a high percentage of foreign currency loans in some economies, which, in conjunction with low economic growth, would result in a marked increase in non-performing loans in some CEE economies. The possibility of this adverse scenario arising was also reflected in share prices and prices of CDS contracts of bank groups with major exposures to CEE countries (see section 3.1).

Although the Czech Republic is one of the new EU Member States from the CEE region, it is already classified by international institutions and many global investment banks as an advanced economy and no longer as an emerging economy, as it does not share some of the economic and financial features of most new EU Member States.<sup>62</sup>

The Czech Republic and Slovenia are the only new CEE EU Member States where the banking sector is independent of external funding, despite a high share of foreign ownership of domestic banks. This is confirmed by the positive net external position of the banking sector (see Chart IV.4). The major Czech banks are thus often net creditors of the European bank groups of which they are members. Although domestic banks borrow abroad (see Chart IV.5), these external borrowings are relatively small compared to those of the other countries of the region and EU countries. The refinancing risk is also low in the Czech Republic, since the short-term net external position of the banking sector is positive and banks would be thus able to cover any shortfalls in external short-term financing by liquidating short-term external claims.

The independence of the Czech banking sector of external funding is due to the high deposit-to-loan ratio, which is high even by European standards (see Chart IV.6). Credit expansion is thus financed mainly from primary deposits. The remaining liquidity is withdrawn by the central bank in regular repo operations (see section 3.1). The excess of deposits over loans also fosters good balance-sheet liquidity of domestic banks.

A very low share of foreign currency loans is another strong point of the Czech banking system and one of the reasons why the Czech Republic avoided the liquidity problems seen in advanced markets in 2008 Q4 (see Chart IV.7). This share is virtually zero for loans to households and stood at around 18% for non-financial corporations at the end of 2008. This conservative strategy of households and corporations borrowing in the domestic currency significantly limits the dependence of banks on developments in the interbank euro or Swiss franc markets and reduces the sensitivity of debtors to depreciation of the exchange rate and changes in the interest rate environment in creditors' countries.

<sup>62</sup> GDP per capita in the Czech Republic expressed in purchasing power parity slightly exceeds 80% of the EU-27 average, which is higher than that in Portugal, for example. The World Bank and the IMF include the Czech Republic in the advanced countries group.

To illustrate the refinancing risks of the new CEE EU Member States, the investment community, some international institutions and respected economic media have mainly used BIS data on foreign claims for individual countries. These claims include not only direct cross-border exposures of internationally active banks in individual countries, but also whole portfolios of local claims of subsidiaries and branches of these banks in those countries.<sup>63</sup> Although the influence of foreign banks in the new CEE EU Member States defined in this way is relatively high, it is not significantly different from that in some other EU countries (see Chart IV.8). In many cases, however, analysts have incorrectly used the “foreign” claims defined in this way as an indicator of the dependence of domestic economic agents on external funding and have generalised the issue of refinancing to the entire CEE region. The BIS data on “foreign” claims do not take into account the sources from which the credit expansion of subsidiaries and branches of internationally active banks is financed. In the case of the Czech Republic and some other EU countries, where loans provided by foreign-owned banks are largely financed from domestic deposits, the use of the volume of “foreign” claims as an indicator of the external funding risk would imply that there is a de facto risk of a massive outflow of deposits from domestic banks’ local depositors and parent banks would have to provide the missing funds from their own resources. In the first few months of 2009, the CNB came out very strongly against this very gross simplification and against the insufficient distinction being made between the countries of the region.<sup>64</sup>

### Loan portfolio

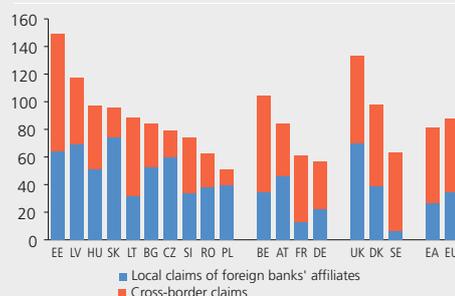
Although growth in the banking sector’s total assets continued at a slower rate in 2008 (7.9% year on year), it was still supported by a relatively high rate of growth of loans to the real sector. While the rate of growth of loans in the euro area declined to levels of around 6%, and even close to zero in the case of households at the start of 2009 (see Chart IV.9), growth in lending in the Czech Republic reached a relatively high 16.4% at the end of 2008, despite slowing appreciably (see Chart IV.10).

Annual growth in loans to non-financial corporations slowed only slightly. It stood at 14% at the end of 2008 and fluctuated around 12% on average in 2009 Q1. Part of this relatively high growth, however, was due to a rise in existing foreign currency loans as a result of the koruna depreciation.<sup>65</sup> In a situation of a worsening external and domestic economic outlook and falling orders, non-financial corporations showed limited demand for investment loans and loans for trade receivables. The low demand for loans has also caused month-on-month declines in total bank loans to non-financial corporations since December 2008.

**CHART IV.8**

#### Cross-border claims for selected EU countries from BIS data

(% of GDP; 2008)

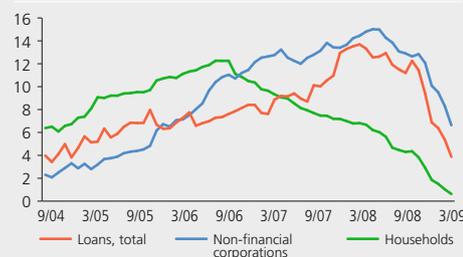


Source: BIS, IMF, Eurostat, CNB calculation  
Note: Calculation based on BIS data using both available bases. The data for the EU and euro area (EA) are not consolidated.

**CHART IV.9**

#### Year-on-year credit growth in the euro area

(in %)

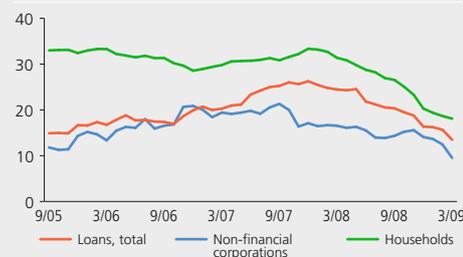


Source: ECB

**CHART IV.10**

#### Year-on-year credit growth in the Czech Republic

(in %)



Source: CNB

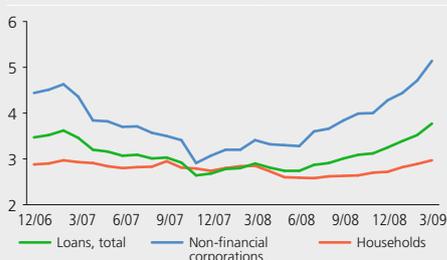
<sup>63</sup> The BIS data on foreign claims are consolidated, i.e. cross-border claims exclude loans by parent institutions to their subsidiaries and branches. The CNB used these data for the 2005 Financial Stability Report (Box 2: *Consequences of Capital Inflow and the Risk of Cross-Border Contagion*, pp. 24–25).

<sup>64</sup> See, for example, the CNB press release of 24 February 2009 “The CNB’s statement on misleading information in articles published by Financial Times and Economist”, available at [www.cnb.cz](http://www.cnb.cz).

<sup>65</sup> The growth of 13.6% year on year observed in January would have declined to 10.8% if the koruna exchange rate had not depreciated and had remained flat at the previous year’s level.

**CHART IV.11**  
Non-performing loans

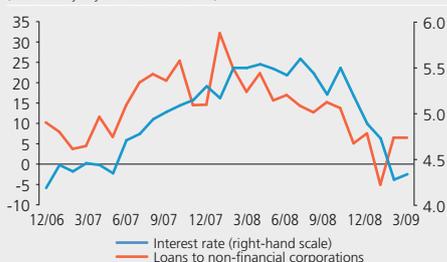
(% of total loans in sector; loans to residents)



Source: CNB

**CHART IV.12**  
Loans to non-financial corporations

(new loans y-o-y in % and rate in %)



Source: CNB

**CHART IV.13**  
Loans to households for house purchase

(new loans y-o-y in % and rate in %)



Source: CNB

In line with developments in the euro area, growth in loans to households slowed sharply, falling by 10 percentage points during 2008 to 21% in December 2008 and declining slightly further to around 19% in 2009 Q1. The growth in loans to households was driven mainly by loans for house purchase, which represent around 75% of total loans to households and which grew by 20% in 2008 (and 18% in March 2009). The growth rate of consumer credit declined in 2008, reaching around 23% in December 2008 (and around 20% in March 2009).

The adverse economic situation is negatively affecting the ability of both corporations and households to repay their obligations. The share of non-performing loans in total loans gradually increased in 2008, reaching 3.2% at the end of 2008 and 3.8% in March 2009 (see Chart IV.11). Increases were recorded both in the segment of non-financial corporations, where the NPL ratio reached 5.1% in March 2009, and in the household segment (3% in March 2009). The quality of loans to households is affected by the dominant share of less risky house purchase loans. However, this segment also saw an increase in the NPL ratio from 1.5% at the end of 2007 to 1.8% in March 2009.

Most house purchase loans are fully secured by property.<sup>66</sup> At the end of 2008, the loan-to-value ratio was 44% for the banking sector as a whole and 56% for banks (excluding building societies). However, an analysis of mortgage loans provided over the past three years indicates an increase in the LTV ratio for new loans to levels of around 80%–90%. These new loans with higher LTV ratios may thus become problematic in the event of default and a parallel decline in property prices (see section 4.2).

Banks have gradually been gearing up for growth in losses due to credit risk. They have long maintained the ratio of provisions to NPLs at a prudent level of around 57%. At the same time, banks in the Czech Republic tightened their lending standards for new loans throughout 2008. A lower rate of growth of new koruna loans to corporations turned into an absolute decline in new bank loans to the corporate sector at the start of 2009 (see Chart IV.12). Interest rates on loans to non-financial corporations tracked rates on the interbank market, which, however, responded to the reductions in monetary policy rates with a lag (see section 3.1), and thus declined mainly in 2008 H2. A greater tightening took place in the non-interest lending conditions, such as required collateral for projects financed and the proportion of own financing. The tightening of non-interest lending conditions was particularly apparent in the property developer sector (see section 3.2).

The volumes of new house purchase loans to households declined in absolute terms during 2008 (see Chart IV.13), and consumer credit joined this decline at the end of 2008 (see Chart IV.14). The household segment saw a more pronounced tightening of the interest rate conditions, especially for house purchase loans.

<sup>66</sup> The amended Act No. 190/2004 Coll. on Bonds effective from 1 July 2008 defines a mortgage loan as a loan which is at least 50% secured by a lien on property. Before this date, a mortgage loan was defined as a loan at least 100% secured by a lien on property. The latest reliable data on the share of house purchase loans fully secured (i.e. 100% or more) by property are thus available for June 2008, when this share was 65%.

While long-term rates declined during 2008 (see section 3.1), rates on new loans for house purchase with fixations of between one and five years increased by more than 50 basis points. The tightening also affected the non-interest conditions, in particular loan collateral (a lower LTV ratio) and higher household income required for a particular loan volume (i.e. a lower LTI ratio).

The negative loop between adverse macroeconomic developments, growth in NPLs and an absolute decline in lending to the economy in order to reduce risky assets, which, however, would result in a further deepening of the economic decline (a feedback effect), is identified as one of the major risks to the global banking system going forward. This might happen particularly if global economic activity declined by more than expected and the risks in banking institutions increased more substantially, to which the banks would respond with a credit crunch. Although the indicators from both the financial and the real sectors are not currently indicating this risk to a significant extent, with the exception of sharp falls in new loans in the euro area (see Chart IV.15), it cannot be ruled out in advance. In order to test the resilience of the Czech banking sector, we have thus compiled a strongly adverse alternative scenario entitled "economic depression".

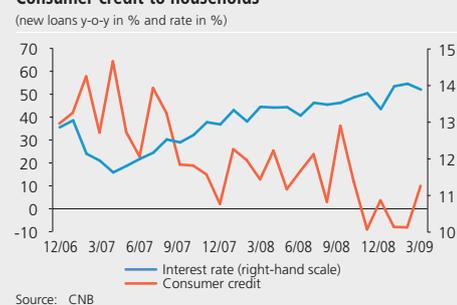
#### Alternative scenario C: "economic depression"

Scenario C assumes a very sharp decline in domestic and external economic activity, partly due to a credit crunch in the real economy. Nevertheless, the decrease in Czech GDP would be greater than that in the euro area, amounting to -10% in 2010 Q1. The ECB would respond to the slower economic performance in the euro area by lowering rates, but the easing of monetary policy by the CNB would be limited by depreciation of the exchange rate. The significant decrease in domestic economic growth and the only slight decline in monetary policy rates would foster a marked rise in default in the non-financial corporation and household sectors, while the pro-export effect of the weaker exchange rate would be offset by a shortage of orders abroad. Overall credit growth would slow radically and turn negative in 2009 H2, while share and property prices would record a significant fall. Negative values of economic growth would exert downward pressure on the net income of the financial sector, which would amount to only 70% of the average for the last two years.

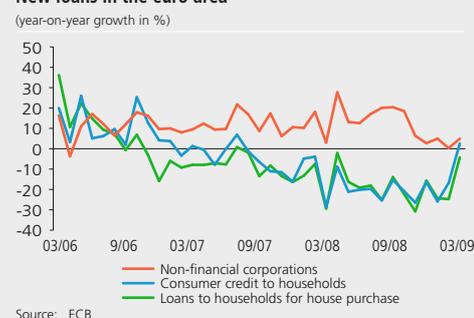
#### Capital adequacy, balance-sheet liquidity and the banking stability index

The Czech banking sector remains sufficiently capitalised. At the end of 2008, its capital adequacy ratio was 12.3% (12.9% in March 2009) and its Tier 1 capital adequacy was 11.8% (12.3% in March 2009; see Chart IV.16). The moderate rise in both indicators in 2008 was due to high profit generation in previous years, capital increases and gradual changeover to Basel II, which allowed capital requirements to be lowered relative to banks' credit risk thanks to more accurate risk assessment. The global financial community currently focuses mainly on the Tier 1 capital adequacy ratio, with a level of around 10% being regarded as a safe threshold. The Czech banking sector meets this requirement without any problems.

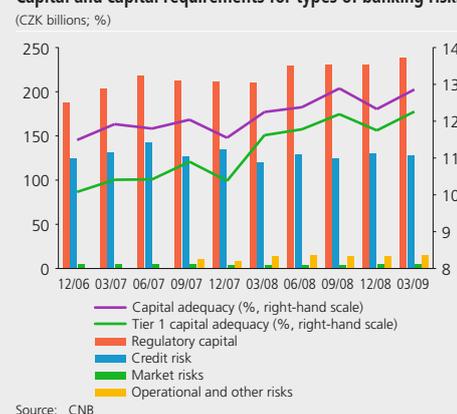
**CHART IV.14**  
Consumer credit to households



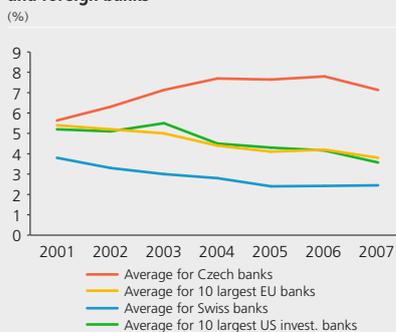
**CHART IV.15**  
New loans in the euro area



**CHART IV.16**  
Capital and capital requirements for types of banking risks



**CHART IV.17**  
Capital ratios (capital/total assets) of Czech and foreign banks



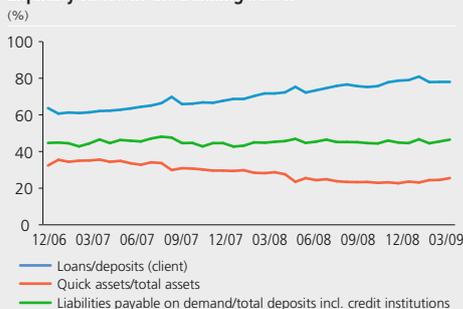
Source: BankScope, CNB calculation

**CHART IV.18**  
Capital ratios of major foreign banks



Source: Swiss National Bank, BankScope

**CHART IV.19**  
Liquidity ratios in the banking sector



Source: CNB

**CHART IV.20**  
Banking stability index



Source: CNB, CNB calculation

Especially in the case of small economies with rapidly growing financial sectors, it may be useful to introduce an additional regulatory threshold for the ratio of capital to (non-risk-weighted) bank assets, called the capital ratio.<sup>67</sup> The risk stemming from an excessively large financial sector whose assets exceed the country's GDP several times is illustrated, for example, by Iceland's experience.<sup>68</sup>

By comparison with foreign banks, Czech banks seem very conservative in this respect (see Chart IV.17). The average capital ratio for the largest Czech banks was 6.8% in 2007,<sup>69</sup> which is considerably higher than that for French, Belgian or Swiss banks.<sup>70</sup> While the capital ratios of foreign banks have fallen significantly since 2003, the ratio for Czech banks rose until 2006 and still exceeded 7% even after a moderate decline in 2007 (see Chart IV.18). Although this concept runs somewhat contrary to the trend of estimating risk and capital using sophisticated models that has prevailed over the last decade, it has some relevance as an additional criterion for the assessment of bank capitalisation.

The general liquidity situation in the banking sector changed little in 2008 and 2009 Q1, which means that Czech banks remain very liquid (see Chart IV.19). In March 2009, the ratio of quick assets to total assets was 25%, a level that can be deemed acceptable. The same is true of the ratio of loans to primary deposits of around 80%, which rose by 5 percentage points without having a significant effect on bank liquidity and bank business stability.

The data on banking sector soundness used to construct the banking sector stability index indicate a similar degree of stability in the Czech banking sector in 2009 Q1 as at the end of 2007 (see Chart IV.20).<sup>71</sup> A moderate decline in profitability, a rise in non-performing loans and slightly worse indicators of interest rate, liquidity and foreign exchange risk are offset by higher capital adequacy.

<sup>67</sup> Sometimes also called capitalisation. Its inverse (i.e. the ratio of total assets to capital, or assets expressed as a multiple of capital) is called the leverage ratio.

<sup>68</sup> Some international institutions (OECD, Financial Stability Forum) are discussing the capital ratio as a complementary instrument to strengthen banks' capital adequacy and dampen the pro-cyclical effects of financial intermediation in addition to stricter existing risk-weighted capital requirements. Despite its drawbacks – above all a failure to account for risk exposures and therefore an inability to reflect structural differences in banks' business models – the capital ratio can be used as a simple and transparent, albeit rough, indicator of a bank's capital adequacy.

<sup>69</sup> The analysis was intentionally performed on data for 2007 before banks' capital was increased under the anti-crisis measures. The capital ratio for the Czech banking sector excluding foreign bank branches averaged 8.3% in 2008.

<sup>70</sup> The Swiss banking sector is undercapitalised judging by the capital ratio despite considerably exceeding the Basel II regulatory requirement. In 2009, therefore, the Swiss National Bank complemented regulation under Basel II by introducing obligatory monitoring of this indicator (at least 3% at group level) in response to the sector's problems.

<sup>71</sup> The banking stability index is an aggregate indicator of the soundness of the banking sector. It is constructed as a weighted average of indicators of capital adequacy, profitability, asset quality, balance-sheet liquidity, foreign exchange risk and interest rate risk. The methodology underlying the index is described in detail in Geršl, A., Heřmánek, J. (2007): Financial Stability Indicators: Advantages and Disadvantages of Their Use in the Assessment of Financial System Stability. CNB, Financial Stability Report 2006, pp. 69–79.

### Off-balance-sheet exposures of the banking sector

Since 2004, the higher rate of growth of off-balance-sheet items in relation to the domestic banking sector's balance sheet has been associated with growth in currency and interest rate derivatives and a rise in other off-balance-sheet items (see Chart IV.21). Derivatives, which account for the bulk of off-balance-sheet items (90% of off-balance-sheet assets and 75% of off-balance-sheet liabilities at the end of 2008) grew as the largest exporters gradually hedged their operations. Medium-sized and some small exporters followed suit in 2007 and 2008 in an effort to reduce the risk stemming from exchange rate volatility. A proportion of the derivatives contracts are due to interbank derivatives operations, which are used by banks primarily to manage foreign exchange and interest rate risks; another group of derivatives reflects counterdirectional hedging by domestic banks and closing out of their positions vis-à-vis foreign (parent) banks. In addition to derivatives, custody services<sup>72</sup> (with a share of around 13% in 2008) and pledges accepted (the remaining 12%) were also dynamically rising off-balance-sheet liability items.

The difference between the positive and negative fair values of derivatives has been positive over the last three years (see Chart IV.22). This indicates that banks are generating profit on derivatives operations regardless of the evolution of the underlying asset, e.g. the exchange rate in the case of hedging by exporters (see Box 2 *Exporters, exchange rate volatility and hedging* in section 2.2). At the same time, these developments confirm that banks usually fully close out their derivatives operations and hedge them with their parent bank or another foreign bank.

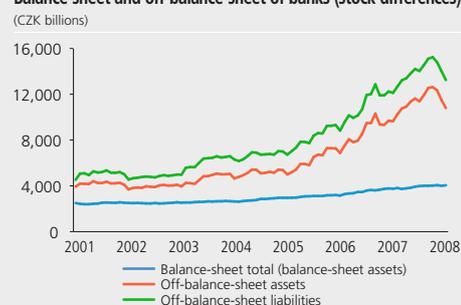
### Building societies

Building societies are a relatively important part of the Czech banking sector, but their business model is limited to activities within the state-supported building savings system pursuant to a special law. The guaranteed returns on building savings foster a stable deposit base (roughly 20% of all deposits in the banking sector), enabling building societies to use funds not used for housing loans to supply liquidity on the interbank market.

The development of the building savings system depends largely on the parameters of state support, which amounted to roughly CZK 14.2 billion in 2008 and is expected to decline gradually owing to a falling number of accounts and a changeover to terms and conditions involving lower state support (see Table IV.1).<sup>73</sup>

CHART IV.21

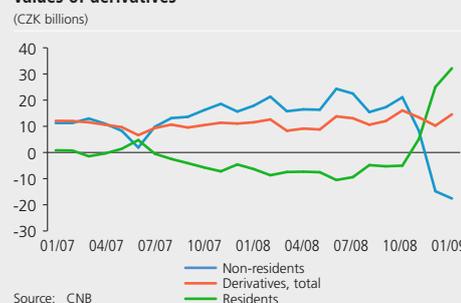
#### Balance-sheet and off-balance-sheet of banks (stock differences)



Source: CNB

CHART IV.22

#### Difference between positive and negative fair values of derivatives



Source: CNB

TABLE IV.1

#### Overview of building savings system

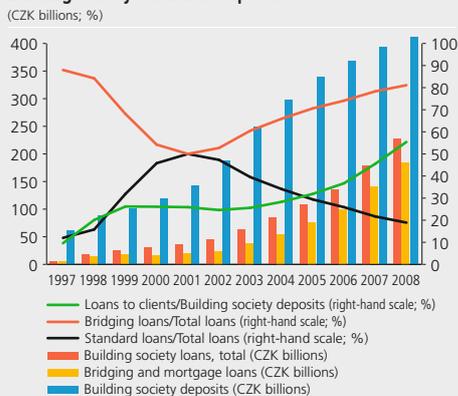
Situation as of 31 December 2008	No. of contracts thous.	Saved amount CZK bn	Av. interest rate on deposits % p.a.	Av. target amount CZK thous.
a) Old contracts without prolongation (until 31 Dec. 2003)	1,917	205	2.50	222
of which old contracts without state support entitlement	222	25	x	x
b) Prolonged contracts with entitlement of up to CZK 4,500	927	125	2.17	390
c) New contracts (since 1 Jan. 2004) with entitlement of up to CZK 3,000	2,207	66	1.92	279
of which new contracts without state support entitlement	68	2	x	x
Contracts total	4,760	369	2.30	278
- with state support entitlement				
- without state support entitlement	995	27	x	x

Source: CNB

<sup>72</sup> Safekeeping and administration of securities for clients – see the Glossary.

<sup>73</sup> The accumulated state support over the entire existence of building savings schemes (since 1994) has reached CZK 136 billion.

**CHART IV.23**  
Building society loans and deposits



Building society loans represent almost 40% of all housing loans. At 27%, they grew more rapidly in 2008 than loans provided by the banking sector as a whole (20%). The growth in building society loans was due mostly to bridging loans, which to a certain extent are an alternative to bank mortgage loans. Their share in total building society loans was 80% at the end of 2008 (see Chart IV.23). Housing loans provided by building societies are characterised by very conservative LTV ratios, which averaged roughly 35% at the end of 2008.

#### 4.1.2 Non-banking financial institutions

##### Insurance companies

The economic and asset market developments were also reflected in the insurance companies sector. The growth rate of premiums written moderated from 8.9% in 2007 to 5.2% in 2008, owing chiefly to a decline in the growth rate of life insurance from almost 15% in 2007 to around 5% in 2008 (see Chart IV.24). By contrast, investment life insurance recorded buoyant growth in premiums written (17.4%), unlike in the euro area, where this segment experienced lower demand as a result of the adverse financial market developments.<sup>74</sup> The high growth in investment life insurance in the Czech Republic was probably influenced by the fact that the financial market crisis in Central Europe and the resulting impact on investment life insurance returns did not fully emerge until the end of 2008.

The insurance sector recorded higher claim settlement costs in 2008, especially in the life insurance segment, which saw a rise of almost 22% (see Chart IV.25). This is related to a higher number of terminated and settled contracts. Some of these terminated contracts might indicate a gradual decrease in demand for investment life insurance, including a higher degree of cancellation of existing contracts, amid expectations of an economic downturn and weaker investment returns.

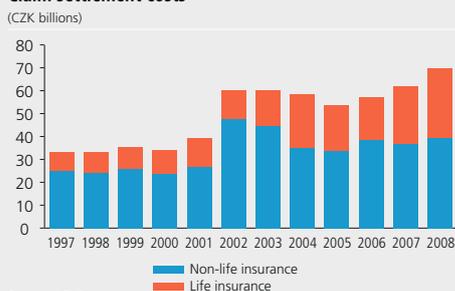
Return on equity decreased to 14% (from 21.7% in 2007) and average return on assets fell to 2.7% (from 3.7% in 2007). The lower profitability compared to 2007 can be attributed to asset revaluation losses. Insurance companies invest their technical provisions set aside for future claim settlements primarily in government bonds and bonds issued by banks and international institutions (53% of technical provisions at the end of 2008). Other investments were made in corporate and municipal bonds, mortgage bonds, mutual fund units, property and marketable shares (see Chart IV.26). The adverse developments on the financial markets affected virtually all types of investment, including many of the bonds in which insurance companies invest.

Insurance companies can be regarded as well capitalised, since in 2007 they were again comfortably compliant with the solvency criteria, i.e. they had internal funds greater than or equal to the required solvency ratio. The aggregate available margin was 2.7 times the required solvency margin on the life insurance market and 3.3 times that on the non-life insurance market.<sup>75</sup>

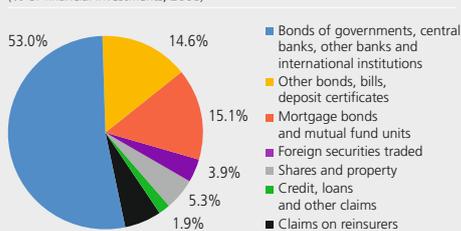
**CHART IV.24**  
Life and non-life insurance (premiums written)



**CHART IV.25**  
Claim settlement costs



**CHART IV.26**  
Financial investment in assets



<sup>74</sup> See the ECB Financial Stability Review, June 2009.

<sup>75</sup> Data for 2008 will become available in July 2009.

Under the quantitative impact study (QIS4), fourteen domestic insurance companies underwent calculation of the new Solvency II capital requirements last year. The insurance companies set their capital requirements according to the rules under preparation, namely the solvency capital requirement (SCR) and the minimum capital requirement (MCR). The overall results for the selected insurance companies show that their average solvency ratio fell from 335% to 235% owing to risks stemming from technical provision placement, insurance risks and other (e.g. operational) risks. As in the case of stress testing (see section 4.2), it was found that the capital requirements for market risks (interest rate and equity risks) and insurance cancellation risk were most important for life insurance, while the capital requirements for non-life insurance risk and equity risk were predominant in non-life insurance.<sup>76</sup>

Contract acquisition costs, which have a negative effect on insurance companies' profitability and clients' returns especially in life (investment or capital) insurance, continued to rise in 2008 (see Table IV.2).

The decline in economic activity in 2009 will affect the insurance sector to some extent. It will be reflected mainly in a fall in demand for some types of insurance (industrial insurance, vehicle accident insurance, investment life insurance) and therefore in slower growth in premiums written. This will probably result in lower profitability. As regards life insurance, the cancellations ratio may rise owing to a preference for liquidity on the part of some households. By contrast, there is increasing demand for debt insurance. However, insurance companies are acting very cautiously in this area because of the uncertainty regarding the degree of insolvency in the corporate sector. Losses can also be expected to arise due to the rise in government bond yields in the first few months of 2009 (see section 3.1) and therefore a decline in the prices of bond holdings (see section 4.2), notwithstanding the sensitivity of liabilities to interest rates, which partly dampens the impacts of interest rate changes.

### Pension funds

In 2008 the pension fund sector recorded a partial decline in the rate of growth of its total assets. This was due not only to a slower inflow of new contributions credited to planholders, but also to a decrease total assets resulting from a fall in the market value of equity securities in particular. An outflow of funds also played a role, as payments of lump-sum settlement and surrender value in particular rose by 37% year on year (see Chart IV.27). The higher number of clients opting to withdraw funds may be related to a preference for liquidity among households affected by the economic downturn as well as the relatively low returns achieved by pension funds, as in the investment life insurance segment.

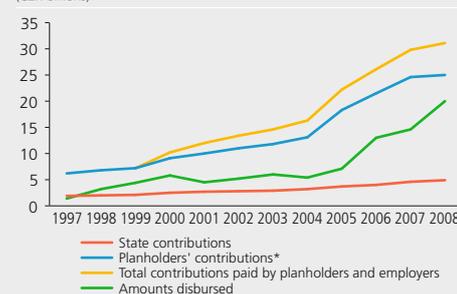
**TABLE IV.2**  
Insurance contract costs paid to intermediaries (%)

	2006	2007	2008
1. Contract costs for payment in given year			
Year-on-year growth	8.4	17.9	9.0
Ratio to gross premiums on new contracts	51.9	54.5	55.9
Ratio to profit after taxation	121.2	159.8	233.7
2. Contract acquisition costs as prepayments			
Year-on-year growth	22.9	43.6	25.0
Ratio to profit after taxation	26.9	43.1	72.4
Ratio of costs (1.+2.) to annual gross premiums	17.2	19.4	20.7
Ratio of costs (1.+2.) to total costs	8.0	8.5	8.2
Coverage of total costs by annual premiums (in years)	2.2	2.3	2.5

Source: CNB

**CHART IV.27**  
Pension fund sources and amounts disbursed in given year

(CZK billions)



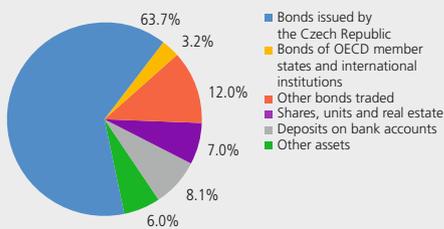
Source: CNB

Note: \* Since 2005, planholders' contributions also include advances

<sup>76</sup> See CEIOPS' Report on its Fourth Quantitative Impact Study (QIS3) for Solvency II, CEIOPS, November 2008. The results of the study for the Czech insurance market are described in Justová, K. (2008): Studie QIS počtvrté: vyhodnocení výsledků. Pojistný obzor 4/2008.

**CHART IV.28**  
Structure of pension fund investments

(%; 2008)



Source: CNB

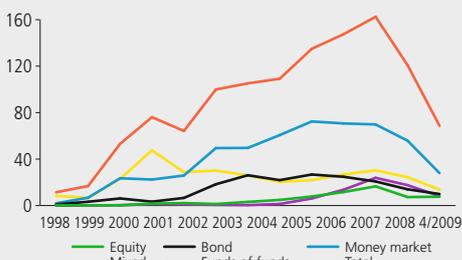
**TABLE IV.3**  
Pension scheme contract costs paid to intermediaries and effect of asset revaluation

	2006	2007	2008
1. Contract costs for payment in given year			
Year-on-year growth	20.2	30.2	28.6
Ratio to profit (loss) from financial operations	36.0	61.6	-38.5
Ratio to profit after taxation	17.4	21.2	167.2
2. Contract acquisition costs as prepayments			
Year-on-year growth	29.5	20.2	17.0
Ratio to profit after taxation	69.6	78.5	562.2
Ratio of costs (1.+2.) to annual state support	88.9	114.4	89.1
Valuation differences			
Ratio to pension funds' capital	13.3	-112.7	-249.9
Ratio to annual state support	29.9	-96.4	-166.3

Source: CNB

**CHART IV.29**  
Equity of domestic open-ended mutual funds

(CZK billions)



Source: AKAT CR

**CHART IV.30**  
Net sales of units of domestic open-ended mutual funds

(CZK billions)



Source: AKAT CR  
Note: \* From 1 January 2009 to 15 May 2009.

At the end of 2008, a total of CZK 186.7 billion in contributions was registered on the accounts of private pension planholders, representing roughly 5% of GDP. This is relatively low by international comparison. In the euro area, pension funds account for 11% of GDP on average, but it must be taken into consideration that systems differ considerably across countries with regard to support and volume.

Under the limits set by law, pension funds invest the funds they raise from planholders in relatively safe assets. In 2008, 87% of assets were invested in bonds issued by general government, bank deposits and other bonds (see Chart IV.28). Investments in shares and units, which can be more volatile than bonds, attracted 6.2% of funds. However, investments in shares and mutual fund units were unfavourable in terms of profit generation. In 2008, funds lost tens of per cent on financial investments in shares and units.<sup>77</sup> Further losses resulted from unhedged or only partially hedged currency exposures. Losses (valuation changes) in the sum of the revalued assets, liabilities and hedging derivatives of pension funds increased from CZK 4.4 billion in 2007 to CZK 8.2 billion in 2008.

In 2008, shareholders increased the capital of pension funds by CZK 6.5 billion. This improved the conditions for fund stability and compensation of asset revaluation losses. Nevertheless, it is expected that shareholders will increase the capital further in 2009. The adverse developments on asset markets – especially bond markets – in 2009 Q1 increased the unrealised losses of pension funds by roughly another CZK 6 billion. Although these losses may be reversed by a decline in long-term bond yields after the high risk aversion decreases, pension funds are required to have sufficient capital to cover asset market volatility so that they do not encounter a negative equity situation (see section 4.2).

In addition to asset revaluation losses, rising contract acquisition costs on the part of intermediaries, which reach about 90% of state support payments every year, could also have a negative impact on the system and its profit generation (see Table IV.3).

#### Investment companies and mutual funds

As a result of the adverse financial market developments, the position of domestic mutual funds deteriorated significantly compared to the previous year (see Chart IV.29). The equity of domestic open-ended mutual funds had totalled almost CZK 162 billion at the end of 2007, but by the end of April 2009 it had fallen by CZK 93 billion to CZK 69 billion. Large decreases were recorded not only by equity and bond funds, but also by relatively safe funds such as money market funds.

The decrease in the equity of funds was driven by a fall in market prices of assets and an outflow of money and a transfer of investments to safer and more liquid instruments, such as bank deposits (see section 4.1). In 2008, the total value of units redeemed by mutual funds exceeded the overall value of units sold by CZK 29 billion, which represents a major turnaround compared to 2007 (see Chart IV.30).

<sup>77</sup> The fair value of their share holdings was roughly 50% below the acquisition price at the end of 2008; in the case of mutual funds the decline was more than 30%.

The highest redemptions were recorded for money market funds (almost CZK 20 billion). Net sales persisted in the first few months of 2009 Q1, reaching almost CZK 10 billion.<sup>78</sup>

Households are the main investors in mutual funds; their share in all units held by residents exceeded 60% in 2008. However, the decline in returns on mutual fund units does not represent any major risk, as this instrument accounts for only 5% of the total financial assets of households.

### Non-bank investment firms

Like other financial institutions, non-bank investment firms have been hit by the financial crisis.<sup>79</sup> Together with a rise in market risk, the increased volatility on the asset market and the rapid decline in asset prices (see section 3.1) led to a fall in demand for investment intermediation among smaller clients, who trade chiefly using credit from investment firms and account for nearly 40% of all clients (see Chart IV.31).

Loans provided to non-financial clients for securities purchases fell by almost 60% compared to 2007. This decline was driven by the drop in stock prices, weaker demand for purchasing securities on credit and a lower supply of this type of trade by investment firms. This was because of an overall decline in loans to investment firms (mainly from banks) connected with increased balance-sheet liquidity risk.

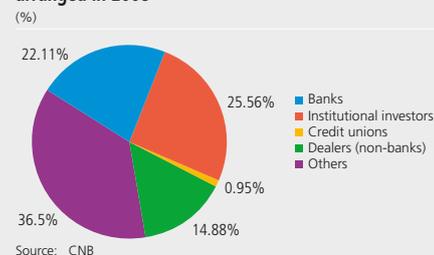
Total client assets managed exceeded CZK 10 billion (less than 1% of GDP) in 2008. This financial sector does not present any significant risk to the financial system as a whole. In the case of households, which use investment firms for individual investment in securities, the ratio of bonds and marketable shares to total financial assets is only 2%, while the same indicator for the euro area is around 10%.

### Non-bank financial corporations engaged in lending

The uncertainty regarding economic activity in the Czech Republic also affected non-bank financial corporations engaged in lending. The volume of assets financed through leasing companies, other lending companies and factoring and forfaiting companies had risen by around 20% in the previous period, but the situation deteriorated significantly last year (see Table IV.4).

CZK 242 billion was lent in leasing last year, an annual increase of only 5.6%, which is very low compared to the growth in total bank loans (16.4%), which are a competing source of funding. In addition to weaker economic activity,

**CHART IV.31**  
Structure of clients by volume of transactions arranged in 2008 (%)



**TABLE IV.4**  
Activities of leasing companies, other lending companies and factoring and forfaiting companies (CZK billions; year-on-year change in %)

	2006	2007	2008	y-o-y change 07/08
<b>Leasing companies</b>				
Loans, total	192.0	229.6	242.4	5.6
Loans to non-financial corporations	131.2	146.9	168.2	14.5
Loans to households	57.3	78.8	69.6	-11.7
<b>Other lending companies</b>				
Loans, total	63.9	78.6	88.9	13.1
Loans to non-financial corporations	3.3	4.7	5.7	21.3
Loans to households	57.5	70.2	81.7	16.4
<b>Factoring and forfaiting companies</b>				
Loans to non-financial corporations	16.9	22.0	19.1	-13.2

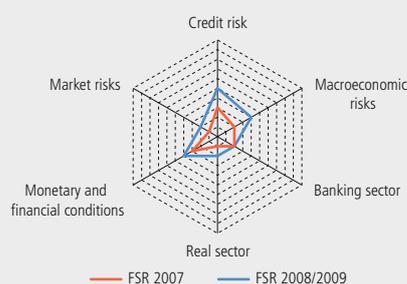
Source: CNB

<sup>78</sup> A similar trend, i.e. a decline in the market prices of individual mutual fund units and an outflow of investments from mutual funds, was also recorded by foreign open-ended mutual funds, in which Czech residents also invest.

<sup>79</sup> Nine non-bank investment firms are members of the Prague Stock Exchange and their trading volume in 2008 was CZK 1,224 billion in shares and CZK 1 billion in bonds. By comparison with 2007, this represents a decline of 16% in share trading and 65% in bond trading.

the decline in demand for lease financing on the part of households was due to changes in the taxation of financial leasing last year, including the accelerated signing of financial leasing contracts in 2007 before these changes took effect. This decline notwithstanding, the share of leasing to GDP is around 6.5%, which is not significantly different from the European average (for the EU-27, this share was around 5.7% in 2007).<sup>80</sup>

CHART IV.1 (Box)  
Financial stability map



Source: CNB calculation  
Note: Points further from the centre of the chart signifies more risk, tighter conditions or more vulnerable sector.

### Box 7: Financial stability map

A financial stability map is one way of aggregating information on the financial stability of the Czech economy.<sup>81</sup> It shows a combination of the key risks to financial stability, the monetary and financial conditions and the situation (resilience) of the financial and real sectors.

The financial stability map for the Czech Republic contains six composite indicators, of which three capture risks (macroeconomic, credit and market risks), one captures the monetary and financial conditions and the remaining two capture the vulnerability of the real and financial sectors. The indicators are normalised on a scale from 1 to 10, with higher values representing higher risk, tighter conditions and greater vulnerability (lower resilience).

The composite indicators were constructed as follows. The indicator of macroeconomic risks is the average of the GDP growth forecasts for next year in the euro area and the Czech Republic and the risk premia (CDS spreads) for Central European countries. The credit risk indicator is composed using the current and expected rates of loan delinquency for households and corporations, while the market risk indicator is based on a volatility index, an index of market liquidity for the Czech financial markets and the expected volatility of short-term interest rates and the exchange rate.

The indicator of the financial sector's vulnerability uses the banking stability index and the results of standardised stress tests of banks, while the indicator of the real sector's vulnerability contains a number of indicators concerning the debt of individual real sectors and the economy as a whole, as well as an indicator of the creditworthiness of the corporate sector. The monetary and financial conditions are calculated as the average of the risk premium in the Czech Republic, bank interest rates for the real sector, current and expected growth in new loans to the real sector and expected exchange rate movements at the one-year horizon. The map is constructed as of the first quarter of the given year and contains the indicators of past developments available at that time and also some forward-looking indicators capturing the risks for the period ahead.

<sup>80</sup> For comparison, this share is 11% in Hungary and around 3% in Poland, and in Germany it is about the same as in the Czech Republic (roughly 6%).

<sup>81</sup> For a discussion of the efforts to compile aggregate financial stability indicators and construct an experimental banking stability indicator for the Czech Republic see Geršl, A., Heřmánek, J.: Financial Stability Indicators: Advantages and Disadvantages of Their Use in the Assessment of Financial System Stability. Financial Stability Report 2006, CNB.

The financial stability map for the Czech Republic indicates that the risks are rising significantly compared to the previous year, especially the macroeconomic and credit risks (see Chart IV.1 Box). The resilience of the real sector is falling slightly owing to the economic recession, and the monetary and financial conditions are generally tighter. This is the case despite the easing of monetary policy and the depreciation of the exchange rate, mainly as a result of increases in risk premia and client interest rates and a decline in the rates of growth of lending to the real sector. However, the banking sector remains resilient to a similar extent as in the previous year. This creates good conditions for absorption of the risks stemming from the expected adverse macroeconomic developments.

#### 4.2 ASSESSMENT OF THE FINANCIAL SECTOR'S RESILIENCE

According to stress tests using alternative macroeconomic scenarios, the financial sector is resilient to market, credit and some other risks. However, some financial institutions would suffer losses which might require capital injections if the alternative scenarios materialised. The longer the horizon of the negative economic situation, the higher the losses and the lower the level of capital adequacy that can be expected.

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. In the stress testing, we analyse the effects of alternative model-consistent scenarios. This section also presents the results of a new stress test of the banking sector's liquidity.

Three alternative scenarios were presented in the 2007 Financial Stability Report (safe haven, property market crisis and loss of confidence). Subsequent economic developments showed that the risks captured in two of these three scenarios materialised. Until September 2008, the Czech economy evolved broadly in line with the "safe haven" scenario, characterised by a very strong koruna and a gradual slowdown in GDP growth due to a greater-than-expected decline in external demand. This scenario was not expected to have major effects on the soundness of the financial sector, and reality confirmed this. 2008 Q3 saw a turnaround and the outcomes were closer to the "loss of confidence" scenario, with a significant cooling of economic activity and gradual depreciation of the koruna. In the stress test, this scenario generated higher risks to the financial sector, related largely to expectations of large interest rate increases in response to the inflationary pressures stemming from the weaker koruna. In reality, however, these risks were dampened because the CNB cut its monetary policy rates as the inflationary pressures subsided and market rates also declined as a consequence. At the same time, bank capital was strengthened in 2008, so capital adequacy increased compared to the end of 2007.

CHART IV.32

Alternative scenarios: real GDP growth path

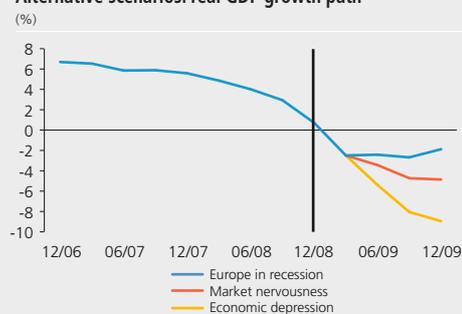


CHART IV.33

Alternative scenarios: 3M PRIBOR path

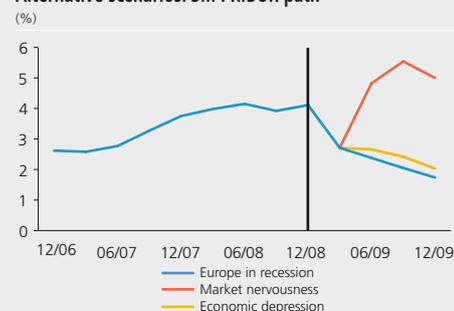
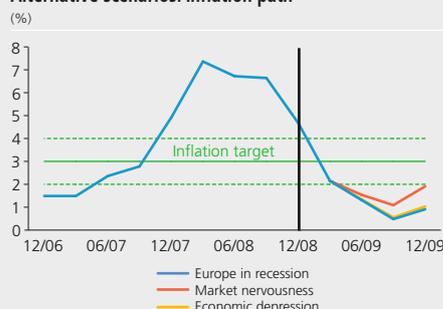


CHART IV.34

Alternative scenarios: exchange rate path



**CHART IV.35**  
Alternative scenarios: inflation path



**TABLE IV.5**  
Scenario type and shock size in bank stress test

Scenario type	Europe in recession	Market nervousness	Economic depression
Change in CZK interest rates (p.p.)	-1.86	0.32	-1.65
Change in EUR interest rates (p.p.)	-2.92	-3.82	-3.63
Change in CZK/EUR exchange rate (- appreciation, %)	4.86	13.58	9.57
Loan default rate of households (%)	5.43	6.35	7.85
Loan default rate of corporations (%)	13.04	13.48	16.98
Growth in loans to households (%)	0.76	-0.68	-4.44
Growth in loans to corporations (%)	-5.38	-6.74	-10.29
Net income compared to 2007-2008 average (%)	90	80	70

Source: CNB

Note: Changes in parameters represent the difference between 2008 Q4 and the average for 2009.

As in the 2007 Financial Stability Report, three alternative adverse scenarios were presented in the preceding text, this time entitled “Europe in recession” (scenario A), “market nervousness” (scenario B) and “economic depression” (scenario C).<sup>82</sup> The alternative scenarios respond to risks identified in the domestic real and financial sectors and abroad and represent the potential unfavourable evolution of the current global economic recession.<sup>83</sup>

All the scenarios were defined primarily using key economic variables, in particular GDP (see Chart IV.32), short-term interest rates (see Chart IV.33), the exchange rate (see Chart IV.34) and inflation (see Chart IV.35), and were constructed in a model-consistent way using the CNB’s prediction model.<sup>84</sup> The average predictions for the macroeconomic variables in 2009 are entered in the stress tests which have a one-year shock impact horizon. The other parameters entering the stress tests were derived using the values of the aforementioned macroeconomic variables with the aid of sub-models (see Table IV.5). In the case of the stress tests for insurance companies and pension funds, some shocks (e.g. the specific shock in the insurance sector) were specified using expert estimates based on historical averages or foreign experience.<sup>85</sup> We also assume that all financial institutions will generate positive net income (for banks especially net interest income and net fee income) and will use it as first line of defence against the shocks. Net income is set separately for each scenario as a percentage of the average for the previous two years, depending on the evolution of economic activity (see Table IV.5).

Scenario B (“market nervousness”) can be classified as the worst, with an aggregated impact on all three tested financial sector segments (banks, insurance companies and pension funds) of almost CZK 110 billion. Underlying this impact is a combination of significant losses due to the credit risk of banks and losses from a decline in prices of assets (shares and bonds) in other financial institutions. The impacts of the other scenarios are smaller (CZK 47 billion for scenario A and CZK 86 billion for scenario C), as they assume a decline in interest rates and therefore a rise in prices of bond holdings, which reduces the other losses.

<sup>82</sup> The “Europe in recession” scenario is the CNB’s official May 2009 macroeconomic forecast as described in detail in Inflation Report II/2009.

<sup>83</sup> Comparison with the results in the 2007 Financial Stability Report is not possible, as in the meantime substantial changes have been made to the models used and to the tests themselves. These changes were made as a consequence of backtesting of the models and tests on real data from previous years, which showed that the stress tests overestimated the risks. Although overestimation of risks is a more acceptable form of deviation than underestimation from the point of view of financial stability, the models used and their assumptions had to be put on a more realistic footing. In particular, the models for loan growth and credit risk and the assumptions about the outflow of non-performing loans were adjusted and more realistic assumptions about the degree and allocation of the banking sector’s net income were incorporated.

<sup>84</sup> This is the CNB’s official “g3” macroeconomic prediction model, whose main features were presented in Inflation Report II/2009.

<sup>85</sup> The methodology of the stress tests for banks, insurance companies and pension funds was described in detail in previous Financial Stability Reports.

### Stress test results for the banking sector

The banking sector as a whole would withstand the shocks in all three alternative scenarios, although there are banks that would not be compliant with the regulatory capital adequacy threshold in each scenario. The total effects of the shocks in scenario A (“Europe in recession”) would be around CZK 60 billion (roughly 25% of the banks’ capital, or 125% of the average annual profit in the last five years). These losses are due to the relatively large credit shock, but the decline in interest rates has a favourable impact. However, we assume that banks will generate net income (especially net interest income and net fee income) of 90% of the 2007–2008 average, which they will use to cover their losses. A few smaller banks would fail to comply with the capital adequacy requirement under this scenario, requiring a capital injection of 0.2% of GDP (around CZK 8 billion). However, the banking sector as a whole would withstand the shocks with a resultant capital adequacy ratio of 11.3% despite an increase in the NPL ratio from 3.5% at the end of 2008 to almost 8% at the end of 2009 (see Chart IV.36). As scenario A represents the most probable outcome, these losses can be interpreted as the upper estimate of expected losses in 2009, as the stress tests usually overestimate the risks.

In the case of scenario B (“market nervousness”), which simulates a combination of a decline in economic activity and a sharper depreciation of the koruna, therefore being rather similar to last year’s “loss of confidence” scenario, the overall impact of the shocks would be almost CZK 100 billion (roughly 45% of the banks’ capital, or 210% of the average annual profit in the last five years). A moderate average increase in interest rates occurs in this scenario, but its impact is very small. We assume that banks would generate net income of only 80% of the average for the previous two years. In this scenario, the number of banks that would fail to comply with the capital adequacy requirement would be twice the number under the “Europe in recession” scenario and would include some more important banks. Capital injections would require around 0.4% of GDP (CZK 15 billion). The banking sector would withstand this scenario, too, with an overall post-test capital adequacy ratio of 10.0% and an NPL ratio rising to 8.6%.

The total effects of the shocks under scenario C (“economic depression”) would be around CZK 90 billion (roughly 40% of the banks’ capital, or 200% of the average annual profit in the last five years). These effects are due almost exclusively to the credit shock resulting from a decrease in GDP growth to high negative figures, while the slight decline in interest rates and moderate exchange rate depreciation have a positive effect. The lower impact than in scenario B (“market nervousness”) is due mainly to the positive effect of very low interest rates. We assume that banks’ net interest income and net fee income would be only 70% of the average for 2007–2008. A few smaller banks sensitive to credit risk would fail to comply with the capital adequacy requirement under this scenario. Stabilising them would require a capital injection of 0.4% of GDP (around CZK 15 billion). Even in this scenario, however, the banking sector as a whole would withstand the shocks with a resultant capital adequacy ratio of 9.7%, despite a significant rise in the NPL ratio to 11.2% at the end of 2009.

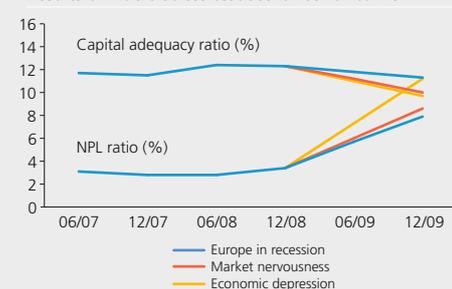
The stress tests results are not very sensitive to the assumptions regarding net income generation. For example, in the worst scenario (“economic depression”) net income would have to fall to just 15% of the average for the previous two years to bring the capital adequacy of the entire sector down to the regulatory

**TABLE IV.6**  
Results of bank stress tests

Scenario type	Europe in recession	Market nervousness	Economic depression
<b>Key macroeconomic variables in 2009</b>			
Real GDP growth (% , y-o-y)	-2.4	-3.9	-6.2
Inflation rate (% , y-o-y)	1.2	1.7	1.3
1Y PRIBOR (%)	2.4	4.6	2.6
CZK/EUR exchange rate	26.6	28.8	27.8
<b>Capital adequacy (CAR)<sup>1)</sup></b>	<b>12.3</b>	<b>12.3</b>	<b>12.3</b>
Overall impact of shocks (p.p. CAR)	-3.2	-5.4	-5.0
Interest rate shock	1.3	0.0	1.2
Exchange rate shock	0.0	0.1	0.1
Credit shock	-4.4	-5.4	-6.2
... households	-1.3	-1.5	-1.8
... non-financial corporations	-3.0	-3.1	-3.9
Interbank contagion	-0.1	-0.1	-0.1
Income allocation <sup>2)</sup>	2.2	3.1	2.4
<b>Post-test CAR</b>	<b>11.3</b>	<b>10.0</b>	<b>9.7</b>
Capital injection (CZK billions) <sup>3)</sup>	8.0	15.7	15.5
Capital injection (% of GDP) <sup>3)</sup>	0.2	0.4	0.4
No. of banks with CAR below 8%	4	8	4
Share of banks with CAR below 8% <sup>4)</sup>	8.2	21.8	5.0
No. of banks with negative capital	0	0	1
Share of banks with negative capital <sup>5)</sup>	0.0	0.0	5.2

- 1) CAR means the capital adequacy ratio defined in accordance with the relevant CNB regulations, in particular the prudential business rules.
- 2) We assume that even given adverse developments banks would generate income that would use to strengthen their capital. We estimated the level of income on the basis of past trends and the parameters of the adverse scenario. When allocating income, each bank tries to attain its initial CAR.
- 3) The capital needed to ensure that each bank has a post-shock CAR of at least 8%.
- 4) The share of banks with a post-shock CAR of 0%–8% (as a percentage of total assets).
- 5) The share of banks with negative post-shock capital (as a percentage of total assets).

**CHART IV.36**  
Results of macro stress test scenarios for banks



minimum of 8%. Such a low level of income is not very probable, as in previous periods of crisis banks have experienced transfers of funds from riskier investments to (low-interest) demand bank deposits, which has boosted their ability to generate sufficient interest and non-interest income.

As regards the results of stress tests for banks, it must be borne in mind that the shock impacts are calculated for the one-year horizon. As credit risk usually materialises gradually and with a lag behind the business cycle, the rates of default and the NPL ratio may continue rising in 2010. This is indicated by the results of new dynamic stress tests performed for the aforementioned alternative scenarios (see Box 8).

CHART IV.2 (Box)

**Capital adequacy ratio path in dynamic stress tests of banks**

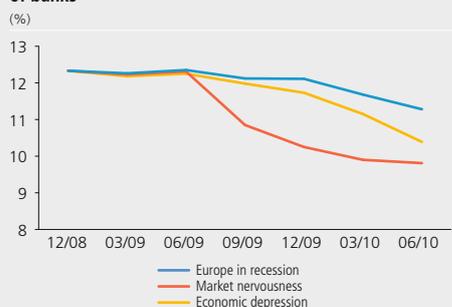
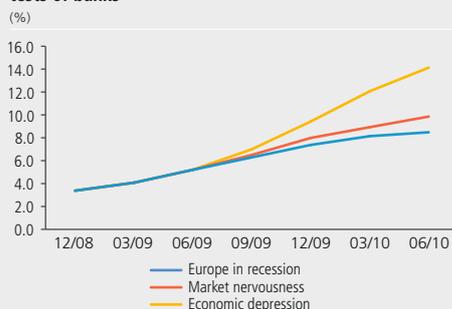


CHART IV.3 (Box)

**Non-performing loan ratio path in dynamic stress tests of banks**



### Box 8: Dynamic stress tests for banks

The current stress test methodology used by the CNB and other national and international institutions to test the resilience of the financial sector is limited as regards its ability to capture the effects of individual shocks over time and their potential interaction with the macroeconomic environment (feedback effect). This can be best illustrated by the difference between the effects of market and credit risks. While the impact of a change in interest rates or other market variables (the exchange rate or stock prices) on the balance sheets of financial institutions is virtually immediate (revaluation of securities), credit risk accumulates over a longer time frame (one to three years) as loans gradually shift into the NPL category. The standard stress tests address this discrepancy with a compromise assuming an impact horizon of one year. However, the global credit crisis and the onset of the economic recession worldwide show that this compromise is imperfect. Market shocks have paralysed financial institutions within a few days, yet NPL losses will accumulate gradually over the course of more than a year.

One of the possible solutions to these disadvantages is to switch to a form of “modelling” of the financial or banking sector. Banks’ balance sheets would be modelled dynamically, for example for each quarter, as they are hit by the individual shocks. This would allow the shock impact horizon to be extended, for example to six to eight quarters. Losses would then accumulate gradually and if any of the key variables (e.g. the capital adequacy ratio) overstepped a pre-defined threshold during the whole cycle, other shocks would be generated (e.g. interbank contagion, outflow of liquidity, etc.). However, choosing the best possible way of modelling banks’ behaviour amid slowly accumulating losses remains a challenge in this approach.

This box presents the first attempt at dynamic stress testing of banks in the Czech Republic, using the alternative scenarios prepared for the standard stress tests. The results show that capital adequacy falls further compared to the standard test as the horizon is extended to six quarters (see Chart IV.2 Box). This is due chiefly to further growth in credit risk, which peaks in the first two quarters of 2010 (see Chart IV.3 Box). The tests, however,

work with the extremely conservative assumption that banks do not respond to the impacts of the shocks. That is why the results are unrealistically pessimistic.

Dynamic tests also allow us to identify the different contributions of the individual shocks over time. This is best seen in the case of scenario B, which assumes losses due to unfavourable interest rate changes in some quarters, but these losses are fully reversed in the following periods and a positive accumulated impact of the interest rate changes prevails in 2010 Q2 (see Chart IV.4 Box). It is these dynamics of the directional changes in the shocks over time that can generate stress situations in the financial sector even over a longer impact horizon and that cannot be captured by the standard stress tests using averages for the entire test period.

The onset of the economic recession has increased the uncertainty regarding growth in the NPL ratio owing to the decline in household income (see section 2.3) and movements in house prices. The combination of a high NPL ratio for housing loans and a decrease in property prices (see section 3.2) could have a significant impact on the banking sector.

In a sensitivity stress test on the housing loan portfolio, we assume that new non-performing housing loans have an LTV ratio of 100%. That is a radical assumption, as the average LTV ratios in individual banks range from 35% to 100%. On the other hand, this assumption is in line with the findings that many mortgage loans were provided with an average LTV of 80–90% over the last two years (see section 4.1). The analysis assumes that an increase in the share of non-performing housing loans would be accompanied by an equal decline in property prices. Problem debtors or banks themselves could cause a more marked decline in property prices by selling larger volumes of collateral on the property market.

The simple test demonstrated the banking sector's resilience to a mortgage loan portfolio shock given the above-mentioned radical assumptions. With regard to provisions created and capital adequacy, banks should withstand the stress of an increase in non-performing mortgage loans of as much as 25% if they could not sell any collateral. If collateral was sold at a property value loss of around 25%, the capital adequacy ratio would fall only slightly (see Chart IV.37).

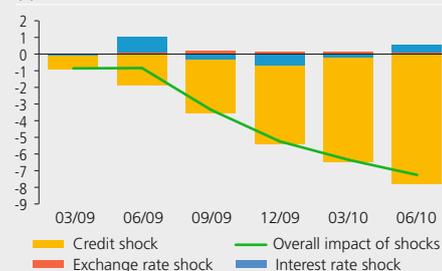
One of the risks that might arise if the highly adverse scenarios B and C materialise is a panic on domestic financial markets. This might happen if some banks fall below the regulatory threshold for capital adequacy. The panic would then be reflected not only in interbank contagion, which is taken into account in the stress tests, but also in bank runs and problems in asset markets. This balance-sheet liquidity risk is tested using an advanced approach in Box 9.

Drawing on the experience of countries that have rescue plans in place for banking sectors hit by severe losses, the CNB and the Ministry of Finance prepared a preventive amendment to the Act on Banks which expands the powers of the CNB as the financial market regulator and supervisor. For example, the amendment simplifies the process of increasing a bank's capital and enables the central bank

CHART IV.4 (Box)

Accumulation of shocks in dynamic stress tests of banks for scenario B "market nervousness"

(p.p. CAR)

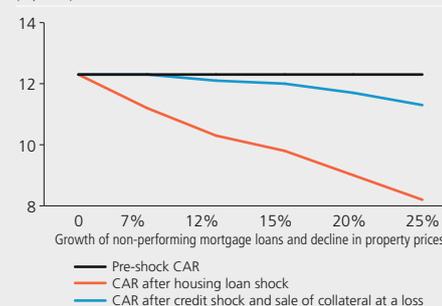


Note: The chart shows the accumulated impact of the shocks not taking into account net income and any capital increases during the test period.

CHART IV.37

Simple test for mortgage loans

(%, 2008)

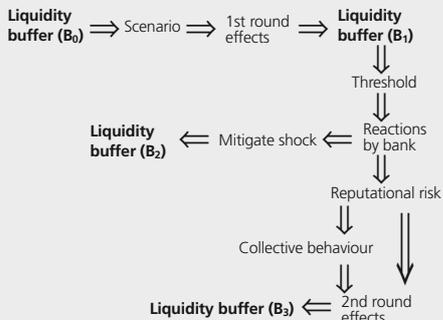


Source: CNB

Note: Scenarios of additional 7–25% of mortgage loans becoming NPLs. Banks or clients would sell collateral at 93–75% of its value.

FIG. IV.1 (Box)

## Flow chart for liquidity stress test



Source: Van den End, J. W. (2008): Liquidity Stress-Tester: A Macro Model for Stress-testing Banks' Liquidity Risk, DNB WP No. 175, May 2008

TABLE IV.1 (Box)

Summary of liquidity stress test results  
(CZK billions)

	Total	Weighted average
Initial buffer ( $B_0$ )	3,902	388.6
Buffer after 1st round ( $B_1$ )	2,382	229.5
No. of banks reacting	14	14
Buffer after banks react ( $B_2$ )	2,998	302.7
Buffer after 2nd round ( $B_3$ )	2,041	202.7

Source: CNB  
Note: Banks' total assets used as weight for average.

CHART IV.5 (Box)

## Change in banks' liquidity buffer



Source: CNB  
Note:  $B$  = size of buffer,  $B_0$  = before shock,  $B_1$  = after 1st round,  $B_2$  = after banks react to 1st round,  $B_3$  = after 2nd round.

to respond more flexibly to banks' problems using numerous new instruments (e.g. the rapid transfer of a troubled bank to a sound institution or a special-purpose public bank). The CNB is thus preparing preventively for the relatively unlikely but possible situation that some banks might experience problems owing an accumulation of losses stemming from credit risk or due to panic and problems with balance-sheet liquidity.

## Box 9: Stress testing of banks' balance-sheet liquidity

To test banks' liquidity risk, we used a macro stress testing model based on a model of the Dutch central bank adapted to the Czech situation.<sup>86</sup> The model's value added consists in taking into account the link between balance-sheet and market liquidity, which is generated by banks' response to a liquidity shock. The liquidity risk that is the subject of the test stems not only from balance-sheet liquidity risk (the bank's ability to raise funds), but also from a strong link between the bank's balance sheet and market liquidity (the bank's ability to sell assets at a specified price). Taking this link into account significantly increased the sensitivity of the tested banks to macroeconomic and financial shocks and made the balance-sheet stress test more realistic compared to the very simple model used last year.

The model uses data on liquid assets and liabilities in the balance sheets of all banks active in the Czech Republic at the end of 2008. In this model, all liquid bank balance sheet items (both assets and liabilities) are exposed to shocks at the same time. This leads to a decrease in the market value of financial asset holdings and to withdrawals of deposits, which do not return to the banking system but are held as cash.<sup>87</sup>

The model assumes three subsequent steps that are logically interlinked (see Figure IV.1 Box). First, we assume that a sound banking system (with a predefined liquidity buffer  $B_0$ ) is hit by a liquidity shock (bank runs and falling prices of securities holdings). This shock will have a negative effect on the balance-sheet liquidity of banks, which will respond if their liquidity buffer falls below a threshold value.<sup>88</sup> On the one hand, the banks' response will reduce the impact of the shock on the balance-sheet liquidity of individual banks, but on the other hand it will increase the reputational risk of each responding bank and the systemic risk through the simultaneous response of the banks on the financial markets.

<sup>86</sup> For a detailed technical description of the model see Van den End, J. W. (2008): Liquidity Stress-Tester: A Macro Model for Stress-testing Banks' Liquidity Risk, DNB WP No. 175, May 2008.

<sup>87</sup> The magnitude of the shocks was derived using Monte Carlo simulation based on data on the potential variability of individual liquid items.

<sup>88</sup> A bank will respond if its liquidity buffer falls by more than 40%. This threshold is set relatively low, ensuring that a sufficient number of banks will respond to the worsened liquidity situation.

A bank's reputational risk consists in signalling its liquidity problems. An increase in systemic risk occurs in this model when excessive one-sided pressure from banks on the financial market (e.g. all banks want to sell bonds) leads to a decline in market liquidity. The increase in these two risks feeds back in the form of a secondary shock to banks' balance sheets (a further decline in bond prices and a further outflow of deposits).

The initial liquidity buffer  $B_0$  was calculated as the sum of unweighted liquid assets. The average initial liquidity buffer was almost CZK 389 billion (see Table IV.1 Box). The initial shock affects all liquid items, with the average impact on the balance sheet of each tested bank reaching almost CZK 159 billion. The liquidity buffer thus declined by roughly 41% to an average of CZK 229.5 billion (see Table IV.1 Box). All banks but one were hit, in particular large banks, foreign bank branches and building societies ( $B_1$  was 40% lower than  $B_0$  on average, see Chart IV.5 Box). In no case did the liquidity buffer turn negative (see Chart IV.6 Box).

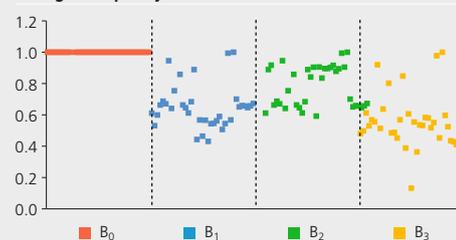
A total of 14 banks crossed the threshold for the decline in the liquidity buffer and responded to the initial shock on the financial markets. A bank's response type is assumed to reflect its specialisation and exposure to the specific market. Hence, a particular bank will react, for example, by reducing its holdings of securities that are relatively important on its balance sheet, or, in the case of a bank with a strong deposit base, by attracting new deposits (at higher interest rates). We assume that there are sufficient counterparties (e.g. non-bank financial institutions) willing to purchase the securities even at the falling market prices.

The response of the 14 banks increased the liquidity buffer by CZK 73 billion on average, to CZK 302.7 billion (buffer  $B_2$ ). A relatively large number of banks (almost 40%, in particular foreign bank branches and large banks) responded in a very similar manner. This behaviour led to a strong negative feedback reaction (a decline in market liquidity and further changes in market prices) and caused a second-round shock that hit all banks equally and at the same time. The second-round shock reduced the liquidity buffer by CZK 100 billion to CZK 202.7 billion (buffer  $B_3$ ). Foreign bank branches, large banks and building societies were again hit hardest by the second-round shock (see Chart IV.5 Box).

Although the simulated shock was very strong and the assumptions were quite severe, no bank in the entire tested system had a negative post-shock liquidity buffer (i.e. an inability to pay for funds accepted by selling assets and thus de facto bankruptcy). This confirms that banks have very good balance-sheet liquidity and are resilient to potential liquidity shocks.

CHART IV.6 (Box)

## Change in liquidity buffers of individual banks



Source: CNB

Note: Each point denotes the ratio of the relevant buffer to the initial buffer of the bank.

TABLE IV.7

## Scenario type and shock size in insurance company and pension fund stress test

	Europe in recession	Market nervousness	Economic depression
Change in CZK interest rates (p.p.)	-1.86	0.32	-1.65
Change in EUR interest rates (p.p.)	-2.92	-3.82	-3.63
Change in CZK/EUR exchange rate (- appreciation, %)	4.86	13.58	9.57
Increase in NPLs (reclassification, %)	5.43	6.35	7.85
Change in share value (%)	-10	-20	-30
Change in property prices (+ rise, - fall, %)	-10	-20	-30
Increase in risk in LI <sup>1)</sup> (risk of epidemics, %)	3	3	3
Increase in risk in NLI <sup>1)</sup> (risk of climate change, %)	50	50	50

Source: CNB

Note: <sup>1)</sup> Insurance company test only. LI = life insurance; NLI = non-life insurance

Note: Changes in parameters represent the difference between 2008 Q4 and the average for 2009.

**TABLE IV.8**  
Results of insurance company stress tests  
(capital adequacy ratios; % and p.p.)

Scenario type	Europe in recession	Market nervousness	Economic depression
<b>CAR<sup>1)</sup> for insurers as a whole (%)</b>	<b>11.9</b>	<b>11.9</b>	<b>11.9</b>
Overall impact of shocks from exposures (p.p.)	1.3	-1.6	-0.1
Interest rate shock	2.1	-0.2	1.9
Exchange rate shock	0.1	0.2	0.2
Credit shock	-0.2	-0.4	-0.4
Equity shock	-0.5	-1.1	-1.6
Property price shock	-0.1	-0.1	-0.2
Overall impact of shocks in insurance (p.p.)	-0.4	-0.4	-0.4
Life insurance	-0.1	-0.1	-0.1
Non-life insurance	-0.3	-0.3	-0.3
Allocation of profit and equalisation provisions (p.p.)	-1.3	1.6	0.2
Post-test CAR (%)	11.5	11.6	11.5
Capital injection (CZK billions)	6.0	6.3	6.1
Capital injection (% of GDP)	0.2	0.2	0.2
No. of insurers with negative capital	1	1	1
Share of insurers with negative capital <sup>2)</sup>	0.1	0.1	0.1

Note: 1) Calculation for December 2008, derived for illustration from bank capital adequacy methodology.  
2) The share of insurance companies with negative post-shock capital (as a percentage of total assets).

**TABLE IV.9**  
Solvency and insurance company test results  
(%)

Insurance type	Total	Life	Non-life
<b>Europe in recession</b>			
Solvency	308	276	337
Before allocation of profit and eq. provisions	312	337	292
Post-test solvency	274	261	284
<b>Market nervousness</b>			
Solvency	308	276	337
Before allocation of profit and eq. provisions	256	260	254
Post-test solvency	272	258	283
<b>Economic depression</b>			
Solvency	308	276	337
Before allocation of profit and eq. provisions	283	328	247
Post-test solvency	273	261	282

Source: CNB

**TABLE IV.10**  
Summary of stress test results for pension funds  
(capital adequacy ratios calculated using the methodology for banks; p.p.)

Scenario type	Europe in recession	Market nervousness	Economic depression
Overall impact of shocks (p.p. CAR)	16.0	-3.3	10.9
Interest rate shock	17.0	-2.3	15.1
Exchange rate shock	1.2	3.5	2.4
Credit shock	0.0	0.0	0.0
Equity shock	-2.0	-4.0	-6.0
Property price shock	-0.2	-0.4	-0.6

### Stress test results for the insurance sector

The increased financial market volatility and the decline in prices of assets in which insurance companies invested their technical provisions also affected this sector. The capital adequacy ratio calculated according to the banking methodology for a comparable sample of 33 insurance companies fell from 13.3% in mid-2007 to 11.9% at the end of 2008.

The alternative scenarios B ("market nervousness") and C ("economic depression") would continue to have some adverse effects on the insurance sector in 2009. These adverse effects would amount to CZK 7.4 billion (roughly 70% of the average profit for the last two years) in scenario B and CZK 2 billion (19% of profit) in scenario C. In the less favourable scenario B ("market nervousness") insurance companies would use their income to cover the losses and maintain the required solvency level. It is assumed that this income would reach only 80% of the average for the last two years (see Table IV.8).

The aggregated impact of scenario A, which captures the most probable path of the economy combined with specific shocks in the insurance sector, would be positive at CZK 3.8 billion (35% of profit). This is due mainly to a decline in interest rates and a moderate depreciation, which largely eliminate the impact of the fall in prices of shares and mutual fund units as well as the impact of the part of specific risks not covered by premiums, provisions and reinsurance. It should be pointed out, however, that the tests do not take into account the sensitivity of liabilities to interest rates, in particular for life insurance companies. Given the longer duration of liabilities compared to assets, a decline in interest rates to very low levels would represent a problem for insurance companies, especially if rates remained low for a long time.

Insurance companies would be able to withstand the extreme stress ensuing from the specific shocks (climate change, epidemics) with an impact of around CZK 60 billion, even though this figure exceeds the clean-up costs of the 2002 floods by roughly one-third. This is due to the volume of technical provisions and above all payments by reinsurance companies. The stress test results indicate that the insurance sector as a whole would be able to withstand all the alternative scenarios and maintain a high ratio of disposable solvency to required solvency exceeding 270% (see Table IV.9).

### Stress test results for the pension fund sector

Despite a capital increase in 2008, equity fell from 2.3% of total assets at the end of 2007 to 1.7% of total assets at the end of 2008 owing to the unfavourable financial market developments. The pension fund stress tests indicate only partial resilience to adverse shocks (see Table IV.10).

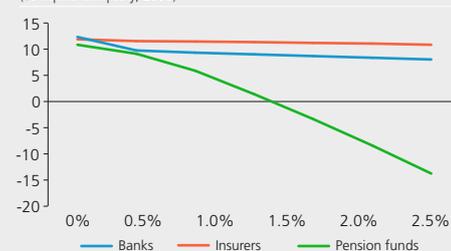
Given pension funds' high sensitivity to credit risk, the interest rate decline in scenarios A ("Europe in recession") and C ("economic depression") would have a positive effect on their overall results in 2009. Losses would be caused by alternative scenario B ("market nervousness"), which assumes an increase in interest rates. The losses under scenario B would be around CZK 1.8 billion (roughly 70% of average profit or 55% of equity at the end of 2008). Given the developments on the bond market in 2009 Q1 (see section 3.1), however, further bond price declines and thus further pension fund losses cannot be ruled out (see section 4.1). Of the three types of financial institutions tested, pension funds are the most sensitive to interest rate increases (see Chart IV.38). If the one-year interest rates in scenario B ("market nervousness") rose by 2 percentage points (and long-term rates by 1 percentage point), the fall in bond prices would eliminate the whole liquidity buffer. A capital increase of around CZK 8 billion would be needed to restore the initial capitalisation of pension funds. However, this represents only 0.2% of GDP.

Given the impacts of financial market developments on pension funds and the absence of regulatory rules for the capital of pension funds, the CNB is preparing new prudential measures together with the Association of Pension Funds of the Czech Republic. The aim is to put in place systemic mechanisms that will automatically trigger certain processes (e.g. provision of additional capital by shareholders) if a pension fund's equity declines below a specified threshold in the reference period. An amendment to the Act on Private Pension Insurance, which from 2009 H2 would allow pension funds to value some bond holdings at amortised cost instead of fair value, is also being discussed in Parliament. This measure is consistent with the long-term investment horizon of pension funds.

**CHART IV.38****Smooth change in interest rate for scenario B**

"market nervousness"

(% capital adequacy, 2008)



Note: For insurance companies and pension funds we assume a change in long-term interest rates (over 5 years) of 50% of the given rise in interest rates.