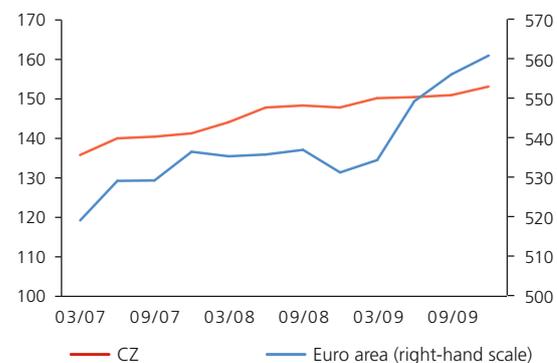


CHART IV.1

Depth of financial intermediation

(assets of financial corporations as % of GDP)



Source: CNB, ECB

4 THE FINANCIAL SECTOR

The Czech financial sector adapted very well to the adverse economic situation in 2009 and reported good economic results. At the same time, there was a halt in growth in total assets of financial institutions, which have been virtually flat since 2008 H2 (see Chart IV.1). The gradual deepening of financial intermediation in the Czech Republic, as measured by the ratio of assets of financial institutions to GDP, thus stopped just above the 150% level (compared to 560% of GDP in the euro area).

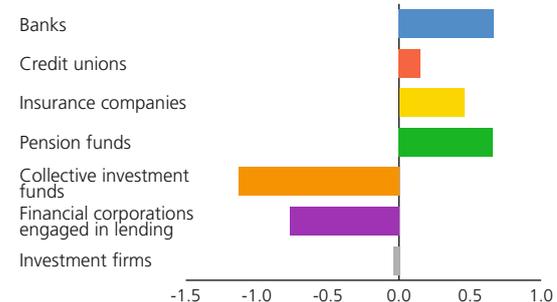
Thanks in part to active communication by the central bank and government institutions, general risk aversion towards countries classified by analysts and international institutions as the CEE region came to a halt. This aversion had peaked in the first few months of 2009. In the remainder of 2009 and at the start of 2010, however, a more differentiated approach to developments in financial sectors in individual EU countries was observed.

Future developments in the financial sector will depend on what happens in the real economy (see section 2) and in financial markets abroad (see section 3), but the domestic financial sector is currently relatively resilient to the risks identified.

CHART IV.2

Change in shares in financial sector assets over the last two years

(p.p.; change between end-2009 and end-2007)



Source: CNB

4.1 FINANCIAL SECTOR DEVELOPMENTS

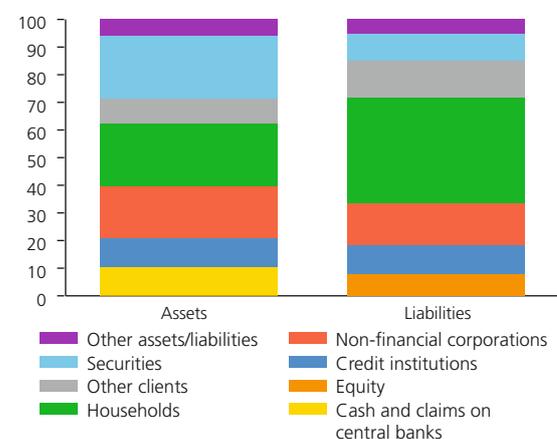
The main segments of the financial sector coped well with the adverse economic situation. The banking sector increased its capital adequacy amid a stagnant loan portfolio. Insurance companies, pension funds and mutual funds benefited from more favourable trends in the financial markets. The capitalisation of insurance companies and pension funds is assessed as sufficient. Non-bank financial corporations engaged in lending lost market share. Despite signals of a general improvement in the economic outlook and financial market situation, we identify the following risks to the financial sector. First, a more pronounced increase in NPLs (to both households and corporations) in the event of renewed economic recession, especially for banks that have more concentrated portfolios. Second, a decline in bond holdings due to a potential increase in the Czech Republic's risk premium connected with the risk of unsustainable developments in the fiscal area. Besides banks, this would significantly affect insurance companies, pension funds and mutual funds. Third, a decline in banks' operating profits due to a possible flattening-out of the yield curve in the near future and a decline in interest margins. Fourth, liquidity risk in the building societies subsector, which might be reflected in the reputational risk of parent banks if problems manifest themselves. Fifth, the so far unclear impact of international initiatives to reform the regulatory framework on the currently well-capitalised and liquid domestic banking sector.

The structure of the financial sector changed somewhat in 2008 and 2009. In particular, banks, insurance companies and pension funds increased their share in the sector's total assets at the expense

CHART IV.3

Structure of banking sector assets and liabilities

(% of total assets/liabilities; 2009)



Source: CNB

of collective investment funds and non-bank financial corporations engaged in lending (see Chart IV.2). With their share of 77%, banks remain the dominant subsector.

The banking sector recorded flat total assets

The banking sector has maintained its total assets at around the same level (just over CZK 4 trillion) since 2008 H2. Having previously increased dynamically, the credit portfolio thus remains flat due to weak economic output, declining demand for loans, particularly in the corporate sector, and partly also to a tightening of the credit conditions by banks themselves (see section 2.2).

Renewed growth in loans in the near future will depend on the rate of economic recovery, monetary and fiscal policies, the setting of credit conditions by banks (reflecting also credit risk), sufficient sources for loan financing, and the adequacy of the capital and liquidity buffer with regard to potential future changes in bank regulation (see Box 6). Compared to many European countries, the conditions for renewed loan growth in the banking sector are relatively favourable, while the extent of the economic recovery and its impact on demand for loans remain uncertain. In the *Baseline Scenario*, growth in client loans would amount to 6.3% in 2010 and rise to almost 8% in 2011. In the stress scenarios with weaker economic activity, however, the total credit portfolio could shrink by as much as 15% (see section 4.2).

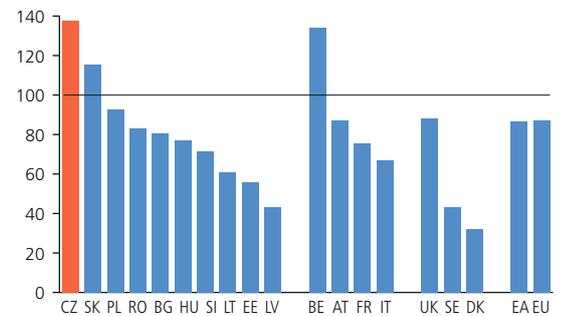
The conservative banking model in the Czech Republic has proved successful

The banking sector's asset and liability structure clearly shows the prevailing traditional conservative model of domestic banking business, which is based largely on providing loans and accepting deposits (see Chart IV.3). This banking business model, together with full coverage of the credit portfolio from domestic client deposits (see Chart IV.4), a virtually zero share of foreign currency loans to households and minimal activity of banks in the Czech Republic in investment in riskier financial products, contributed to the resilience of the Czech banking sector to the first phase of the global financial crisis in 2007–2008, which was marked by a sharp fall in prices of toxic assets and reduced liquidity in global markets. Temporary declines in the value of some financial assets and persisting low liquidity in the domestic money market had no major effect on the banking sector.

The Czech Republic was one of the EU countries where the situation required no capital injections from public sources or the use of any other instruments to support the banking sector (government guarantees for bank debt, purchases of problem assets or measures to support the balance-sheet liquidity of banks). The total support from public sources in EU countries forced to apply the aforementioned measures amounted on average to more than 20% of GDP. However, guarantees accounted for most of this support (17% of GDP), while capital injections represented only about 2% of GDP.

CHART IV.4

Ratio of deposits to loans granted in selected EU countries
(2009: %, deposits/loans to residents)

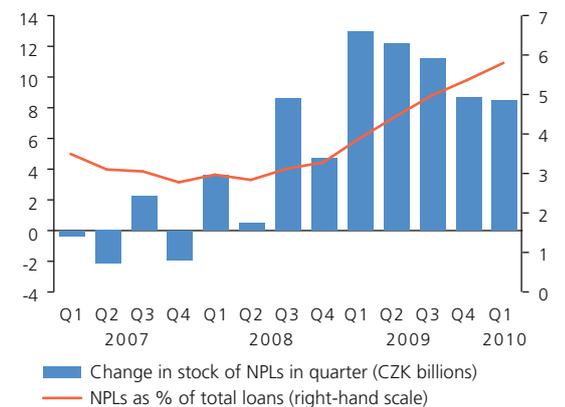


Source: ECB

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

CHART IV.5

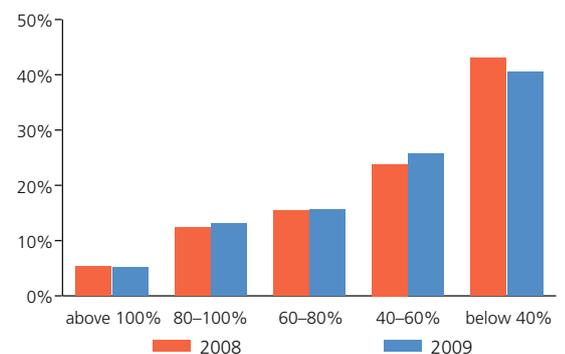
NPLs in the Czech banking sector
(client loans; %, CZK billions)



Source: CNB

CHART IV.6

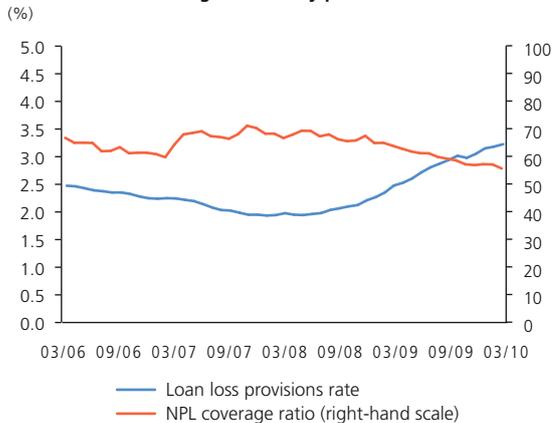
LTV ratio distribution for building societies
(%)



Source: CNB

CHART IV.7

Provisions and coverage of NPLs by provisions



Source: CNB

Credit risks are becoming a closely observed area...

The subsequent phase of the global financial crisis, combined with a strong, internationally synchronised economic recession in 2009, is generating concerns about the extent and impact of increased credit risks. This is a closely observed area in the European context, since the role of credit risk in total bank risks – as measured by the ratio of capital requirements for credit risk to total capital requirements – is around 85% on average in all EU countries (except the UK, where it stands at 60%; in the Czech Republic it is 88%).

The decline in economic activity in the Czech Republic since 2008 H2 resulted in an increase in NPLs in bank portfolios to 5.2% at the end of 2009 (see Chart IV.5) and 5.8% in March 2010. Although the inflow of new NPLs gradually decreased during 2009, uncertainty still prevails with regard to the intensity of their growth in 2010. In spite of the expected slight recovery, economic conditions may not be favourable enough for a more pronounced decline in credit risk (see section 2.1).

TABLE IV.1

STRUCTURE OF NPLs BY COLLATERAL, CATEGORY AND TIME PAST DUE

	Collateralised loans to households and corporations	Non-collateralised loans to households and corporations	Other loans	NPLs, total
2007	26.5	63.2	10.3	100.0
2009	33.2	58.8	8.0	100.0
	Non-standard	Doubtful	Loss	NPLs, total
2007	31.5	16.8	51.7	100.0
2009	37.3	20.9	41.8	100.0
	Not past due	Up to 3M past due	More than 3M past due	NPLs, total
2007	47.7	7.8	44.5	100.0
2009	52.3	8.8	38.9	100.0

Source: CNB, CNB calculation

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

...especially in the segment of house purchase loans, which are being tested by economic recession for the first time

This mainly concerns the household segment, which is being affected by the recession with a lag, together with an increase in unemployment (see section 2.3). Moreover, this is the first time in the Czech Republic that the relatively large bank portfolio of loans to households – the volume of which exceeded loans to non-financial corporations at the end of 2009 – has undergone the test of economic recession.

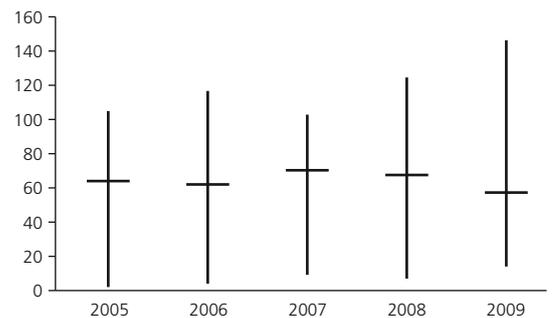
There is particular uncertainty about NPL growth in the segment of house purchase loans. Attention is also being focused on building societies, which specialise in house purchase loans and whose credit portfolio now represents almost 40% of all house purchase loans granted. For several years, these specialised institutions, which form part of the banking sector, have recorded faster growth in house purchase loans than the average figure for the banking sector as a whole and increasingly grant loans of a bridging nature with nominal values exceeding CZK 500,000, whereby they aim to compete with mortgage loans offered by banks.⁸⁷

However, credit risk in the building society sector can be assessed as low. Building societies recorded an average LTV ratio for mortgage loans of 54% at the end of 2009, while the figure for the banking sector as a whole was roughly 56%. Moreover, information about the distribution of the LTV ratio indicates a high proportion of well-secured loans with LTV ratios below 40% (see Chart IV.6). The NPL ratio has long been just below 2% and was exactly 2% at the end of 2009, while the figure for the banking sector as a whole in the house purchase loan segment was 2.6% in the same period.

⁸⁷ A survey conducted among building societies in March 2010 revealed that loans exceeding CZK 500,000 currently account for around 52% of total loans granted by building societies, up by 4% on a year earlier. Building societies also increasingly refinance mortgage loans, but the share of such loans in total loans granted is just a few per cent.

CHART IV.8

Distribution of NPL coverage ratio in the Czech banking sector (%; min, max and average)



Source: CNB

The higher credit risk is being reflected in increased provisions

The volume of provisions for NPLs continued to grow in 2009 and at the beginning of 2010 in parallel with the increase in NPLs. The loan loss provision rate thus increased to 3% in December 2009 (see Chart IV.7). However, the rise in provisions lagged slightly behind the rise in NPLs in 2009. This was reflected in a decline in the NPL coverage ratio to 57% in December 2009 and 56% in March 2010.

The main reason for the decline in NPL coverage was a change in the NPL structure in terms of both collateral value and classification (substandard, doubtful and loss loans). The proportion of NPLs with relatively good collateral (house purchase loans secured by property and secured loans to corporations⁸⁸) increased from 26.5% in 2007 to 33.2% in 2009 (see Table IV.1). The given volume of NPLs thus requires much lower provisions to cover potential losses, since provisions are created only for the unsecured part of the portfolio.

As regards the NPL classification structure, a comparison between 2007 and 2009 reveals that the largest growth in share was recorded by level-one NPLs, i.e. non-standard loans, which are defined mainly by a number of days past due in the range of 90–180 days (see Table IV.1). These are relatively “young” NPLs which require less provisioning than loans in worse categories.

Banks are acting very cautiously when classifying bad loans...

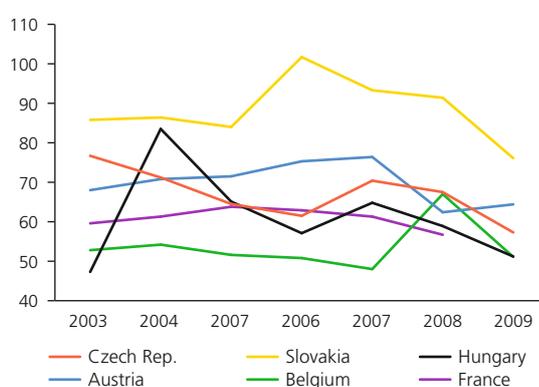
The available evidence suggests that many NPLs, especially in the substandard loans category, are being categorised on a prudential basis (i.e. on a voluntary basis by banks, without necessarily meeting the basic condition for them to be categorised as such, i.e. a past-due period of more than 90 days). Provisions are thus being created to a certain extent “in advance”.

The hypothesis of prudential loan classification is supported by two observations. First, the structure of NPLs by days of default suggests that there has been an increase in the share of NPLs which are actually “being repaid”, i.e. their repayments are not past due or the default period is shorter than 90 days (see Table IV.1). Particularly in 2009, banks classified a number of loans for prudential reasons as NPLs based on other factors than the number of days past due. Anecdotal evidence suggests that large and medium-sized banks in particular have invested a large amount of funds and effort in early warning systems which should be able to predict future defaults (for example on the basis of information on the sales and profits of corporate clients). Moreover, the adverse economic situation has led banks to set the default classification threshold at quite a conservative level, so many potentially good clients may have been classified as being “in default”.

⁸⁸ Information about the value of collateral for loans to non-financial corporations is not available on the aggregate level. The Central Credit Register maintained by the CNB contains only information about the existence of various types of collateral (property, claims, securities, guarantees, security, etc.). Loans secured by property plus two other types of collateral are considered loans with a relatively good collateral.

CHART IV.9

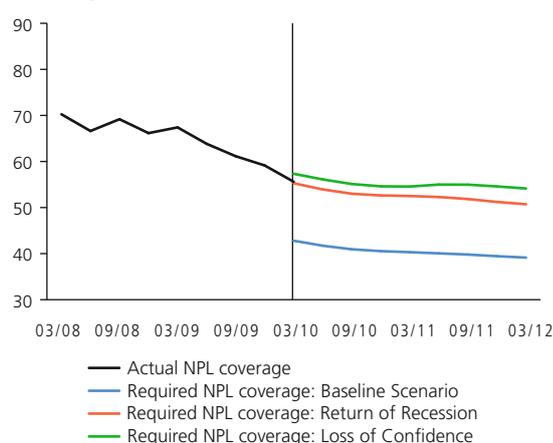
NPL coverage ratios – international comparison
(%)



Source: IMF

CHART IV.10

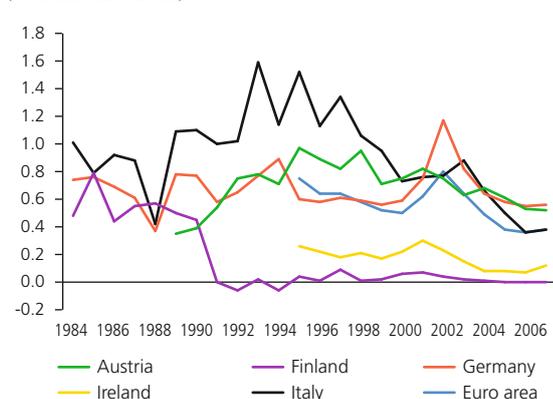
Actual versus required NPL coverage
(NPL coverage ratio; %)



Source: CNB, CNB calculation

CHART IV.11

Loan loss provisioning rate
(% for selected countries)

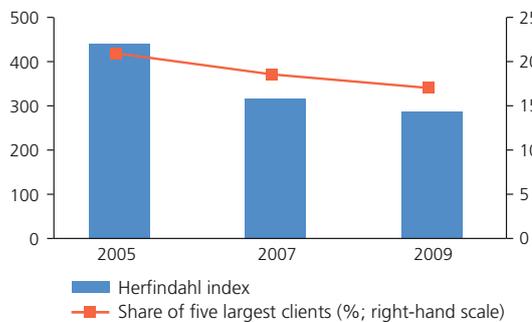


Source: IMF

CHART IV.12

Concentration of corporate portfolios

(HHI index 0–10 000; share of five largest clients in %; loans to legal entities)



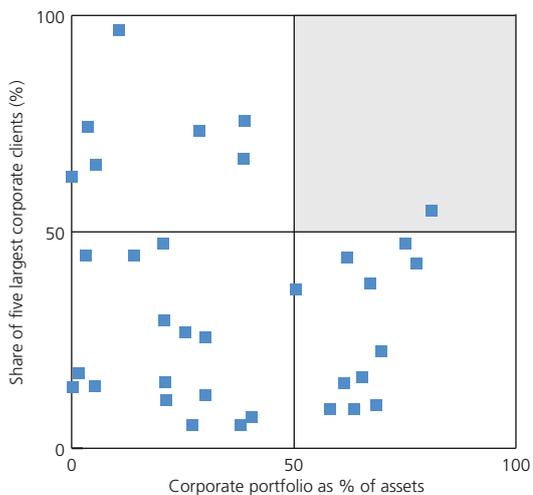
Source: CNB, CNB calculation

Note: Weighted average, with shares of individual banks in total portfolio of legal entities used as weights.

CHART IV.13

Concentration of corporate portfolios and relevance of corporate loans in assets

(%; as of end-2009)

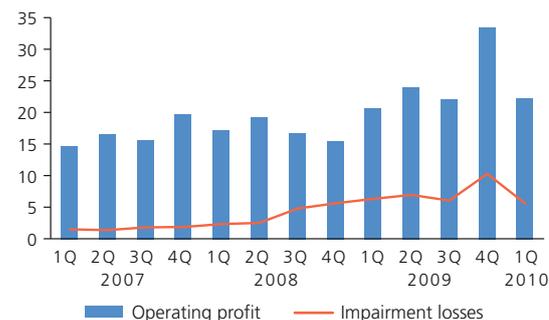


Source: CNB, CNB calculation

CHART IV.14

Operating profit and impairment losses

(CZK billions; quarterly values)



Source: CNB

Second, the current regulatory rules force banks to classify restructured loans as NPLs, i.e. at least as substandard loans. Of course, the low economic activity has led to a rise in restructured loans. CZK 260 million in loans to non-financial corporations were restructured in 2008, while more than CZK 730 million were restructured in 2009, i.e. around 1% of the total portfolio. Restructured loans to households for house purchase rose from CZK 110 million to CZK 290 million (0.5% of the portfolio), while consumer credit surged from CZK 14 million to CZK 125 million (almost 1% of the portfolio). Although loan restructuring is de facto default, it involves a qualitatively different type of substandard loan than in the case of fully defaulting debtors with loans more than 90 days past due and a low repayment probability in the near future.

...and the NPL coverage can thus be regarded as sufficient

Despite a visible decline, the current NPL coverage ratio can be regarded as sufficient. The evidence regarding the distribution of banks in the Czech Republic by NPL coverage suggests that although this ratio has declined at the aggregate level, there has also been an increase in its maximum value (see Chart IV.8). An international comparison for the available countries reveals that declines were observed in most monitored countries last year (most probably for the same aforementioned reasons) and that values ranging between 50% and 60% are quite common (see Chart IV.9). Alternatively, the actual coverage ratio can be compared with the analytically constructed "required" coverage ratio. Various loss given default (LGD) rates were applied to each NPL segment. This creates expected loan losses for the individual segments and for the entire NPL portfolio, which should be fully covered by provisions. Given the uncertainty regarding the "correct" LGD rate, we conducted the analysis for the three different sets of LGD assumed in the alternative scenarios (see Chart IV.10). The results show that the current coverage ratio is more or less sufficient even for the stress scenario with extremely unfavourable LGD values.

The volume of new provisions, or its share in total gross loans (the provisioning rate), indicates the bank's risk costs. Given the flow nature of this indicator, it is an item which, adjusted for provisions released as unneeded, directly affects total profit in a form of loan impairment. The value of this indicator in relative terms increased in the Czech Republic from 1.5% in 2007 to 1.9% in 2009. Data available for international comparison (available only for the period before the global financial crisis) show that the figures for the Czech Republic are higher, although this may indirectly confirm the aforementioned hypothesis of a very prudential approach by banks to loan classification and thus of sufficient provisioning (see Chart IV.11).

Concentration of loan portfolios might be a risk

The advanced credit risk management systems, which banks currently use, require maximum portfolio "granularity", i.e. the smallest possible concentration of the loan portfolio. However, this is difficult to achieve, especially in smaller economies, where the relative size of banks is small

compared to large corporations. Although the regulatory framework in force restricts concentration by means of certain limits,⁸⁹ a non-linear increase in default in more concentrated portfolios cannot be ruled out if one of the adverse scenarios materialises.

Nevertheless, the available evidence suggests that the concentration of corporate loan portfolios has tended to decline in the past few years (see Chart IV.12). The average (weighted) share of the five largest clients (legal entities) was around 17% at the end of 2009, which is not a negligible figure. Since exposures to large (i.e. as a rule, credible) debtors are not only relatively large, but also less secured or entirely unsecured, banks might suffer large losses in this portfolio if several of their largest clients default (see section 4.2).

Concentration of the corporate portfolio could be a greater problem for banks where the corporate portfolio accounts for a significant share of total assets. Although the average concentration in the Czech banking sector has declined over time, there are banks whose corporate portfolios would be significantly affected by the collapse of their largest corporate debtors. These are mainly smaller banks or foreign bank branches focusing largely on corporate clients in their lending activities. However, the evidence suggests that there are almost no banks in the “critical quadrant” of a large share of corporate portfolios in assets and a high concentration of these portfolios (see Chart IV.13). The issue of concentration may thus affect individual institutions but should not pose systemic problems.

The good resilience of the banking sector is also illustrated by profitability in 2009

The conservative banking business model in the Czech Republic brings banks benefits in the form of relatively stable income on financial activities. Banks are able to generate sufficient income in the long run primarily through their portfolio of claims and to make net profits even in years when income on other financial activities declines or risk costs increase. The year 2009 was no exception in this regard. Despite an almost twofold increase in risk costs due to provisioning, profitability did not decline since operating profit gross of losses from impairment of loans and other assets recorded a sizeable increase (see Chart IV.14).

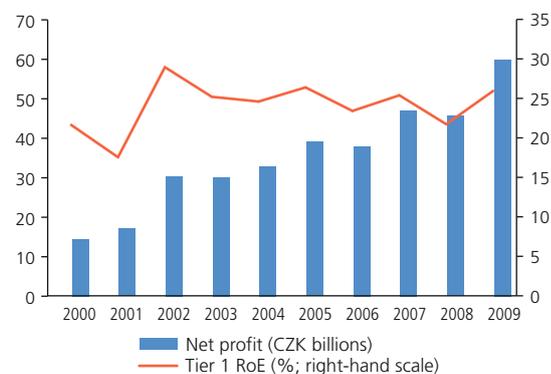
The banking sector ended 2009 with a net profit of CZK 60 billion, up by around 30% on 2008. This corresponds to a return on Tier 1 capital of 26.1% and a return on assets of 1.5% (see Chart IV.15). However, the increase in profits was affected by numerous one-off operations which influenced the results in both 2008 and 2009. The profit less these one-off transactions recorded in 2009 would be slightly below the 2008 level.

⁸⁹ Loans and claims on clients or economically related groups may not as a rule exceed 20% of capital. In addition, there are other conditional limits on a bank's overall exposure.

CHART IV.15

Net profit and return on equity

(CZK billions; %)



Source: CNB

CHART IV.16

Leverage

(leverage multiple; assets as multiple of equity; CZ in 2000–2009; foreign data for 2008)

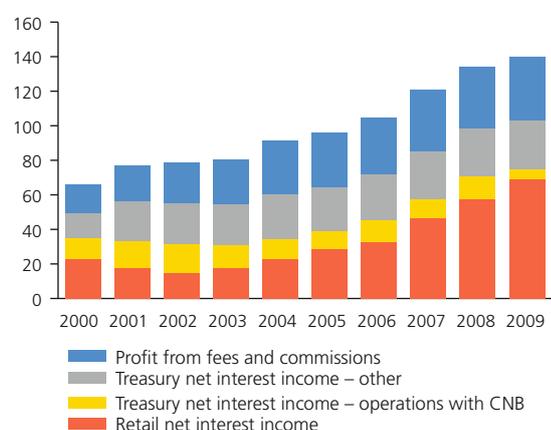


Source: CNB, ECB

CHART IV.17

Key components of profit from financial activities

(CZK billions)



Source: CNB

CHART IV.18

Interest margin from retail operations of banks

(%)

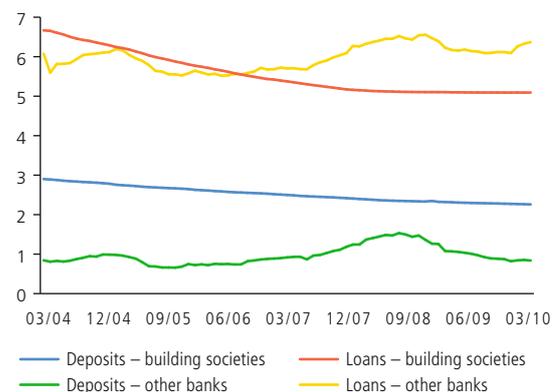


Source: CNB

CHART IV.19

Average interest rates on assets and liabilities: building societies versus other banks

(%)

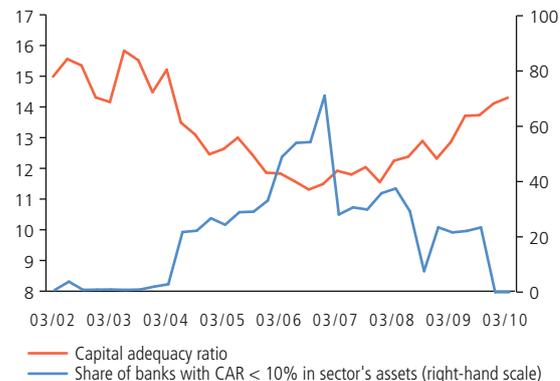


Source: CNB

CHART IV.20

Capital adequacy ratio

(%)



Source: CNB

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

Banks in the Czech Republic are able to maintain stable profitability despite slightly declining leverage

Since leverage (assets expressed as a multiple of equity) in the Czech banking sector has been generally declining over the past decade (see Chart IV.16), the sector's profitability has been driven not by the use of a larger volume of external funds compared to equity, but by a higher profit margin. The value of leverage for 2009 (12.5) is lower than in the banking sectors of some countries where parent banks of the largest Czech banking institutions are active. By contrast, Central European countries (Slovakia, Poland and Hungary) record very similar values of this indicator as the Czech Republic.

In 2009, banks benefited mainly from an increase in the interest margin, even in conditions of declining interbank rates...

Despite the reduced economic output, stagnant credit portfolios and declining market interest rates, the main components of profit from financial activities increased in 2009. A more detailed analysis reveals that the increase in net interest income was due mainly to a higher interest margin in the retail segment of client deposits and loans, as net interest income from the administration of securities and other financial operations (e.g. repo operations with the CNB) declined (see Chart IV.17).

The increase in the interest margin amid declining interbank rates (see Chart IV.18) was due to both a larger decrease in interest rates on deposits and the maintenance of relatively high average lending rates (see section 3.1). This pricing policy was banks' response to the higher existing and expected credit risk in the economy. The higher interest income is being used to cover losses from NPLs.

...but future developments will exert downward pressure on interest margins

The current interest margin can be assessed as being relatively high. In the near future the interest margin can be expected to decline as a result of factors associated with a slight economic recovery, a decline in credit risk and a possible flattening-out of the yield curve. The potential impact of regulatory requirements, e.g. for stable sources of financing, proposed as part of measures to support balance-sheet liquidity, also remains an open question (see Box 6).

The fact that building societies cannot lower interest rates for a significant proportion of their deposits as these rates are usually fixed contractually constitutes a risk to their net interest income. Owing to the set conditions for building savings schemes, the average rate on deposits is far higher in the current period of low interest rates than in the banking sector as a whole and the interest margin is smaller (see Chart IV.19). A longer period of low market interest rates – such as in the *Return of Recession* scenario – would thus exert pressure on their profitability.

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

The high profitability of Czech banks in recent years is directly reflected in satisfactory total capital adequacy and Tier 1 capital adequacy ratios (14.1% and 12.7% respectively at the end of 2009) thanks to increases in regulatory capital from retained earnings. Moreover, for the first time since 2002, all banks have total capital adequacy ratios above 10% (see Chart IV.20). The first months of 2010 suggest that although the ratio of dividends to profits in 2009 will increase slightly again (see Chart IV.21), regulatory capital will be significantly strengthened by retained earnings.

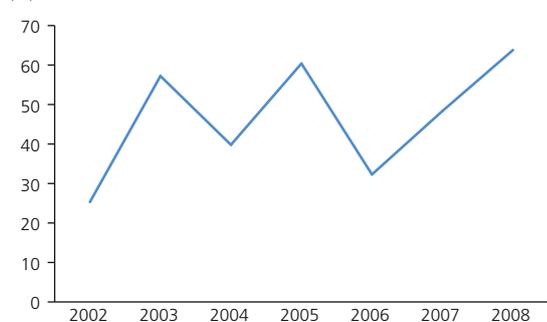
The total capital adequacy ratio of the Czech banking sector was at the European average in 2008. The quality of regulatory capital as measured by the ratio of Tier 1 capital to total regulatory capital is the second highest after Finland (see Chart IV.22). Although Tier 2 may equal up to half of Tier 1 according to the regulatory rules in force, in the case of Czech banks this share amounted to 16% on average at the end of 2009 and has shown no major change in the past four years, as both these components of capital are rising steadily. Retained earnings remain the largest component of Tier 1 capital (50% at the end of 2009). Subordinated debt is the main component of Tier 2, and was the only one at the end of 2009. At 18%, it ranks third in the structure of total regulatory capital, behind retained earnings (44%) and equity capital (27%). Retained earnings and subordinated debt rose in 2009 (see Chart IV.23).

The impact of international initiatives to improve capital quality remains an open issue

The high share of retained earnings in regulatory capital is often a source of debate regarding its "durability", as shareholders can easily withdraw this type of capital up to the permitted regulatory limits for Tier 1 capital or replace it to some extent with subordinated debt (i.e. Tier 2 capital). A comparison of EU countries suggests that in this respect, there is relatively large room for such capital adjustments in the Czech Republic. However, the existing international initiatives (see Box 6), which emphasise more than in the past that regulatory capital should be made up of components of the highest possible quality and be used to absorb potential losses, may increase the probability of the exchange of capital. The international banking groups to which Czech banks belong may be forced to a much greater extent to optimise their capitalisation not only on a consolidated basis, but also for individual subsidiaries. Countries in which subsidiaries of globally active banks have better quality capital (such as the Czech Republic) may thus be used as a source of funds to strengthen the group's capital in other countries, provided that the compliance with the regulatory limits is safeguarded.

CHART IV.21

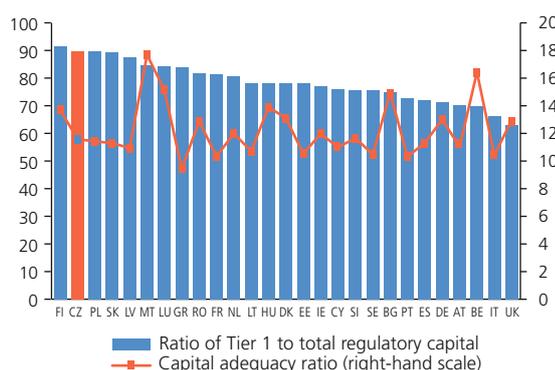
Ratio of dividends to net profit in given year (%)



Source: CNB

CHART IV.22

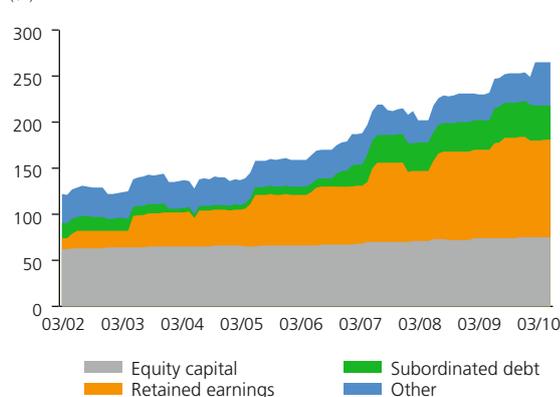
Quality of regulatory capital (ratio of Tier 1 to total regulatory capital in %, 2008)



Source: ECB

CHART IV.23

Structure of regulatory capital (%)

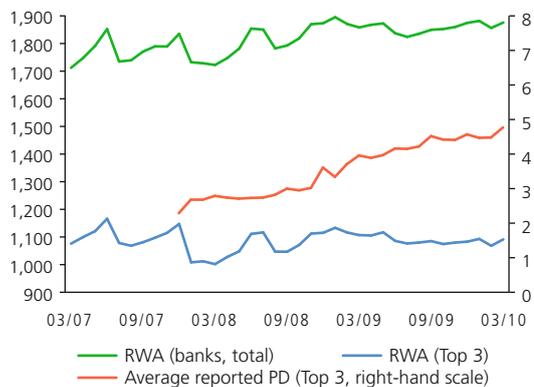


Source: CNB

CHART IV.24

Risk-weighted assets

(stock in CZK billions; three largest banks (Top 3) versus banking sector as a whole; average PD in %)



Source: CNB, CNB calculation

Risk-weighted assets recorded no major rise despite an increase in risk parameters

Capital adequacy was not weakened by growth in risk-weighted assets, which remain broadly flat despite some slight volatility. The rise in credit risk, and thus also in the reported values of probability of default (PD), was not a source of excessive growth in risk-weighted assets (see Chart IV.24), as it was counteracted by a flat credit portfolio and a decline in exposures with a higher degree of risk.

Box 6:

KEY INTERNATIONAL ACTIVITIES IN THE REGULATION OF FINANCIAL INSTITUTIONS

In response to the global financial crisis, an agreement was reached at the level of global groups headed by the G20 on reform of the global financial infrastructure and the regulatory framework to prevent the emergence, or the potential very adverse impacts of, future financial crises. A specific vision for the reform of the bank regulatory framework newly incorporating macroprudential risks was published by the Basel Committee on Banking Supervision in December 2009 (the proposal is sometimes referred to as Basel III). The consultation documents propose a reform of the currently used Basel II framework in several areas, namely (a) capital adequacy; (b) liquidity; (c) new instruments for preventing systemic risk. The emphasis on limiting systemic risks, including reducing the procyclicality of regulation,⁹⁰ is a new element in the international debate on the reform of banking regulation. A breakthrough in the macroprudential area is a proposal to introduce a countercyclical capital buffer or even an additional capital requirement for “systemically important” institutions. Also worth mentioning is a proposal which would require banks at times of “excessive” expansion in lending to keep part of their profit as capital in the form of retained earnings.⁹¹

The changes in capital adequacy, which will be applied in EU countries in the form of an amendment to the CRD (known as CRD IV), include features for better risk assessment and harmonise certain concepts (e.g. items deductible from capital). The primary aim is to enhance the quality of capital. The introduction of a leverage ratio, intended to restrict excessive growth in balance sheet size without sufficient capitalisation, is under consideration. New, “safer” (i.e. higher) values are being considered for the standard capital ratios (CAR and Tier 1 CAR). An internationally endorsed set of indicators and formulas for calculating sufficient liquidity will be introduced in the liquidity

⁹⁰ See the thematic article *Procyclicality of the Financial System and Simulation of the Feedback Effect* in this Report.

⁹¹ The Turner Review (2009): *A Regulatory Response to the Global Banking Crisis*, FSA UK, March 2009.

area. The aim is to enhance banks' liquidity and to motivate banks to minimise maturity mismatch. A more precise calibration of all the quantitative variables is the subject of an impact study being conducted in 2010 H1. It is thus not clear what the final overall impact on the financial system in the Czech Republic will be.

As regards macroprudential regulation, the macroeconomic variable on which the creation of the additional capital buffer would depend is now being discussed. Preliminary studies by Basel Committee experts suggest that this variable will be the constantly updated calculated deviation between private sector debt (in % of GDP) and its long-term trend computed using the HP filter on an at least a ten-year series with a high and pre-set lambda. For converging countries such as the Czech Republic (in contrast to the non-converging EU economies), a higher debt ratio would trigger creation of an additional buffer only in the case of accelerating credit growth, not higher growth alone. In the event of a crisis, the capital buffer would be released at the discretion of the regulator.

As regards the possible countercyclical capital buffer, a preliminary analysis for the Czech Republic conducted on the recommended period of the past ten years using the methodology defined by a Basel Committee working group indicates that banks in the Czech Republic would have needed to create a capital buffer as from the end of 2006 (if these rules had applied then; see Chart IV.1 Box).

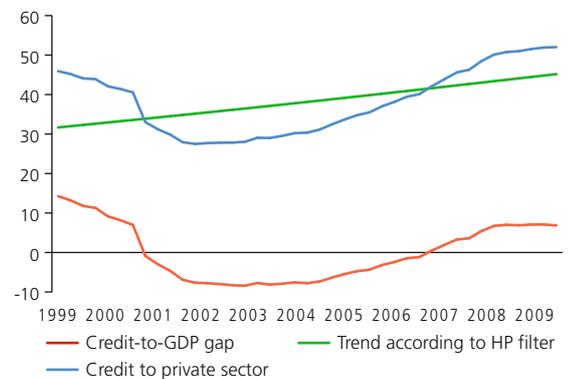
The liquidity situation of the banking sector is good

The liquidity buffer – in the form of quick assets (i.e. in particular government bonds, cash, claims on central banks and accounts receivable from banks on demand) expressed as a percentage of assets and client deposits – started to increase slightly in 2008 following a temporary decline (see Chart IV.25). Given the relatively high liquidity of the Czech banking sector, there should be no problem with potential implementation of the new liquidity requirements proposed by the Basel Committee (see Box 6).

Client deposits, which accounted for 67% of total liabilities at the end of 2009, are the main source of asset financing. They ensure sufficient liquidity, providing another reason why the business model of Czech banks can be regarded as safer than that in sectors that have significant exposures to the money and capital markets. The banking sector has surplus client financing, as client deposits currently exceed client loans by more than 30% (see Chart IV.26). This surplus was almost 100% at the start of 2003 and decreased over time until 2008 as the credit portfolio grew and alternative investment products with higher yields than those on bank deposits became more popular.

CHART IV.1 BOX

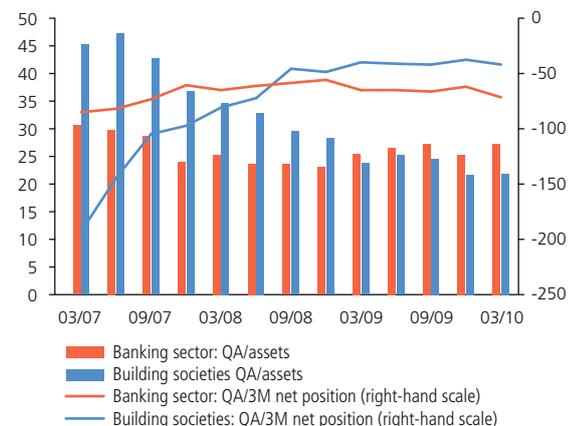
Gap between private sector debt and trend (% of GDP)



Source: CNB, CNB calculation

CHART IV.25

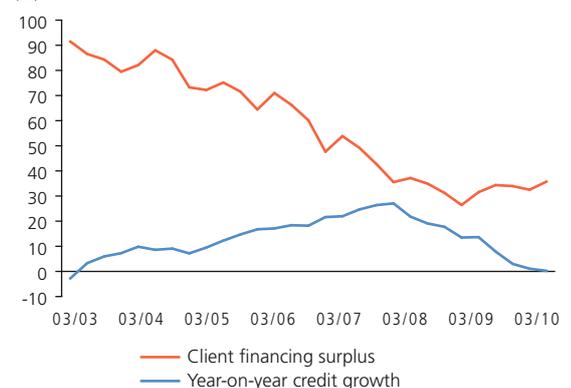
Liquidity situation in the banking sector and building society sector (%; QA = quick assets)



Source: CNB

CHART IV.26

Client financing surplus and client credit portfolio growth for the Czech banking sector (%)

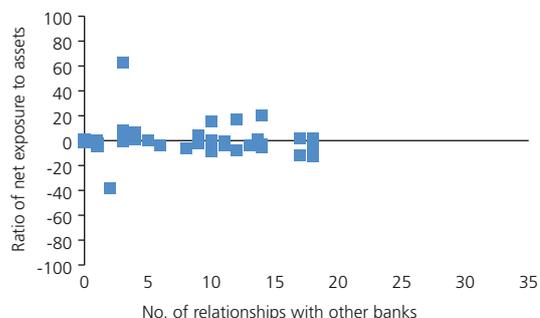


Source: CNB

CHART IV.27

Interbank exposure ratio

(%; as of 31 Dec. 2009; points indicate individual banks)

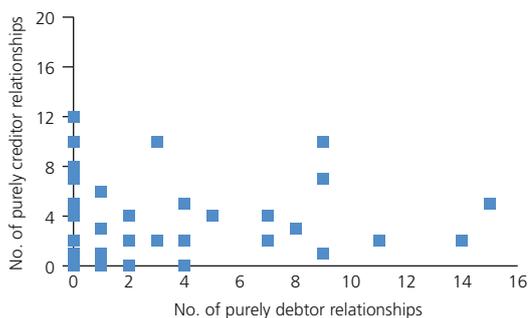


Source: CNB, CNB calculation

CHART IV.28

Debtor and creditor: the existence of both positions in banks

(points in the chart are individual banks as of 31 Dec. 2009)

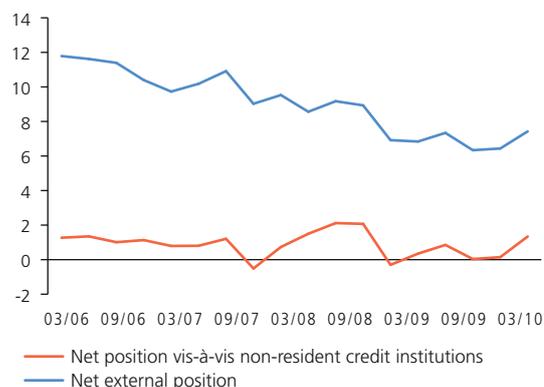


Source: CNB, CNB calculation

CHART IV.29

Net external position of the Czech banking sector and net position vis-à-vis non-resident credit institutions

(% of GDP)



Source: CNB

Building society liquidity risk might affect banks' reputational risk

Building societies' liquidity situation is gradually deteriorating as the ratio of the credit portfolio to deposits increases and contracts "age". The share of quick assets in total assets has gradually been declining in recent years and is currently lower than in the banking sector as a whole. On the liabilities side the average maturity of deposits is falling, which increases the risk of a liquidity outflow. In 2006 the share of deposits with maturities of up to three months had been just 35%, but at the end of 2009 it was 70%. The volume of quick assets at the end of 2009 would cover only 40% of the (negative) cumulated net balance-sheet position of up to three months. This is lower than the coverage rate in the banking sector as a whole (about 60%) and contrasts with coverage exceeding 100% before 2007 (see Chart IV.25). However, despite the deterioration in the aforementioned indicators, this poses no major problem for building societies as a whole.

Nevertheless, building society liquidity risk might affect the reputational risk of banks that control building societies. It can be assumed that in the event of a liquidity shortage, shareholder banks would resolve the situations of their building societies by using their own resources. This, however, would have a potential impact on their own liquidity position.

But the risk of interbank contagion appears to be small

Most banks use the domestic interbank market not as a source of credit financing, but rather as a means of managing short-term liquidity. This is confirmed by the fact that activity is concentrated on exposures with very short maturity (see section 3.1).

Standard measures of connectivity in the interbank relationship network show that the interrelationship matrix is relatively "sparse".⁹² The average number of relationships between a bank and other banks in the Czech Republic (referred to as the degree) was around 7.5 at the end of 2009 (minimum 0, maximum 20). This implies an average connectivity of 21% for the total of 36 banks analysed.⁹³ However, such figures are very difficult to compare internationally, as they are not generally available for banking sectors and those that are available contain different indicators.⁹⁴ The available evidence for Hungary, which is largely similar in terms of banking system size and structure, shows an average degree of 6 and an average connectivity of 20%. Indicators calculated for the Austrian sector on the basis of interbank payment flow indicators, which are not, however, fully comparable with the interbank exposure network indicators, indicate a higher degree (of around 15) but a very low connectivity (8%), due a to huge number of banks which are not interconnected.⁹⁵

92 The interbank interrelationship matrix applied is not necessarily complete, as it is based on data sources which include only the 15 largest exposures to banks.

93 The connectivity for each bank is calculated as the number of relationships with the other banks relative to the maximum possible number of relationships (35 in our case). It thus ranges between 0 and 100%. The average connectivity is then the average for all banks.

94 OeNB, Financial Stability Report 7, pp. 77–87.

95 Puhr, C., Schmitz, S.W. (2009): *Structure and Stability in Payment Networks – A Panel Data Analysis of ARTIS Simulations*, OeNB, Vienna (<http://ssrn.com/abstract=1400883>).

A risk to banking system stability could arise in a situation where there were several banks in the sector that are net debtors and have a high number of relationships with other banks. Their collapse could then start a domino effect in a large part of the system, not least because interbank exposures are generally unsecured. However, the analysis of the connectivity of banks with other banks in terms of net creditor or net debtor position does not indicate that net creditor banks have a significantly different number of relationships with other banks than net debtor banks (see Chart IV.27). At the same time, most banks simultaneously have a net creditor position vis-à-vis some banks and a net debtor position vis-à-vis others (see Chart IV.28). The interbank contagion effect, moreover, is regularly tested as part of the bank stress tests (see section 4.2). Given the low connectivity, its effect is generally limited even in the highly adverse scenarios.⁹⁶

The Czech banking sector maintains a net external creditor position and its exposure to parent banks is stable

The net external position of the Czech banking sector remains positive at around 7% of GDP. To a certain extent this is also true of the net position vis-à-vis non-resident credit institutions including foreign parent banks (see Chart IV.29). The exposures of the Czech banking sector to problem regions in the EU are minimal.⁹⁷ The exposure limit vis-à-vis parent groups (20% of regulatory capital) has long been observed by domestic banks; their exposure is currently about one-half of this figure, i.e. around 10%. However, the limit is applied to net, i.e. adjusted, exposures. For example, 80% of the exposure to credit institutions from EU Member States can be subtracted from the initial gross exposure (exposure to the parent group). The total (unadjusted) exposure of banks resident in the Czech Republic (i.e. excluding foreign bank branches) to parent groups in the last two years has been around CZK 100 billion, i.e. roughly 50% of regulatory capital, or 3% of GDP.

Given the majority foreign ownership of domestic banks and the potential propagation of risks between parent companies and their subsidiaries in the current relatively volatile period, it is important to monitor the key financial soundness indicators of the parent institutions of the largest Czech banks. Overall, 2009 saw an increase in credit risk and a decline in profitability, but no losses from transaction positions were recorded compared to 2008 (see Table IV.2). The available evidence suggests that the main foreign parent banks coped well with the global turbulence, although some of them received state support.

TABLE IV.2

KEY PARENT BANK INDICATORS

(consolidated data; unweighted average for Erste Bank, SG, KBC and UniCredit)

	2008	2009
Profitability		
RoE	2.23%	-0.75%
RoA	0.13%	0.01%
Net interest income growth	69.43%	17.08%
Impairment loss growth	291.44%	82.02%
Net profit growth	-40.39%	-28.49%
Capital adequacy		
CAR	11.71%	13.69%
Tier 1 ratio	8.32%	10.07%
Regulatory capital growth	15.19%	10.67%
Asset quality		
Loan loss provisioning rate	0.72%	1.53%
NPL ratio	2.96%	3.48%
Balance sheet indicators		
Asset growth	2.05%	-7.30%
Client loan growth	10.34%	-2.65%
Loan-to-deposit ratio	125%	118%

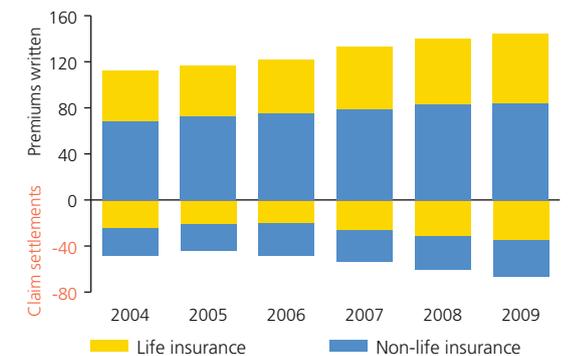
Source: Annual reports of Erste Bank, SG, UniCredit and KBC.

Note: The NPL ratio is the average for Erste Bank and UniCredit only.

CHART IV.30

Premiums written and claim settlement costs

(CZK billions)



Source: CNB

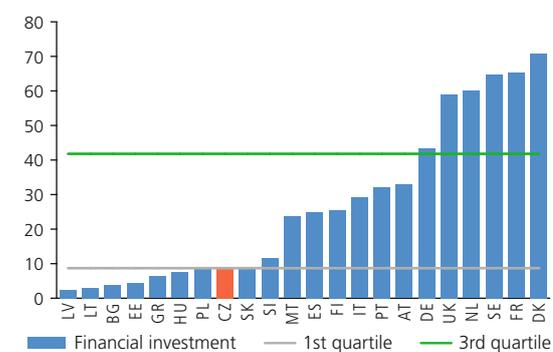
⁹⁶ However, the analysis of interbank contagion does not take account of the potential transmission of risks from abroad via links to the foreign banking groups to which Czech banks belong.

⁹⁷ In March 2010 the banking sector's total exposure to Portugal, Italy, Greece and Spain was CZK 46.3 billion, i.e. 1.1% of assets. Bonds, especially government bonds, represent the overwhelming majority of this exposure (77%). Section 4.2 contains a sensitivity analysis of the impact of potential losses from these exposures on the Czech banking sector.

CHART IV.31

Insurance penetration by financial placement volume in EU economies

(% of GDP; 2008)

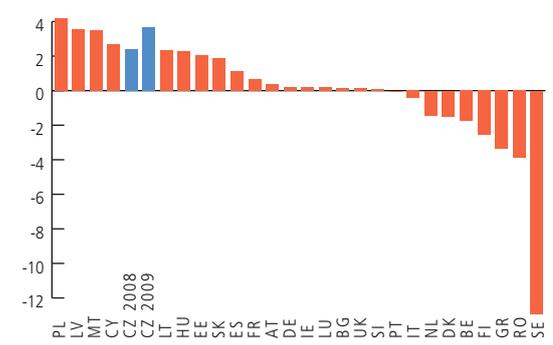


Source: CNB, ECB

CHART IV.32

Returns on assets of the insurance company sector

(%, 2008)

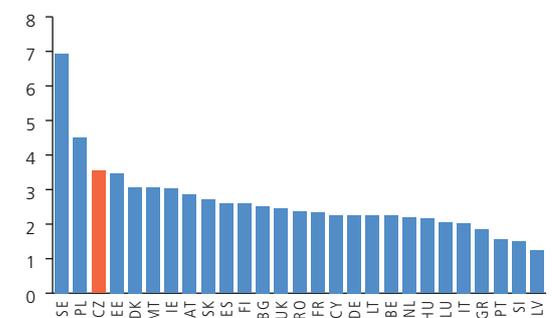


Source: CNB, CEIOPS

CHART IV.33

Solvency of insurance companies

(available to required solvency ratio; 2008)



Source: CNB, CEIOPS

The insurance sector recorded stagnant premiums written in non-life insurance only

In 2009 the insurance sector recorded no extraordinary changes or events jeopardising its proper functioning and stability. The deterioration in the performance of the Czech economy during 2009 fostered a decrease in the growth rate of premiums written in the non-life insurance market. By contrast, premiums written in life insurance rose faster than in 2008, owing chiefly to an increase in single premium payments in investment life insurance (see Chart IV.30).

Total assets, financial placement and premiums written are rising gradually in the domestic insurance sector. By comparison with other European countries, however, insurance penetration is one of the lowest, indicating a still relatively underdeveloped market, especially in the area of life insurance. The ratio of financial placement to GDP for the Czech Republic only slightly exceeds the value of the lower quartile (see Chart IV.31). In the case of life insurance, however, a number of specific factors play a role, including tax privileges, private pension scheme type and competition from similar products.

Transitory losses on bond and share portfolios were balanced during 2009, so the sector achieved high profitability

At the end of 2008 and in 2009 Q1 many securities held, above all shares and bonds, were revalued because of the adverse market situation. However, these losses did not materialise in full in the performance of insurance companies, i.e. in their profits and losses, as insurance companies can now value a large portion of the government bond portfolio (held to maturity) at amortised cost. Moreover, the financial market situation started to improve considerably in 2009 Q2 (see section 3.1). Overall, the insurance sector ended 2009 with a high return on equity of 23% (compared to 16% in 2008) and its total profit reached an all-time high in 2009. An international comparison reveals that the profitability of insurance companies in the Czech Republic is relatively high in the European context (see Chart IV.32).

The capital and solvency of Czech insurance companies are sufficient...

The aggregate solvency of insurance companies operating in the Czech Republic (i.e. their ability to ensure that insurance claims can be settled at any time using their own funds) is very good. The ratio of disposable solvency to required (minimum regulatory) solvency in the domestic insurance sector is relatively high by European comparison (see Chart IV.33).⁹⁸ Good capitalisation is also indicated by the ratio of capital to total assets, which has long been around 17%, corresponding to a relatively small leverage multiple of 5.

⁹⁸ The figure on the solvency of insurance companies in 2009 will not be released until June 2010, so it was not available at the time of preparation of this Report.

...and can be expected to remain so after the launch of the new Solvency II regulatory framework

Preparations are currently continuing for a new regulatory framework in the insurance sector requiring a systematic and comprehensive approach to risk management. The requirements of a new European directive⁹⁹ should guarantee that insurance companies have sufficient and more accurately calculated resources commensurate with the risks to which they are exposed. This should lead to an improvement in the risk management system and a strengthening of the sector's financial stability.

The fifth round of the quantitative impact study on the effects of the introduction of Solvency II will take place in 2010. According to the results of the last study, which was carried out in the EU in 2008, the capital requirements for Czech insurance companies can be expected to rise by around 150% following the introduction of the new regulatory framework. All 14 Czech insurance companies that participated in the study (representing roughly 90% of the sector's assets) would meet both the new capital requirements stipulated in the new directive.¹⁰⁰ Implementation of the new Solvency II framework is scheduled for the start of 2013.

Pension funds recorded similar security revaluation problems as insurance companies, but to a larger extent

An unfavourable environment for the pension funds sector prevailed in the first months of 2009, resulting in further losses due to revaluation of financial assets. Negative valuation differences thus deepened further from CZK 8 billion at the end of 2008 to CZK 13 billion at the end of March 2009. However, the rather more favourable situation in the financial markets starting in 2009 Q2 helped to minimise the losses. The valuation changes were only CZK -0.5 billion at the end of 2009 and turned slightly positive at the end of March 2010 (see Chart IV.34).

Unlike in 2008, capital was not strengthened by additional capital injections from shareholders

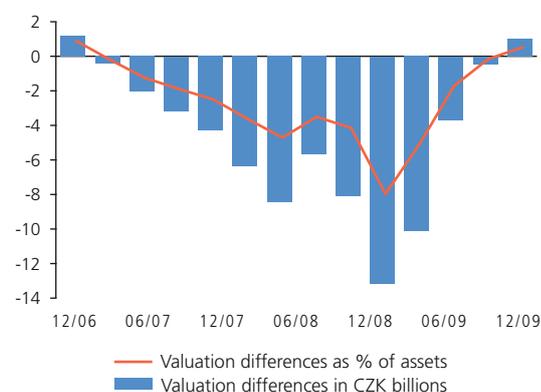
Shareholders' equity totalled 1.4% of assets in mid-2009 and 6.2% at the end of 2009. This is still less than in the insurance sector, but it represents a significant increase compared to 2008, when this ratio was only 1.7% (see Chart IV.35). The improvement in capitalisation in 2009 was due exclusively to lower valuation changes (as a component of equity). Capital injections from shareholders were minimal.

99 Directive of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of insurance and reinsurance (Solvency II).

100 The minimum capital requirement (MCR) is the amount of primary capital (own funds) of an insurance company below which clients would be exposed to an unacceptable degree of risk if the insurance company stayed in operation. If an insurance company's own funds fall below the MCR, an immediate reaction of the supervisor follows, possibly resulting in revocation of its licence. The solvency capital requirement (SCR) comprises all risks facing the insurance company and represents the amount of own funds required to cover significant unexpected losses from the insurance company's activities over the next 12 months with a probability of 99.5%.

CHART IV.34

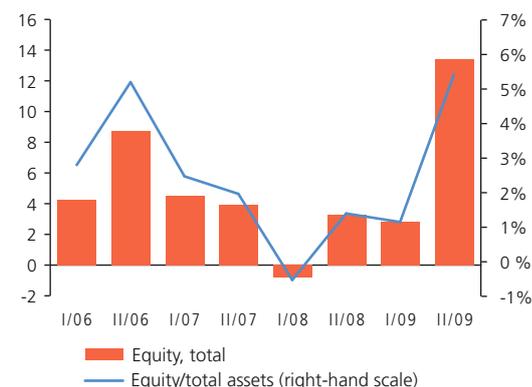
Losses from revaluation of financial assets in pension funds
(valuation differences in CZK billions and as % of assets)



Source: CNB

CHART IV.35

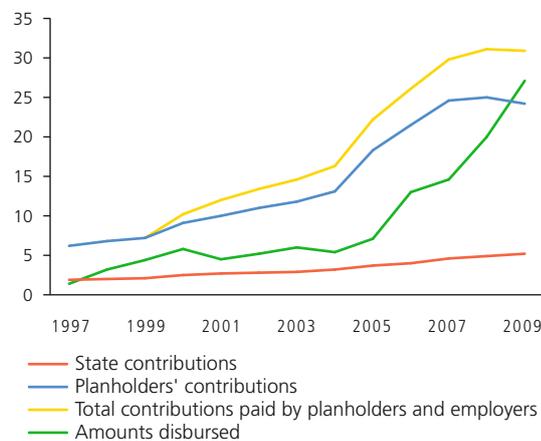
Capitalisation of pension funds
(CZK billions and %)



Source: CNB

CHART IV.36

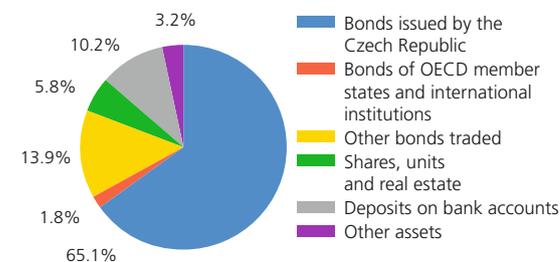
Pension fund sources and amounts disbursed in given year
(CZK billions)



Source: CNB

Note: Since 2005, planholders' contributions also include advances.

CHART IV.37

Structure of pension fund investment allocation
 (%; 2009)


Source: CNB

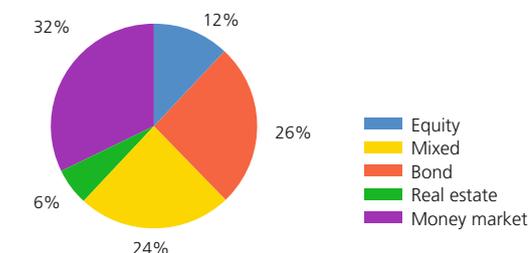
An amendment to the Capital Market Undertakings Act, which introduced valuation of a portion of pension fund portfolios (a maximum of 30% of a fund's assets) at amortised cost effective from 1 August 2009, is also helping to strengthen the sector's financial stability and its resilience to adverse financial market developments.¹⁰¹ Another new element is a "prudential mechanism" introduced on a voluntary basis during 2009 under an agreement between the CNB and the Association of Pension Funds. This mechanism will ensure that a process to increase a pension fund's equity is started if its regulatory capital falls below 50% of its risk exposure in the reference period. This mechanism has been in trial operation since 1 September 2009 and regulatory capital will continue to serve as an indicator for assessing a pension fund's financial situation.

Households withdrew their savings from pension funds as well

As in 2008, the inflow of new planholder contributions continued to slow and, conversely, the outflow of funds relating to lump sum settlement and surrender value payments increased (by 35% year on year). The higher number of clients who made use of the option to withdraw their savings was probably associated with the economic situation of households, which are opting for more liquid funds or more profitable investments at this time of recession given the low returns this sector is currently offering. Overall, however, pension funds are continuing to record a net inflow of funds if one takes into account employers' contributions (see Chart IV.36). The total assets of the pension fund sector thus increased to almost CZK 216 billion in 2009.

The allocation of pension fund investments is conservative under the legislation in force, and its structure did not change significantly from 2008 (see Chart IV.37). Roughly 90% of investments went into bonds and bank deposits, while less than 6% was invested in the more volatile shares and units.

CHART IV.38

Collective investment fund structure
 (% of total assets; 2009)


Source: CNB

The situation in the collective investment funds sector stabilised in 2009

The total assets of collective investment funds (CIFs)¹⁰² continued to decline in 2009 Q1, reaching CZK 129 billion. However, the trend then reversed and total assets stood at almost CZK 150 billion at the close of the year.¹⁰³ The largest proportion of funds was again invested in money market funds, whose share in total assets is currently 32% (see Chart IV.38); however, this represents a year-on-year decline of 6 p.p. By contrast, the lower interest rates on the money market and the recovery of stock markets at home

¹⁰¹ The amendment of the Capital Market Undertakings Act should also foster lower growth of contract intermediation costs thanks to the introduction of fees for migration between pension funds. For more details on fees, see the CNB's 2009 Financial Market Supervision Report.

¹⁰² Collective investment funds comprise all investment and mutual funds, whether open to the public or limited to qualified investors. Open-ended mutual funds intended for the public dominate this sector, accounting for over 80% of its total assets.

¹⁰³ For more information on the issue of collective investment funds, see the article *Regulation of Alternative Funds in the Czech Republic in the Context of the Debate on Their Potential Regulation in the European Union* in the thematic part of this report.

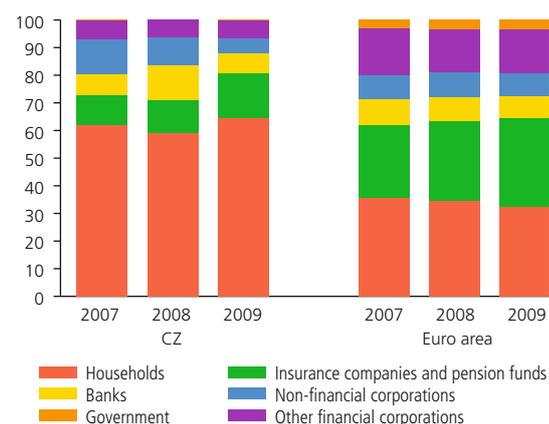
and abroad supported growth in the assets of equity funds, whose share rose from 7% to 12% by comparison with 2008.

The structure of investors in CIFs recorded only modest changes over the last two years (see Chart IV.39). A slight decline in the share of households in 2008 was reversed the following year, when it returned above 60%. The non-financial corporations sector lowered its exposure to collective investment funds from 10% at the end of 2008 to 5% at the end of 2009. This was linked with an increased need for cash in the last two years. An international comparison reveals a more balanced investor structure in the euro area. The volatility of fund returns thus affected not only households, but also other sectors, and to a larger extent than in the Czech Republic, as the exposures of the individual sectors in the euro area are higher than in the Czech Republic. In the Czech Republic, the worse financial results of CIFs manifested themselves mainly in a drop in household assets. Although the household sector accounts for the majority of total assets, the changes in CIF performance do not pose a large risk to households, as such investments represent only 6% of their financial assets in the Czech Republic compared to 8% in the euro area.

In the case of open-ended mutual funds intended for the public, unit redemptions again exceeded sales in 2009, albeit to a lesser extent than in 2008 (see Table IV.3). The full-year data are significantly influenced by the first half of 2009, as unit sales predominated in the second half of the year. This suggests that mutual funds were seen as a risky investment only in 2009 H1. By contrast, capital gains acted in the opposite direction due to the financial market recovery (see section 3.1) and led to an increase in net assets overall.¹⁰⁴

CHART IV.39

Structure of investors in CIFs by sector
(% of total investment in CIFs)



Source: CNB, ECB

TABLE IV.3

DECOMPOSITION OF CHANGE IN NET ASSETS OF OPEN-ENDED MUTUAL FUNDS INTENDED FOR THE PUBLIC
(CZK billions)

	Funds, total	Money market funds	Equity funds	Mixed funds	Bond funds	Funds of funds	Real estate funds
2008							
Income from net sales of units	-26,641	-20,148	638	-2,173	-4,105	-1,282	429
Profit from capital	-23,884	-1,646	-9,641	-5,679	-3,270	-3,718	70
Change in net assets	-50,525	-21,794	-9,002	-7,853	-7,375	-5,000	499
Net assets at end-2008	114,835	50,523	7,886	22,967	14,725	17,029	1,705
2009							
Income from net sales of units	-8,244	-4,253	875	-1,173	-950	-2,581	-162
Profit from capital	10,587	438	5,539	2,288	1,043	1,495	-215
Change in net assets	2,343	-3,815	6,414	1,116	92	-1,087	-377
Net assets at end-2009	117,178	46,708	14,299	24,083	14,817	15,942	1,328

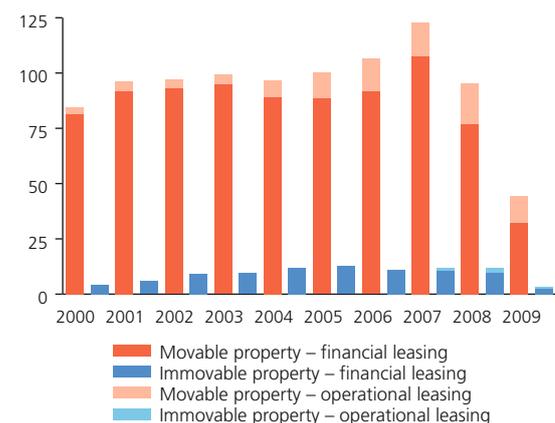
Source: CNB

¹⁰⁴ Net assets represent the difference between funds' total assets and liabilities and are equal to shareholders' equity.

In the CIF sector the investor (the holder of the fund's units or shares) directly bears the risk of a decline in asset prices, whereas open-ended mutual funds can face liquidity risk. If unit redemptions were to exceed sales and market liquidity were to fall sharply in the relevant markets at the same time (as, for example, in the aftermath of the collapse of Lehman Brothers in 2008), funds would be forced either to sell assets at a considerable loss or stop issuing and redeeming units. While some European funds (especially money market funds) faced this problem during the first phase of the global financial crisis, the positive financial market developments since the second half of 2009 and the renewal of liquidity in corporate bond markets have minimised this liquidity risk in the Czech Republic as well. The fact that domestic mutual funds offered to the public are mostly managed by management companies from bank groups is also having a positive effect. It can be expected that they would be able to provide the necessary help to funds in the event of liquidity problems in order to reduce the potential reputational risk for banks, which are usually involved in the distribution of unit certificates to clients.

CHART IV.40

Movable and immovable property leasing volumes (CZK billions)



Source: Czech Leasing and Financial Association

Non-bank financial corporations engaged in lending lost market share

The downturn in economic activity in 2009 was reflected in a slowdown not only in bank loans, but also in non-bank loans, which are used chiefly by corporations and households. The value of loans provided to residents by non-bank financial corporations engaged in lending was CZK 297 billion at the end of 2009, representing a year-on-year decrease of 16%. This can be partly explained by a drop in demand for loans in the case of non-financial corporations. In addition, a tightening of lending standards had a significant impact on the volume of loans provided. This effect was also predominant in factoring and forfaiting companies, whose services should tend to be used more at times of crisis. Financial leasing companies have the largest share on the non-bank asset financing intermediation market,¹⁰⁵ accounting for 68% of the sector's total assets. The volumes of financial leasing of movable and immovable assets provided by CLFA members recorded a marked decline of 60% year on year. This decline was due to a sharp fall in investment activity, for which financial leasing is normally used, and to a continuing trend of transferring the financing of some movable assets (cars) from financial leasing to bank loans or operational leasing.¹⁰⁶

¹⁰⁵ The non-bank asset financing intermediation market comprises financial leasing companies, factoring and forfaiting companies and other lending companies.

¹⁰⁶ The ratio of operational to financial leasing for immovable assets started to be monitored in 2007. Operational leasing enables a movable or immovable asset to be used, but no subsequent transfer of ownership occurs. It therefore *de facto* represents renting, so it is not included in the CNB statistics on financial intermediation.

4.2 ASSESSMENT OF THE FINANCIAL SECTOR'S RESILIENCE

This section sets out to assess the resilience of the Czech financial sector using stress tests and supplementary analyses. The results of the stress tests¹⁰⁷ confirm that the Czech financial sector remains resilient to risks arising from potentially adverse macroeconomic developments in 2010–2011. Advanced stress tests of the banking sector's balance-sheet liquidity indicate that the sector is resilient to strong liquidity shocks.

The situation in 2009 was closest to the baseline scenario, with the exception of GDP, but the impact of the risks was lower in reality

In addition to the *Baseline Scenario* (called *Europe in Recession*), last year's 2008/2009 FSR included two other stress scenarios (*Market Nervousness* and *Economic Depression*). The macroeconomic developments in 2009 were broadly in line with the *Baseline Scenario*, i.e. in line with the CNB's official May 2009 forecast (see section 2.1). Interest rates and inflation decreased, while the exchange rate gradually returned to stronger levels following a temporary depreciation in early 2009. The only exception was GDP growth, which deviated significantly downwards from the predicted path and neared the values of both stress scenarios (see Chart IV.41).

However, the less favourable evolution of economic output did not lead to larger loan losses in the banking sector than predicted in the *Baseline Scenario*. Both the loan losses (see Chart IV.41) and the NPL ratio were lower in reality in 2009 than predicted by all the scenarios (see Chart IV.42). This was due to intentional overestimation of the credit risk parameters in the conservatively calibrated model of NPL growth. At the end of 2009, the capital adequacy ratio was much higher than estimated in the individual scenarios. This was due above all to an increase in bank capitalisation from retained earnings of 2008. Similar favourable developments were also observed in the other sectors tested, i.e. insurance companies and pension funds.

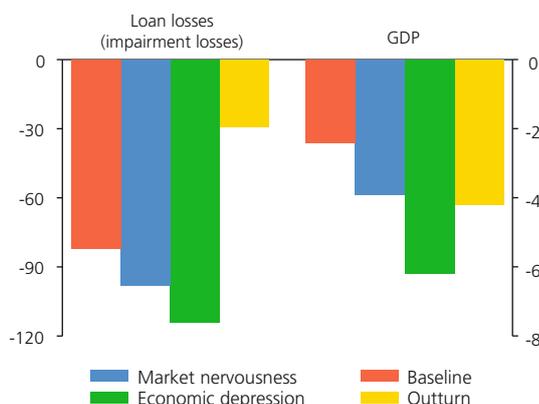
The *Loss of Confidence* scenario has the greatest impact of the new alternative scenarios

Section 2.1 introduced three alternative scenarios (*Baseline Scenario*, *Return of Recession* and *Loss of Confidence*). While the *Baseline Scenario* corresponds to the current (May) CNB macroeconomic forecast, the two stress scenarios capture the most significant risks to financial stability in the Czech Republic.

CHART IV.41

Loan loss forecasts and estimates: last year's scenarios versus 2009 outturns

(GDP in %, right-hand scale; loan losses in CZK billions, left-hand scale)

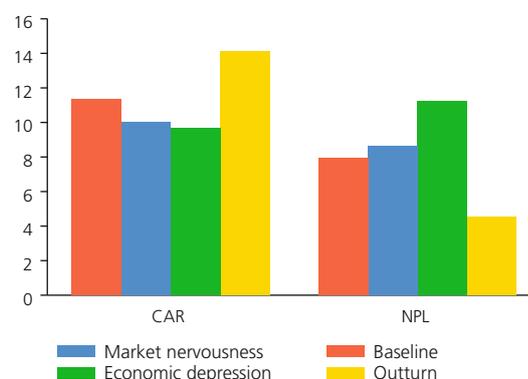


Source: CNB

CHART IV.42

Estimates of NPL ratio and capital adequacy ratio: last year's scenarios versus 2009 outturns

(%)



Source: CNB

¹⁰⁷In order to include the most up-to-date assessment of the potential risks to financial stability in this Report, which also covers the first few months of 2010, the stress tests were performed using the latest available data (March 2010 for the banking sector, end of 2009 for insurance companies and pension funds). This approach differs from previous years, when year-end test results were presented. The results of the banking sector stress tests conducted on the end-2009 portfolios are available on the CNB's website (http://www.cnb.cz/en/financial_stability/stress_testing/index.html).

TABLE IV.4

ASSESSMENT OF THE IMPACT OF THE ALTERNATIVE SCENARIOS ON THE FINANCIAL SECTOR AS A WHOLE				
		Baseline Scenario	Return of Recession	Loss of Confidence
Total impact of shocks (CZK bn)	Banks*	-32.0	-53.4	-67.3
	Insurance companies	-0.1	-3.1	-7.6
	Pension funds	-0.4	-3.4	-8.1
	Total in CZK billions	-32.5	-59.9	-82.9
	Total in % of assets	-0.7	-1.2	-1.7
Change in capitalisation (between 2009 and 2010)	Banks (CAR in p.p.)	-1.4	-2.7	-2.6
	Insurance companies (solvency in p.p.)	-46.6	-61.3	-126.8
	Pension funds (capitalisation in p.p.)	1.5	0.2	-2.0
Need for capital injections	Banks	0.0	2.1	2.4
	Insurance companies	0.0	0.1	2.8
	Pension funds	0.0	0.0	0.0
	Total in CZK billions	0.0	2.2	5.2
	Total in % of GDP	0.00	0.06	0.14

Source: CNB, CNB calculation

* The figure for banks is the average for 2010 and 2011

Despite the differences in methodology of the tests of the individual sectors and the different shock impact horizons, it can be inferred that the *Loss of Confidence* scenario has the most severe impact on the financial sector as a whole. This scenario generates the greatest risk impacts in all the sectors tested, primarily in the form of loan losses and losses from revaluation of securities or property (see Table IV.4). The aggregate impact on the entire sector would be just under 2%. At the same time, this scenario leads to the largest decrease in solvency indicators (capital adequacy, solvency and capitalisation), taking into account the dampening effect of the expected returns in an adverse period. The *Loss of Confidence* scenario also predicts the largest capital injection into the sector as a whole, albeit a relatively small one of around CZK 5 billion (less than 0.15% of GDP).

In all scenarios, all the sectors as a whole remain resilient to the adverse developments. In no scenario would the aggregate solvency indicators fall below the regulatory thresholds (see below). Capital injections would be relatively small.

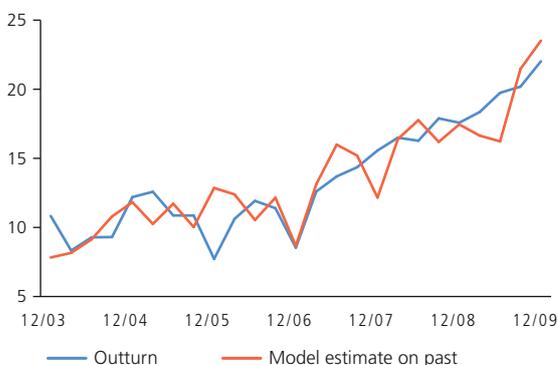
The banking sector tests apply an advanced methodology

Since the publication of FSR 2008/2009 last year, significant progress has been made in the banking sector stress test methodology towards test dynamisation, extension of the test horizon from one year to two years, greater use of modelling techniques and higher compatibility of testing practices at the CNB with commercial bank practices. This direction was outlined in FSR 2008/2009 (Box 8: *Dynamic stress tests for banks*, pp. 64–65). Several further refinements have been made by comparison with the thematic article describing the updated methodology:¹⁰⁸ the banking sector stress test results presented in this section already use a different methodology for calculating the default rate for the main segments, updated partial models for credit risk and loan growth, a change in the linkage between LGD and macroeconomic developments and above all a new banking sector income model (see Box 7).

CHART IV.2 BOX

Outturn versus model estimate of adjusted operating profit on the past

(quarterly values in CZK billions; seasonally adjusted)



Source: CNB, CNB calculation

Box 7:

BANKING SECTOR INCOME MODEL

One of the main factors limiting the impact of losses from adverse economic developments is the ability of banks to generate income even in bad times. The stress tests therefore introduce an analytical item of the profit and loss statement capturing key components of operating profit (adjusted operating profit, AOP).¹⁰⁹ This item is constructed as the sum of net interest

¹⁰⁸ See the thematic article *Stress Test Verification as Part of an Advanced Stress Testing Framework* (Geršl and Seidler) in this Financial Stability Report.

¹⁰⁹ This was referred to as net income in FSR 2008/2009; owing to misunderstandings arising from it being mistaken for net profit it has been renamed to better reflect the operating character of this item.

income, profit from fees and commissions and dividends received less administrative and other operating expenses. AOP excludes loan impairment losses (the impact of the credit shock) and the results of financial operations (revaluation of securities holdings and exchange rate gains or losses as the impact of market shocks).

The previous banking sector AOP estimation method for the individual alternative scenarios applied a very simplified expert assumption that they represent a fixed percentage of the average of this item for the last eight quarters.¹¹⁰ In line with the strategy of further developing the banking sector stress tests, a model was developed for AOP estimation, which is used for the first time in this FSR to estimate this indicator of income for the individual alternative scenarios.

The current version of the model, estimated on data for 2002–2009, is as follows:

$$\Delta AOP_t = -1,3 + 0,07\Delta YC_{t-3} + 0,94\Delta NPL_{t-3} + 8,0MA_GDP_t + 0,08CAR_{t-1}$$

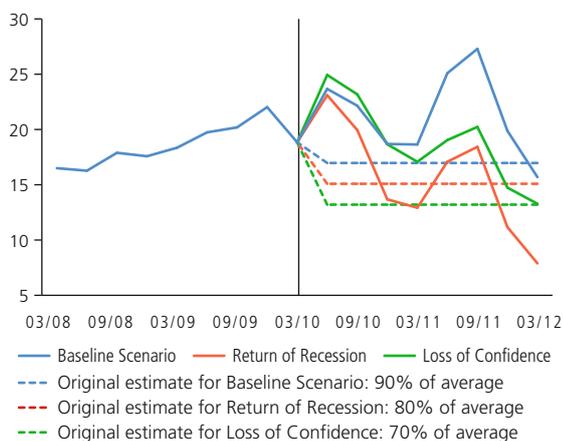
where ΔAOP is annual growth in quarterly AOP volumes, ΔYC is the annual change in the slope of the yield curve (5Y-3M), ΔNPL is annual growth in the volume of NPLs, MA_GDP is average nominal GDP growth for the last six quarters and CAR is the capital adequacy ratio. These explanatory variables appear to be economically the most important determinants of interest income (yield curve slope, NPL growth as a proxy for risk margins) and non-interest income (nominal GDP growth as a proxy for the volume of financial intermediation). The lagged capital adequacy ratio appears to be significant in the context of the time series used, as banks had higher capital buffers to prepare for loan portfolio growth in subsequent periods and related growth in interest and non-interest income.¹¹¹ The estimated model captures the evolution of AOP in the past relatively well (see Chart IV.2 Box).

A conservative strategy was applied to the final AOP estimate for the period ahead in the individual scenarios. It consisted in a downward revision of the AOP growth prediction of one standard deviation of growth volatility for 2002–2009, i.e. 0.24. This conservative revision aims to underestimate the prediction of income slightly. As the estimated coefficients and linkages can change unfavourably, especially in the stress scenarios, this is a way of estimating future income that is consistent with

CHART IV.3 BOX

Estimate of adjusted operating profit for each scenario

(CZK billions; seasonally adjusted)

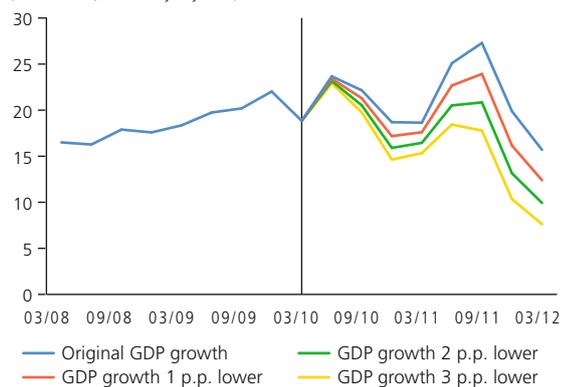


Source: CNB, CNB calculation

CHART IV.4 BOX

Sensitivity of estimate of adjusted operating profit to GDP for Baseline Scenario

(CZK billions; seasonally adjusted)



Source: CNB, CNB calculation

¹¹⁰For example, in FSR 2008/2009, adjusted operating profit was assumed to be 90% of the average for the previous two years in the *Europe in Recession* scenario, while the assumptions for the other adverse scenarios were 80% and 70% of the average.

¹¹¹Growth in capital adequacy can have a positive effect on a bank's profitability also because it is a proxy for the overall soundness of a bank, which can afford to have a riskier – and therefore more profitable – banking business profile if it has higher capitalisation.

TABLE IV.5

KEY VARIABLES IN THE INDIVIDUAL SCENARIOS

(average for given years)

	Baseline Scenario		Return of Recession		Loss of Confidence	
	2010	2011	2010	2011	2010	2011
Macroeconomic variables						
GDP	1.4	1.8	-1.1	-0.7	-0.2	-2.1
Exchange rate	25.3	24.8	25.6	25.8	27.5	27.8
Inflation	1.4	1.8	1.4	1.3	1.9	3.1
Unemployment	9.7	9.9	10.4	12.1	10.1	11.6
Nominal wage growth	3.7	3.8	3.0	1.6	3.3	3.1
Effective GDP growth in euro area	1.4	1.8	-0.2	-2.4	1.0	1.1
Credit growth						
Total	5.6	15.2	4.4	4.0	4.1	-3.7
Corporations	0.5	9.8	-1.1	-3.7	-1.7	-11.2
Households	13.0	21.3	12.3	13.8	12.6	6.4
Default rate (PD)						
Corporations	5.0	1.9	7.0	3.8	7.9	5.8
Loans for house purchase	6.2	5.0	6.7	6.8	6.8	6.1
Consumer credit	8.5	6.8	9.2	9.3	9.3	8.4
Loss given default (LGD)						
Corporations	44.9	45.0	57.7	57.3	53.3	64.8
Loans for house purchase	20.0	20.0	23.1	29.1	26.3	34.5
Consumer credit	57.7	58.7	60.9	69.6	59.3	67.0
Financial markets and property market						
3M PRIBOR	1.2	1.9	1.0	0.8	4.3	4.3
1Y PRIBOR	1.5	2.2	1.3	1.1	4.6	4.3
5Y yield	2.3	2.4	2.8	3.2	4.7	6.0
3M EURIBOR	0.9	1.6	0.9	1.6	0.9	1.6
1Y EURIBOR	1.2	1.9	1.2	2.0	1.2	2.0
5Y EUR yield	2.5	2.5	2.5	2.5	2.5	2.5
Change in res. property prices	-2.4	5.4	-5.8	-5.9	-8.9	-7.8
Change in share prices	0.0		-20.0		-30.0	
Banking sector earnings						
Adjusted operating profit (y-o-y)	13.8	2.8	3.5	-35.3	14.3	-36.3
Insurance sector						
Risk growth in LI*	3.0		3.0		3.0	
Risk growth in NLI**	50.0		50.0		50.0	

Source: CNB, CNB calculation

* growth in gross claim settlement costs

** increase in insurance reserves, premiums written or gross technical provisions

the prudential principle applied in the stress tests. The prediction for the individual scenarios prepared in this way is to a large extent similar to the expert setting of AOP using a percentage of the average for the previous two years, which was applied in the past (see Chart IV.3 Box). However, the model estimate is more realistic and better shows the dynamics over time in relation to the evolution of the economic environment.

The most important item affecting the AOP estimate is of course real GDP growth, which enters the model indirectly through the MA_GDP variable. A simple analysis of the dependence of AOP on alternative assumptions of real GDP growth shows that a decline in growth of 1 p.p. leads to a decline in AOP of about 10% (see Chart IV.4 Box).

The risk parameters for credit risk are now better linked to macroeconomic developments and asset price movements

The scenarios are defined using the quarterly evolution of key macroeconomic variables (GDP, inflation, etc.) over the next eight quarters (see Table IV.5). The key risk parameters for credit risk, i.e. PD and LGD for the main credit segments of bank portfolios, are derived using submodels. While this was also the case for PD in FSR 2008/2009, the LGD parameter is now linked to GDP (loans to corporations), unemployment (consumer credit to households) and residential property prices (house purchase loans to households) using estimated elasticities. Each percentage point of decline in GDP growth compared to the *Baseline Scenario* generates an increase in LGD of 5 p.p. above the initial value of 45%. A rise in unemployment of 1 p.p. generates an increase in LGD for consumer credit of 5 p.p. above the initial value of 55%.

LGD for house purchase loans is linked to the estimated trend in residential property prices in the individual scenarios (see section 3.2). Although banks report a very conservative LTV (loan-to-value) ratio for mortgage loans of around 55%, the initial ("benchmark") LGD value for this segment is roughly 20%. The main reason for loan losses even in a situation where the value of collateral is significantly higher than the volume of loans is the high cost associated with selling property, which can reach 40–60% of the property value.¹¹² Each percentage point of decline in property prices is thus directly reflected in an equal increase in LGD above the initial value of 20% (see Chart IV.43). As a conservative safeguard, LGD was fixed at this value for the case of growth in property prices. The initial values of these three main segments of the loan portfolio were derived from the values reported by selected banks in the joint stress-testing project of the CNB and the largest banks (see Box 8).

¹¹² See, for example, Moody's (2009): *Moody's Approach to Estimating Czech Banks' Credit Losses*, Moody's Global Credit Research, July 2009.

Box 8:**JOINT STRESS TESTING BY THE CNB AND THE BANKING SECTOR**

Based on an agreement with the largest banks in the Czech Republic, the CNB introduced joint (bottom-up) stress testing in 2009 aimed at assessing the effects of negative economic scenarios on the quality of the loan portfolios of selected banks and thereby further refining the impacts of adverse shocks on the domestic banking sector. This box briefly summarises the results of the second round of joint stress testing, which took place at the beginning of 2010.¹¹³

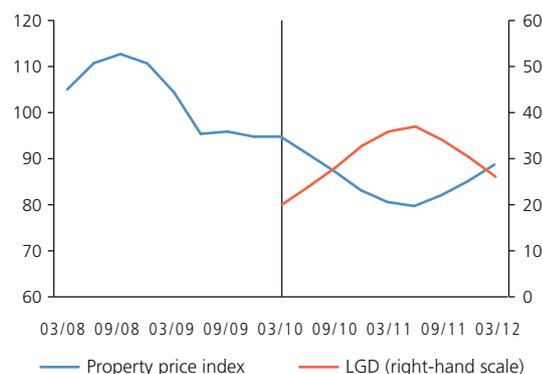
Like the CNB's aggregate stress tests, which test the entire Czech banking sector, the joint stress tests performed with selected banks are based on different scenarios expressing risks in relation to the macroeconomic cycle. For the given scenarios, banks are provided with information on the changes in PD for the individual categories of corporate and retail exposures.¹¹⁴ On the basis of this information, banks carry out stress tests of these portfolios at the one-year horizon and report the principal data on the estimated impacts of the scenarios on the individual loan segments back to the CNB.

The second round of joint stress tests used data as of 31 December 2009. The aggregated PD and LGD values for the individual loan portfolios of banks and the changes thereto stemming from the baseline scenario and the adverse scenario are presented in Table IV.1 Box. The higher PD values in both scenarios lead to expected loan losses in all tested credit segments and to higher capital requirements. If the capital requirements for other, non-stress tested segments (institutions, government and central bank), the capital requirements for other types of risk and the volume of regulatory capital remained unchanged, the aggregate capital adequacy ratio as of 31 December 2010 would fall from 14.3% to 12.9% under the baseline scenario and to 11.8% under the adverse scenario (see Table IV.2 Box).

In the calculation of the capital adequacy ratio the assumption of constant regulatory capital was subsequently relaxed. In this case, the regulatory capital of each bank in 2010 is lowered by the difference between expected losses as of 31 December 2009 and expected losses at the one-year horizon, i.e. as of 31 December 2010, in the individual scenarios. Although this calculation is based on a simplifying assumption of unchanged provisions and reserves at the end of 2009, its goal is to subject

CHART IV.43

**Property price index and LGD for house purchase loans:
Loss of Confidence scenario**
(2007 Q4 = 100; LGD in %)



Source: CNB, CZSO, CNB calculation

TABLE IV.1 BOX

APPROXIMATE RISE IN PD FOR INDIVIDUAL PORTFOLIOS
(EAD weighted; %)

	Actual situation as of 31 Dec. 2009		Baseline scenario	Adverse scenario
	PD (%)	LGD (%)	PD (%)	PD (%)
Corporate exposure categories	2.65	41.34	3.62	5.62
Large enterprises	1.77	41.19	2.42	3.76
Small and medium-sized enterprises (SMEs)	3.54	40.66	4.81	7.43
Specialised lending	2.95	44.00	4.12	6.48
Retail exposure categories	3.00	33.08	3.54	4.48
Retail-assessed SMEs	3.49	45.78	4.89	7.60
Loans for house purchase	2.15	19.76	2.36	2.80
Other loans to individuals	4.48	53.93	5.29	6.48

Source: CNB

TABLE IV.2 BOX

CAPITAL ADEQUACY FOR CONSTANT REGULATORY CAPITAL LEVEL
(CZK millions)

	31 Dec. 2009	Capital requirement			
		Baseline scenario	Change (%)	Adverse scenario	Change (%)
Capital requirements, total (including other risks)	123,147	136,368	10.74	149,917	21.74
Regulatory capital	220,630	220,630	0	220,630	0
Capital adequacy ratio (%)	14.33	12.94	-1.39 p.p.	11.77	-2.56 p.p.

Source: CNB, CNB calculation

¹¹³ Further information on the project, including the results of the first pilot round, is available in the CNB's 2009 Financial Market Supervision Report.

¹¹⁴ The LGD risk parameter is not currently stress-tested.

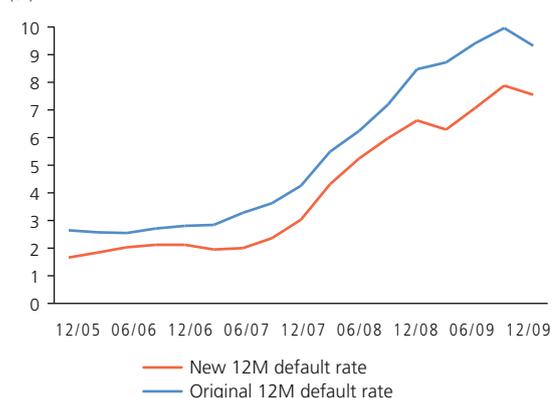
TABLE IV.3 BOX

	31 Dec. 2009	Capital requirement		Adverse scenario	Change (%)
		Baseline scenario	Change (%)		
Capital requirements, total (including other risks)	123,147	136,368	10.74	149,917	21.74
Change in capital due to change in EL	0	-7,714	0	-18,896	0
Regulatory capital	220,630	212,917	-3.50	201,734	-8.56
Capital adequacy ratio (%)	14.33	12.49	-1.84 p.p.	10.77	-3.57 p.p.

Source: CNB, CNB calculation

CHART IV.44

Difference between original and new 12M default rate of non-financial corporations (%)



Source: CNB, CNB calculation

TABLE IV.6

	Baseline Scenario		Return of Recession		Loss of Confidence	
	2010	2011	2010	2011	2010	2011
Expected credit losses						
CZK billions	-40.6	-26.1	-56.1	-48.2	-48.1	-68.8
% of assets	-1.0	-0.6	-1.3	-1.1	-1.1	-1.7
Profit/loss from market risks						
CZK billions	4.8	-1.8	0.6	-1.5	-17.9	2.3
% of assets	0.1	0.0	0.0	0.0	-0.4	0.1
Interbank contagion						
CZK billions	-0.1	0.0	-0.4	-1.3	-0.3	-1.6
% of assets	0.0	0.0	0.0	0.0	0.0	0.0
Earnings for covering losses (adjusted operating profit)						
CZK billions	83.3	90.6	75.3	59.2	85.5	70.8
% of assets	2.0	1.9	1.8	1.4	2.0	1.7
Pre-tax profit/loss						
CZK billions	47.3	62.6	19.4	8.3	19.1	2.6
% of assets	1.1	1.3	0.5	0.2	0.5	0.1

Source: CNB, CNB calculation

banks to additional stress.¹¹⁵ Even in this case, however, the aggregate capital adequacy ratio did not fall below the 10% threshold (see Table IV.3 Box).

The project of joint stress testing by the CNB and selected commercial banks indicates sufficient resilience of the participating banks to adverse macroeconomic shocks. The CNB's aggregate stress tests, discussed in more detail in this section of the report, arrive at the same conclusion.

In addition to information about the sector's resilience, the joint stress-testing project provides the CNB with a great deal of useful information on the levels and evolution of some risk parameters, which are being used to refine the CNB's aggregate stress tests on an ongoing basis.¹¹⁶ The project also provides value added by encouraging more intensive communication between the CNB and the participating banks regarding potential risks and the appropriate configuration of the stress testing methodology.

The new PD calculation methodology for non-financial corporations takes into account the values reported by banks

The PD values for the non-financial corporations segment reported by banks under the joint stress test project were significantly below those previously used in the CNB's aggregate stress tests, which were derived from observed and model-estimated default rates calculated from data in the CNB's credit register. Given uncertainty about the default rate, the original methodology was very conservative in the sense that it regarded loans 30 days or more past due as non-performing (whereas the standard definition is 90 days or more past due) and, moreover, slightly overestimated the volume of NPLs defined in this way.

The methodology has been changed because of considerable overestimation of loan losses compared to actual outcomes, due chiefly to an excessively high default rate. The new methodology only takes into account loans 90 days or more past due and leads to a lower default rate (see Chart IV.44), but it maintains some margin of overestimation by comparison with the values reported by the largest banks.

The stress scenarios would lead to an increase in credit risk and loan losses in the banking sector

The new two-year test horizon allows us to estimate the loan and other losses of the banking sector in the individual scenarios over the next

¹¹⁵This version of the calculation can be interpreted as the influence of unexpected loss (represented by capital requirements) and expected loss on the bank's capital adequacy if an adequate increase in provisions and reserves on the stress-tested portfolios failed to occur.

¹¹⁶See the thematic article *Stress Test Verification as Part of an Advanced Stress Testing Framework* in this Report.

eight quarters. However, for the sake of greater clarity and easier comparison with developments in the sector and the results of the tests of other sectors, the results are presented as values for the whole calendar years 2010 and 2011 (see Table IV.6). Increases in PD and partly also LGD contribute to loan losses, resulting in an obligation to create higher provisions. The risk costs of the banking sector, as measured by the volume of new provisions divided by total gross loans (the loan loss provisioning rate), could rise from 1.9% in 2009 to more than 3% (see Chart IV.45).

The banking sector as a whole does not record an accounting loss under the stress scenarios and maintains a positive return on assets of between 0.1% and 0.5% (see Table IV.6). The impact of the shocks is the largest in the *Loss of Confidence* scenario, where additional losses arise as a result of market risks (especially a decrease in bond prices) compared to the other scenarios. The role of interbank contagion remains limited in all the scenarios, owing to the relatively low connectivity between domestic banks (see section 4.1). Hence, the aggregate impacts of the shocks with and without interbank contagion do not differ much.

Non-financial corporations account for a large proportion of the loan losses in 2010, but the share of households would increase in 2011 in all the scenarios (see Chart IV.46).

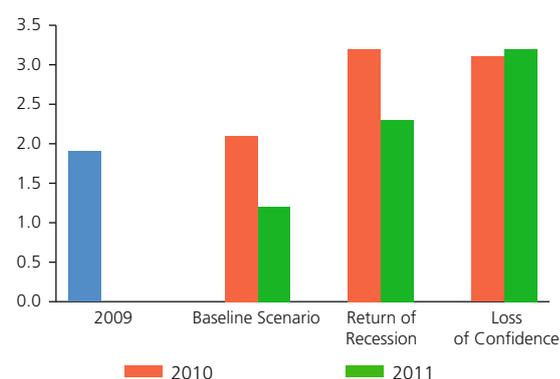
Capital adequacy exceeds the regulatory minimum in all the scenarios

The capital adequacy ratio exceeds the regulatory minimum of 8% in all the scenarios (see Chart IV.47). Tier 1 capital adequacy is roughly 1 p.p. lower than total capital adequacy.

Although the sector as a whole will maintain a capital adequacy ratio above the regulatory limit, this indicator might drop below 8% for several banks due to losses in the stress scenarios, and the shareholders of such banks would be forced to increase their capital. However, even in the worst scenario, the topping-up of the capital adequacy of all banks resident in the Czech Republic to the required minimum would require smaller capital injections than suggested by the bank stress test results published in FSR 2008/2009. According to the current stress tests, the necessary increases in regulatory capital in the most pessimistic scenario are estimated at only CZK 3 billion, i.e. less than 1% of the existing bank regulatory capital and less than 0.1% of GDP. In last year's Financial Stability Report, the capital injections necessary in the worst stress scenario were calculated at CZK 15.7 billion. Although this indicator is not fully comparable between the current and previous FSR owing to the changes in testing methodology, it indicates an increased resilience to shocks. The main reason for the lower need for capital injections even in the worst scenario in the current tests is a higher initial capital adequacy ratio, which is 14.3% (compared to 12.3% in last year's FSR).

CHART IV.45

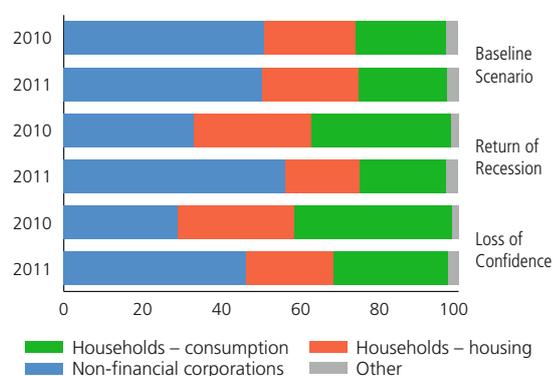
Risk costs of the banking sector in each scenario
(provisioning as % of gross loans for given year)



Source: CNB, CNB calculation

CHART IV.46

Contributions of individual segments to total loan losses
(%)

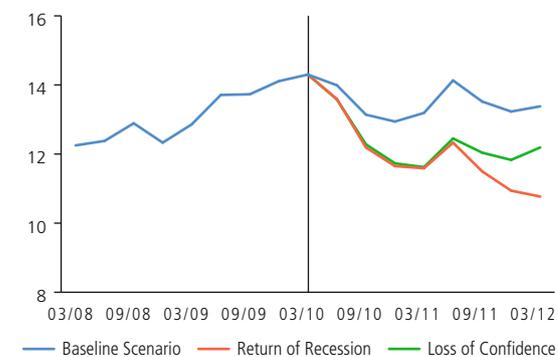


Source: CNB, CNB calculation

CHART IV.47

Capital adequacy ratios in each scenario

(%)

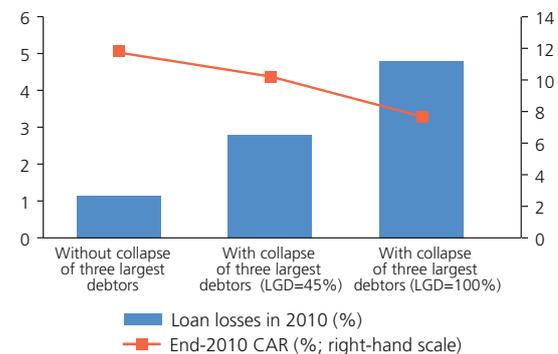


Source: CNB, CNB calculation

CHART IV.48

Impact of the collapse of the three largest debtors of each bank in the Loss of Confidence scenario

(%)

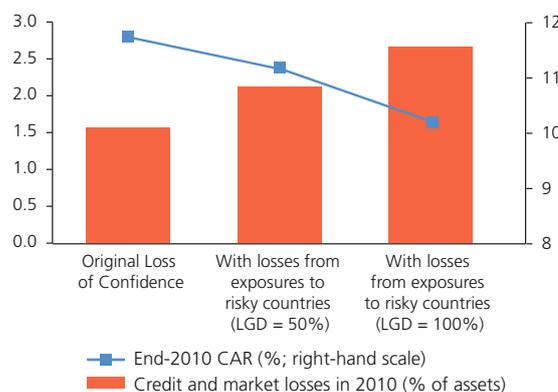


Source: CNB

CHART IV.49

Impact of the ad-hoc "propagation of Greek crisis" test in the Loss of Confidence scenario

(%)



Source: CNB, CNB calculation

An ad-hoc test of portfolio concentration indicates significant impacts of potential bankruptcy of the largest debtors

One of the more important risks is the possibility of a non-linear increase in credit risk, especially if the largest debtors of the individual banks, i.e. the largest corporations, defaulted on their debt. This could occur, for example, at the peak of the adverse phase of the credit cycle. The *Loss of Confidence* scenario involves the highest default rate of around 9%, occurring at the end of 2010 (see section 2.2). Under this scenario, losses from the bankruptcy of three largest debtors of each bank were added to the standard loan losses for this period.

The impact of such an ad-hoc shock would depend critically on the LGD value. As the largest corporations are rated by banks as high-quality debtors, the loans provided to them are usually unsecured, implying an LGD of 100%. On the other hand, many larger companies have assets that could at least partly reduce banks' loan losses in the event of bankruptcy. The test was eventually performed in two alternatives, for LGD = 100% and LGD = 45%; both these values can be viewed as extremes.

The impacts of such an ad-hoc test would be dramatic if LGD was 100% (see Chart IV.48). The sector's capital adequacy ratio falls towards the regulatory threshold of 8% at the end of 2010 and the capital injections necessary to keep each bank at least at 8% would be CZK 47 billion in 2010, i.e. roughly 18% of the current volume of regulatory capital and around 1.5% of GDP. At the same time, however, it must be taken into account that the bankruptcy of the three largest debtors of each bank is an extremely implausible scenario with a probability several times, or many times, lower than even the crisis in the Czech Republic in the late 1990s. The probability of this scenario is very low even by comparison with the normally used very unlikely adverse stress scenarios.

The Czech banking sector is able to withstand the potential losses from propagation of the Greek crisis

Under the *Loss of Confidence* scenario, we carried out an additional sensitivity analysis assuming propagation of the Greek crisis to other risky countries in the southern part of the EU (Spain, Portugal and Italy) and a marked decline in exposures to these countries. At the end of March 2010, the exposures of the Czech banking sector to all four countries totalled CZK 46.3 billion, consisting mostly (77%) of bonds, especially government bonds.

Assuming a 50% loss (LGD) on these exposures, banks would have to write off CZK 23.1 billion (0.5% of assets); under the very extreme assumption of a 100% loss the figure would be CZK 46.3 billion (1% of assets). In both these very improbable cases the capital adequacy of the banking sector would not fall below the regulatory minimum (see Chart IV.49). However, the necessary capital injections would rise to almost CZK 16 billion (i.e. 6% of regulatory capital and around 0.5% of GDP) compared to the original *Loss of Confidence* scenario.

An additional reverse stress test shows that only an extremely unlikely decline in GDP could reduce the sector's capital adequacy ratio below 8%

One of the ways of supplementing stress test results is to perform a reverse stress test (i.e. a stress test using reverse logic). Such a test answers the question how much a macroeconomic, market or other variable, or combination thereof, would have to change for a situation of insufficient capital adequacy (i.e. effectively a CAR below 8%) to arise in the banking sector. Given the stress test methodology used, which combines the effects of numerous variables, it is apparent that many such combinations exist.

For simplicity, only the two variables with the most important impact on the banking sector via credit risk and income were used, namely GDP and unemployment. One limitation of this approach is that modifying these variables without simultaneously modifying the other macroeconomic variables (inflation, the exchange rate, interest rates) disrupts the scenario's macroeconomic consistency. The *Return of Recession scenario*, which already assumes a significant drop in GDP, was chosen as the baseline scenario. The aim was to find the GDP growth path (i.e. to lower the expected GDP growth figures by X p.p.) that generates a decline in the banking sector's CAR below 8% in at least one of the eight quarters.¹¹⁷

The results show that the growth path would be at least 2.5 p.p. lower in the *Return of Recession* scenario (see Chart IV.50). Only in this case does the banking sector as a whole fall slightly below 8% at the end of the test period, i.e. as of 31 December 2011. Such low GDP growth, temporarily reaching almost -7%, can be regarded as relatively unlikely.

Banks' financial soundness is confirmed by the current values of the banking stability index

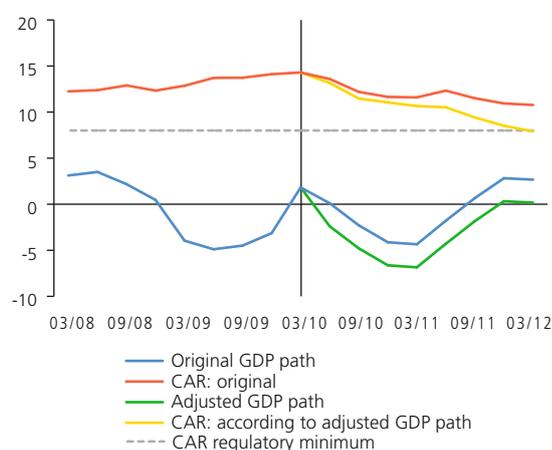
The regularly calculated banking stability index, constructed as a weighted average of the key indicators of banking sector soundness (profitability, asset quality, liquidity, capital adequacy and credit and currency risk indicators), deteriorated slightly in 2009 H2 (see Chart IV.51).¹¹⁸ This was due mainly to lower asset quality, which has a relatively large weight (one-quarter) in the overall index. However, better profitability and an increase in capital adequacy partly offset the deterioration in asset quality.

¹¹⁷ Unemployment was linked to GDP in accordance with Okun's law (the following relationship was used: change in unemployment rate = -0.4 times change in real GDP growth).

¹¹⁸ 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*, Financial Stability Report 2006, CNB, pp. 69–79.

CHART IV.50

Results of reverse stress test
(%; for Return of Recession scenario)

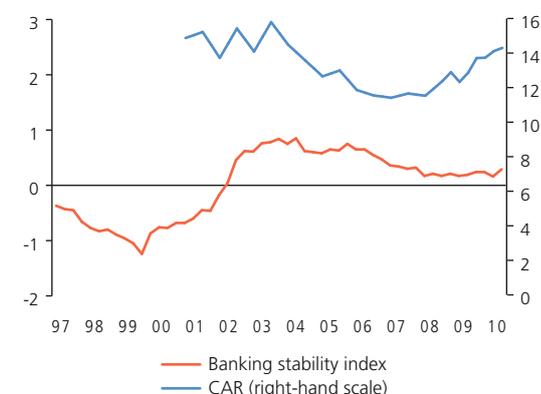


Source: CNB, CNB calculation

CHART IV.51

Banking stability index

(standard deviations from historical average; CAR in %)

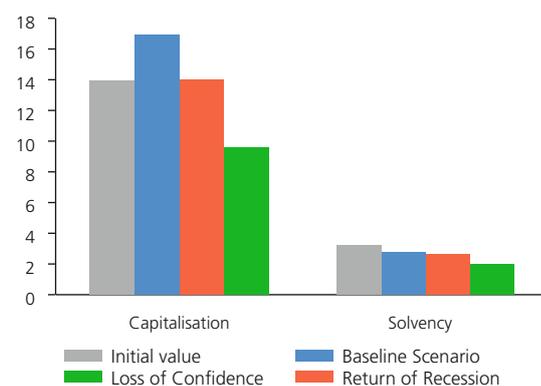


Source: CNB, CNB calculation

CHART IV.52

Solvency and capitalisation indicators of insurance companies in each scenario

(solventy: ratio of available to required solvency ratio; capitalisation in %)



Source: CNB, CNB calculation
Note: Assuming zero dividends.

TABLE IV.7

RESULTS OF INSURANCE COMPANY STRESS TESTS				
		Baseline Scenario	Return of Recession	Loss of Confidence
Market risks				
Bond revaluation gains/losses				
	CZK billions	0.14	-4.59	-18.72
	% of assets	0.04	-1.28	-5.22
Exchange rate gains/losses				
	CZK billions	-0.39	-0.26	1.00
	% of assets	-0.11	-0.07	0.28
Gains/losses from changes in share value				
	CZK billions	0.00	-6.11	-9.17
	% of assets	0.00	-1.70	-2.56
Gains/losses from changes in property value				
	CZK billions	0.00	-0.15	-0.33
	% of assets	0.00	-0.04	-0.09
Credit risk				
Losses from unpaid claims				
	CZK billions	-0.52	-0.63	-0.95
	% of assets	-0.15	-0.18	-0.27
Specific insurance risk				
Claim settlement costs in LI				
	CZK billions	-0.20	-0.20	-0.20
	% of assets	-0.06	-0.06	-0.06
Claim settlement costs in NLI				
	CZK billions	-1.28	-1.28	-1.28
	% of assets	-0.36	-0.36	-0.36
Projected earnings				
	CZK billions	12.45	12.45	12.45
	% of assets	3.47	3.47	3.47
Total impact on equity				
	CZK billions	10.19	-0.78	-17.20
	% of assets	2.84	-0.22	-4.79

Source: CNB, CNB calculation

TABLE IV.8

RESULTS OF PENSION FUND STRESS TESTS				
		Baseline Scenario	Return of Recession	Loss of Confidence
Market risks				
Bond revaluation gains/losses				
	CZK billions	0.06	-1.77	-7.47
	% of assets	0.03	-0.82	-3.46
Exchange rate gains/losses				
	CZK billions	-0.50	-0.33	1.30
	% of assets	-0.23	-0.15	0.60
Gains/losses from changes in share value				
	CZK billions	0.00	-1.15	-1.73
	% of assets	0.00	-0.53	-0.80
Gains/losses from changes in property value				
	CZK billions	0.00	-0.11	-0.24
	% of assets	0.00	-0.05	-0.11
Allocation of earnings				
	CZK billions	3.68	3.68	3.68
	% of assets	1.70	1.70	1.70
Total impact on equity				
	CZK billions	3.23	0.32	-4.46
	% of assets	1.50	0.15	-2.06

Source: CNB, CNB calculation

Stress tests of insurance companies confirm good resilience of this sector

The insurance company stress-testing methodology remained unchanged from FSR 2008/2009. Again, the tests focus mostly on market risks, with the biggest impact being assigned to the risk of revaluation of long-term bonds and losses from declines in stock prices. However, shocks specific to the insurance sector were also considered. After taking into account the effect of equalisation provisions in non-life insurance and the earnings insurance companies would generate during the stress test period (set to 90% of last year's profit net of asset revaluation gains/losses), the total impact of the stress scenarios would range from CZK 1 billion to CZK 18 billion, or from 0.2% to 4.8% of assets (see Table IV.7).

The insurance sector can be regarded as stable despite these losses. The estimated solvency indicator for the individual scenarios, expressed as the ratio of disposable to required solvency, suggests that risk coverage is sufficient. The sector can even withstand the impact of the *Loss of Confidence* scenario equalling almost 5% of assets, which would cause a decrease in capitalisation (defined as the ratio of equity to assets) to around 10% (see Chart IV.52). However, some insurance companies could fall below the regulatory solvency threshold of 100% in the stress scenarios. The capital injections necessary to keep all insurance companies above the regulatory minimum would run to about CZK 0.1 billion in the *Return of Recession* scenario and CZK 2.8 billion in the *Loss of Confidence* scenario.

Pension funds are resilient to an increase in market risks

The stress tests of pension funds focus on market risks. The structure of the portfolios (see section 4.1) implies that this sector is sensitive above all to movements in long-term interest rates, which are reflected in bond revaluation losses, and to declines in stock prices. Such losses are the highest in the *Loss of Confidence* scenario; however, pension funds partly benefit from exchange rate gains due to the koruna's depreciation in this scenario (see Table IV.8). This reflects the currency structure of pension fund balance sheets, where almost all liabilities are in koruna, while assets include securities in foreign currency. The overall impact following the inclusion of income generated in the adverse period (set, as in the case of insurance companies, to 90% of last year's profit net of asset revaluation gains/losses) would be up to CZK 4.5 billion (*Loss of Confidence*), i.e. roughly 2% of assets. Capitalisation, as expressed by equity as a percentage of assets, would remain roughly unchanged (*Return of Recession*) or decrease to 4.2% in the *Loss of Confidence* scenario (see Chart IV.53). The sector's resilience is also illustrated by the fact that no pension fund would get into a negative capital situation in any scenario, implying a zero need for capital injections.

A new balance-sheet liquidity test for banks confirms good resilience to liquidity shocks

A macro-stress-testing model was used to test banks' liquidity risk. By comparison with the methodology presented in FSR 2008/2009, the currently used model has a greater number of different liquidity shocks (in addition to a run on the bank and a decline in the prices of securities holdings it includes, for example, realisation of credit facilities and various degrees of uncollectibility of some short-term claims) and better reflects banks' response to shocks, including their negative feedback effect on bank balance sheets.

Banks were tested under two new scenarios at the one-month horizon for a combination of idiosyncratic and market risks. The combination of shocks generates a positive liquidity gap, i.e. an asset financing requirement which banks must fulfil by reacting subject to pre-defined constraints.¹¹⁹ On the one hand, the response of banks in the form of sales of liquid securities or other assets mitigates the impact of the initial shock on the balance-sheet liquidity of individual banks, but on the other hand it increases the reputational risk of each responding bank and systemic risk in the sector as a whole.¹²⁰ The bank's reputational risk and the increase in systemic risk feed back in the form of another shock to banks' balance sheets through a decline in the market prices of some assets. It is therefore crucial for each bank to have a sufficient liquidity buffer¹²¹ which it can use to cover sudden and unexpected fluctuations on its balance sheet caused by its own activity or market activity.

The aim of the test was to reveal the potential insufficient resilience of a financial institution (i) which is too dependent on a single source of financing (and for which a shortfall in that source of financing would significantly disrupt its operations), (ii) whose assets are too sensitive to market risk, and (iii) which has only a very small liquidity buffer in place for the case of unexpected adverse conditions.

Both selected scenarios assume (see Table IV.9) a rise in loans provided,¹²² an inability to transfer funds within the banking group, an inability to issue new securities, losses from sales of claims before maturity, reduced liquidity of security holdings, a higher haircut (financial collateral ratio) on selected collateral accepted by the central bank and unavailability of claims on credit institutions and other clients maturing within one month. In addition, the first scenario assumes 80% drawdown of credit facilities and constant deposits in nominal terms, unlike the second

¹¹⁹ The limiting assumptions in the currently used model do not allow a bank to close the liquidity gap by obtaining (e.g. more expensive) additional funds. The bank can thus react only by selling some of its assets.

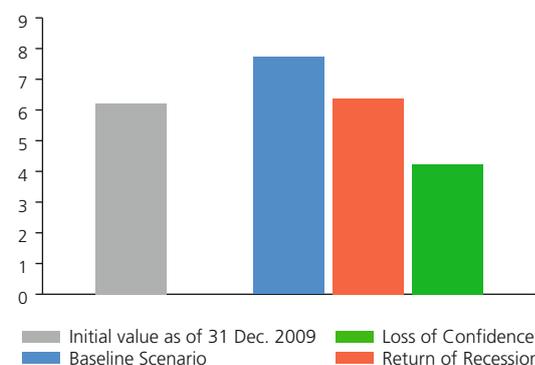
¹²⁰ The simultaneous response by banks will result in an additional decline in the prices of the securities or other assets being sold in the financial market.

¹²¹ The liquidity buffer (LB) consists of quick assets, securities and claims due within one month (including claims payable on demand), with quick assets defined as the sum of cash, claims on central banks, bonds issued by governments or central banks and claims on other financial institutions payable on demand.

¹²² The scenarios assume this even though it is likely that banks will not provide loans if they are unable to fund them. However, given the horizon of the test together with bank's efforts to maintain market share, this assumption was not considered completely implausible.

CHART IV.53

Estimate of capitalisation of pension funds in each scenario (%)



Source: CNB, CNB calculation

Note: For the scenarios the values are those before distribution of profits to planholders.

TABLE IV.9

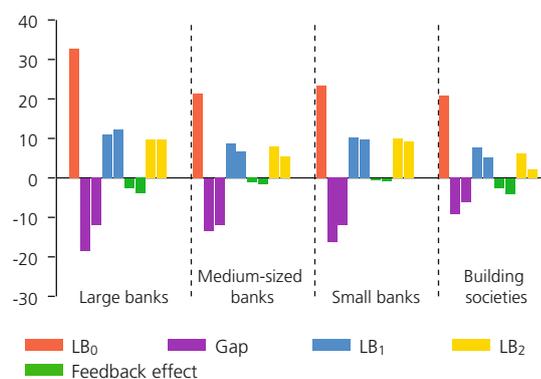
SCENARIO TYPE AND SHOCK SIZE IN BANK LIQUIDITY STRESS TEST

Scenario type	Scenario 1	Scenario 2
Credit growth (%)	10	10
Bank run (%)	0	10
Drawdown of credit facilities (credit lines, % of volume)	80	0
Share of short-term claims on banks that will become unavailable (%)	100	50
Share of short-term claims on other clients that will become unavailable (%)	20	20
Reduction in value of government bonds eligible as collateral in CNB liquidity-providing operations (%)	20	50
Reduction in value of other securities (%)	20	20
Reduction in value of assets sold before maturity (%)	50	50

Source: CNB, CNB calculation

CHART IV.54

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



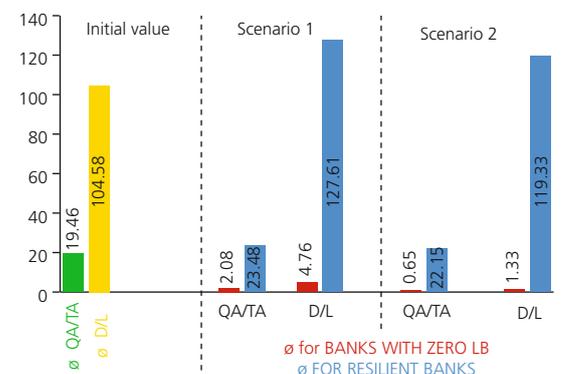
Source: CNB, CNB calculation

Note: The first column of each pair of identically coloured columns expresses the value for Scenario 1 and the second expresses that for Scenario 2. Gap = liquidity gap. Feedback effect = additional stress caused by banks' reactions on markets.

CHART IV.55

Differences in bank liquidity indicators by scenario impacts

(%)



Source: CNB, CNB calculation

Note: QA/TA = quick assets/total assets; D/L = deposits/loans, i.e. coverage by primary funds; ∅ = average; initial value for 21 banks; in Scenario 1 there are three banks with a zero LB and in Scenario 2 there are two.

scenario, where credit facilities are not used but an outflow of 10% of deposits payable within one month (including demand deposits) occurs. Both scenarios were applied individually to 21 banks operating in the Czech Republic.¹²³

Although the set-up of the scenarios was very strict, the tested banks withstood the simulated stress and would be able to close the potential liquidity gap within one month even under worsened market conditions (see Chart IV.54). Nevertheless, three banks in the first scenario and two banks in the second scenario would fully exhaust their liquidity buffers by their response to the liquidity shock.¹²⁴ To be able to close the liquidity gap, they would be forced to obtain additional funds by selling assets with maturities of over one month; however, they would sell them at a considerable loss.

The main reason for the low resilience of banks with exhausted liquidity buffers is the low initial values of their buffers (see Chart IV.55). For easier explanation, two liquidity indicators were used, namely the ratio of quick assets to total assets (QA/TA) and the ratio of deposits to loans (D/L).¹²⁵ By comparison with less resilient banks, resilient banks create much higher quick assets (around 22% of total assets in both scenarios, compared to 2% and 0.5% for the less resilient banks), which they can use quickly if needed. At the same time, it turns out that unlike their less resilient counterparts, resilient banks can largely cover loans provided to non-financial clients from primary funds.

¹²³ The test was not carried out for foreign bank branches.

¹²⁴ The business models of less resilient banks are configured in such a way that by definition they practically cannot withstand the way the test and its scenarios are calibrated. However, this does not mean that their business models are inappropriate from the point of view of liquidity management. Rather, they are specific. Moreover, business models can be changed in the longer term. These scenarios do not take this fact into account.

¹²⁵ This indicator characterises the coverage of a bank's credit activities vis-à-vis non-bank clients by primary funds.

