

ANALYSES OF THE CZECH REPUBLIC'S CURRENT
ECONOMIC ALIGNMENT WITH THE EURO AREA

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2008

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A. Introduction

If the Czech economy is to reap the benefits associated with introducing the euro, it will need to be able to operate without an independent monetary policy and without the option of exchange rate adjustment vis-à-vis its most important trading partners. This ability will be affected by the similarity of economic developments in the Czech economy with those in the euro area, since the degree of alignment will co-determine the appropriateness of the settings of the monetary conditions in the euro area to the current situation in the Czech Republic. The ability to adjust rapidly to economic shocks will be also an important factor. The Czech economy's alignment and its preparedness to adopt the euro can thus be assessed in terms of the long-term economic trends, the medium-term development of economic activity and the structural similarity of the Czech economy to the euro area economy, all of which affect the probability of asymmetric developments and the occurrence of asymmetric shocks, and the ability of the economy to absorb shocks and adjust flexibly to them. The analyses presented in this document therefore examine the Czech Republic's degree of economic alignment with the euro area and the Czech economy's ability to use alternative possibilities of adjustment.

This set of analyses of the Czech economy's alignment with the euro area in 2008 has been drawn up in line with the Czech Republic's Updated Euro-area Accession Strategy and assesses the current state of economic alignment and flexibility in individual areas. The exception is the development of fiscal variables, where the future outlook is also assessed even though it is predetermined to some extent by the current situation. This set of analyses is a follow-up to similar documents published by the CNB in the previous three years. Compared to last year, new analyses have been added and the scope of some of the analyses has been expanded slightly. The individual studies have been updated using the statistical data and information available in September 2008. The analyses are divided into two basic groups according to the type of question they try to answer. The section entitled "Cyclical and Structural Alignment" indicates the size of the risk of different economic developments in the Czech Republic compared to the euro area and hence the risk of the single monetary policy being highly suboptimal for the Czech economy. The section entitled "Adjustment Mechanisms" answers the question of to what extent the Czech economy is capable of absorbing the impacts of possible asymmetric shocks using its own internal adjustment mechanisms.

These analyses are aimed at assessing the evolution of the alignment indicators over time and in comparison with selected countries. The countries under comparison either are euro area members already (Austria, Germany, Portugal and Slovenia)¹ or will become so in the near future (Slovakia) or aspire to such membership (Poland and Hungary). All of the analyses attempted to make comparisons with all the selected countries. However, in some cases this was not possible owing to a lack of relevant statistical data. The values of the indicators for the euro area are defined at the EA-13 level.² The conclusion as to whether the degree of economic alignment in the individual indicators is sufficient for adopting the single currency

¹ The selection of euro area countries included in the comparison comprises countries that are comparable in terms of economic level and countries with which the Czech economy has trading links. The above selection is not associated with any assessment of how successfully these economies have performed in the euro area. Germany, the largest trading partner of the Czech Republic, at the same time provides a useful benchmark as a core country of the euro area, although when making comparisons with aggregate or average economic indicators the large weight of Germany in the calculation of those indicators must be taken into account.

² The EA-13 comprises the euro area member states as of 1 January 2007, i.e. Belgium, Finland, France, Ireland, Italy, Luxembourg, Germany, the Netherlands, Portugal, Austria, Greece, Slovenia and Spain.

cannot be made in absolute terms, but can ensue from the aforementioned comparison with other countries and the assessment of the evolution of the alignment indicators over time in the context of overall economic developments. In general, it can be expected that the benefits of adopting the euro will grow with greater economic alignment and more flexible adjustment mechanisms.

B. Executive Summary

The Czech Republic's entry into the euro area will yield benefits for the Czech national economy, but will also generate risks linked primarily with the loss of two effective channels of adjustment, namely independent monetary policy and exchange rate flexibility vis-à-vis our major trading partners. The consequences of this change will be affected by the degree of similarity of overall economic development in the Czech Republic with that in the euro area and the Czech economy's flexibility and resilience to shocks. The analyses presented in this document assess the similarity of the long-term economic trends, the medium-term development of economic activity and economic structure, the adjustment capacity of fiscal policy and the labour and product markets, and the functionality of financial markets.

Owing to high economic growth, the Czech economy has gradually been catching up with the average GDP level of the euro area in recent years. The functioning of the Czech economy has recently seen some improvement, partly due to cyclical developments. The public finance deficit was reduced quite substantially in 2007. However, eliminating the structural deficit and ensuring public finance sustainability are still a challenge. On the labour market, some structural improvement is being observed in addition to the cyclical improvement. The business environment is also gradually improving. However, problems persist in the institutional framework on the labour market. The current financial crisis and its impacts pose a risk to the outlook for the economic alignment and overall performance of the Czech economy.

In the longer term, i.e. since 2003, when the Czech Republic's Euro-area Accession Strategy was adopted, there have been both favourable and unfavourable developments in terms of euro adoption and the flexibility of the Czech economy. The aforementioned positive shift in some indicators since 2006 came after a relatively adverse period during 2004–2006 which saw a deterioration in economic alignment with the euro area and potential sources of asymmetric development and in the economy's ability to adjust to economic shocks. The Czech Republic's preparedness for euro adoption is thus roughly at the 2003 level for many indicators. Compared to 2003, in addition to advancing real and nominal convergence, there have been positive shifts in the fiscal outlook – even though there is a persisting need to reduce the structural deficit and to ensure long-term sustainability of public finances – and in the unemployment rate. By contrast, the global financial crisis is fostering higher macroeconomic risk.

In terms of its current preparedness to adopt the euro, the characteristics of the Czech economy can be divided into four groups.

The economic indicators that speak in favour of the Czech Republic adopting the euro traditionally include the high degree of openness of the Czech economy, its close trade and ownership links with the euro area, and the achievement of convergence of the inflation rate and nominal interest rates.

The second group comprises **areas which, in terms of euro adoption in the Czech Republic, continue to pose a risk of macroeconomic costs, but which have shown noticeable improvements in recent years.** The positive developments include continuing fast real economic convergence in the Czech Republic, including further convergence of the price level towards that in the euro area, even though a difference in the price level and in the level of economic development persists. According to some analyses, the alignment of economic activity between the Czech Republic and the euro area appears to have slightly increased recently. Owing to favourable cyclical developments and partly also to gradual structural changes, some improvements can be observed on the labour market, manifesting

themselves, among other things, in a decline in total and long-term unemployment and a halt in the decline in the rate of economic activity of the population. International labour mobility has also increased, particularly as regards the inflow of foreign workers to the Czech Republic. However, this suggests persisting rigidities concerning the system of incentives for employing low-skilled Czech workers. In terms of labour market flexibility, the positive developments also include a halt in the growth in overall labour taxation, as well as a halt in the growth of the minimum wage ratio to the average wage. The conditions for entrepreneurship are also improving slowly. The public finance deficit has been reduced, its outlook for subsequent years decreased and the excessive deficit procedure against the Czech Republic has been abrogated; these are vital steps in terms of the country's preparedness to adopt the euro. A reduction in the structural deficit has created space for automatic stabilisers to work without any acute risk of the 3% limit for the government deficit being exceeded.

The third group contains **areas which traditionally represent bottlenecks as regards the economy's flexibility and ability to adjust to shocks and which, moreover, are not showing any significant improvements.** The stabilising effect of public finances continues to be limited by the existence of a structural deficit and by the relatively low effectiveness of automatic stabilisers. In the long run, it will also be necessary to ensure that demographic changes do not adversely affect fiscal policy effectiveness and the long-term sustainability of public budgets. The tax and benefit system, which, despite the measures adopted, still creates a demotivating environment for the long-term unemployed in low-income families with children, is a bottleneck on the labour market. According to analyses, wages in the Czech Republic do not seem to be responding flexibly enough to economic developments. Another problem is that the skills of the long-term unemployed do not meet the current needs of the corporate sector. The costs of terminating open-ended employment contracts, particularly after a short period of employment, remain very high by international comparison.

The area of financial integration, where a satisfactory situation prevailed in the past, can be identified as the fourth group. Amid the current global financial crisis, the existence of an independent monetary policy has both benefits and costs; in general, however, it is likely that having one's own currency is more of a benefit in such a situation. The financial crisis can also be viewed as a temporary adverse factor as regards future adoption of the euro. From the point of view of the indicators monitored, the financial crisis has brought a slight reduction in the alignment of the exchange rate of the koruna with the euro and in the alignment with the euro area of yields on individual financial market instruments. The financial crisis can also be regarded as an example of an asymmetric shock, having various effects on individual economies depending on whether their financial sectors have suffered direct losses from investing in risky assets or whether these economies are facing only indirect impacts of the crisis. The continuing major uncertainty on financial markets does not constitute a favourable environment for the Czech Republic's entry into ERM II, even though the Czech Republic is not among the countries that have been hit directly by the crisis. As a system of fixed but adjustable exchange rates, ERM II is vulnerable to changes in financial market sentiment and in short-term capital flows. Any unfavourable developments during the Czech koruna's stay in this mechanism could generate macroeconomic costs and reduce the Czech economy's alignment with the euro area. As the financial crisis abates, we can expect the results in the area of the Czech economy's financial integration with the euro area to improve again and more favourable conditions for ERM II entry to be established. However, the financial crisis could also have longer-term adverse consequences for the alignment of individual Member States' economies if fiscal discipline in the EU is relaxed as a result. However, there is widespread uncertainty regarding the future application of the Stability and Growth Pact rules at the moment.

The following text in this section summarises developments in the individual areas analysed. The detailed results are given in part D, and a comparison with the previous years' results is given in section 3 of part D.

Cyclical and Structural Alignment

The costs arising from the loss of the Czech Republic's own monetary policy will be particularly pronounced if the Czech economy is not aligned with the euro area economy. The risks arising from the Czech Republic's accession to the euro area will decrease as the degree of alignment increases.

The degree of real economic convergence is an important indicator of the Czech economy's similarity to the euro area. A higher level of such convergence fosters greater similarity of long-run equilibrium development. Indirectly it can also foster a lower likelihood of misalignment in the shorter run. A higher degree of convergence in the economic level prior to ERM II entry and euro adoption should further increase the relative price level, which will decrease potential future pressures for growth of the price level and equilibrium appreciation of the real exchange rate. The process of convergence of the GDP and price levels has accelerated over the past five years. At present, GDP per capita in the Czech Republic is almost 75% of the euro area average, which means that the standard of living is comparable with the less advanced members of the euro area. However, at 60% of the euro area level in 2007, the price level in the Czech Republic is still below that corresponding to its economic level. This indicator shifted upwards in 2004–2007, mainly due to rapid nominal appreciation of the koruna, and the same factor will underlie the likely further significant convergence in 2008. The real exchange rate of the koruna appreciated at an average pace of 3.2% a year between 1998 and 2007, which is a significantly higher pace than in the current euro area countries under comparison. The pace of real appreciation increased even more significantly in 2008. Going forward, the equilibrium trend of real appreciation of the koruna against the euro can be expected to continue in line with the real convergence, according to the analyses at a rate of 1.3%–2.4% a year. Persistence of this trend following the euro area entry will initially engender a corresponding higher rate of inflation in the Czech Republic than in the euro area and related lower domestic real interest rates (possibly even negative in the case of short-term money market rates). If this situation persists in the long term, there would be a risk of an overheating of the economy associated with adverse consequences for macroeconomic and financial stability.

Alignment of economic activity and similarity of economic shocks will help the single monetary policy to have an appropriate effect on the economy in the monetary union. The analyses suggest that the overall economic activity during the business cycle in the Czech Republic is becoming more aligned with that in the euro area. However, the results are not unambiguous and this relationship may be partially distorted by the trend developments in the Czech economy. Although the observed correlations are lower than those of the euro area countries under review, they are slightly higher than those for the currently acceding Slovakia, for example. However, the analysis of the occurrence of demand-side and supply-side macroeconomic shocks failed to find any alignment of the Czech economy with that of the euro area. By contrast, a relatively high degree of alignment with the euro area is signalled by some other indicators, for example by the alignment of activity in industry and export activity. According to the analyses, the Czech Republic's export activity has recently been statistically significantly correlated with euro area exports rather than with GDP growth in the euro area. This may be linked with the integration of Czech exporters into the production chains of multinational companies, and creates conditions for relatively symmetrical transmission of external shocks hitting the euro area to the Czech economy.

Similarity of the **structure of economic activity** with the euro area should decrease the risk of occurrence of asymmetric economic shocks. In terms of production structure, the Czech economy retains a specific feature in the form of a higher share of industry and a smaller share of certain services in GDP compared to the euro area. The high share of the **car industry** in Czech industrial production and exports and its cyclical nature are often viewed as a potential source of asymmetric developments. The share of the car industry in the total output and value added of the Czech economy is comparable to that of Germany, which means that it is higher than the euro area average. Therefore, although any sector-specific shock will affect numerous countries, the disproportionately high share of the car industry in economic output compared to the euro area average may mean that the single monetary policy, in the event of such a shock, will not respond to inflationary or anti-inflationary risks in the Czech economy in the same way as an independent monetary policy would. The relatively high energy intensity and almost complete dependence of the Czech economy on imports of oil are reasons for analysing the impacts of a potential **oil price shock** on the Czech economy. The adverse effect of an oil price shock will depend on the size of the changes in oil prices and their impacts on global demand and demand for Czech exports. Nevertheless, according to estimates in the available literature a relatively subdued impact can be expected, although the impact could be somewhat higher than that on the euro area, mainly because of the higher energy intensity of the Czech economy.

Fast convergence of **nominal interest rates** in the run-up to joining the euro area has acted as an asymmetric shock in some economies in the past. For a country planning to enter, earlier gradual convergence of such rates is therefore an advantage. The difference between Czech interest rates and euro area interest rates has been zero or negative since 2002. A positive interest rate differential opened up temporarily for five-year rates in 2008 H1, although this was probably associated with the impacts of the emerging credit and liquidity crisis in the USA. Provided that no major changes occur, the effects of interest rate convergence when the Czech Republic joins the euro area can be expected to be generally small from the current perspective. The Czech koruna's **exchange rate** against the dollar had been moving very much in line with the euro's exchange rate against the dollar in past years. In 2007 and 2008, however, this relationship loosened, mainly because of the financial crisis and the related increased volatility of exchange rates. The observed medium-term volatility of the Czech koruna against the euro increased in 2008. The Hungarian forint and the Polish zloty showed a similar trend, while the volatility of the Slovak koruna decreased owing to the planned adoption of the euro in Slovakia.

Increased **inflow of resources from EU structural funds** could be a specific asymmetric factor that might impact on the Czech economy. Conditional on a sufficient absorption capacity of the economy this could act as a considerable economic stimulus, materialising primarily in increased investment activity. Although the net financial position of the Czech Republic vis-à-vis the European Union increased in 2007, the rise was due mainly to advance payments to Czech public budgets. The actual drawdown of funds and their economic use has been slow so far. By 2013, the net position will gradually increase to 1.8% of GDP, the highest annual rise being expected in 2009. However, the economic stimulus from these flows will depend on the actual extent of utilisation of these funds by final beneficiaries in the private and public sectors. The financial flows between the Czech Republic and the EU can also be expected to affect the Czech public budgets. The impact on public finances should be positive, provided that a proportion of the funds is re-directed from national projects. The analysis indicates that in 2008 a roughly neutral effect and from 2009 a slightly positive effect of drawdown of EU funds on the economic activity of the Czech Republic is to be expected. However, this situation will not require a sizeable monetary policy reaction or a koruna

exchange rate adjustment that would endanger the stay in ERM II or assessment of the Maastricht exchange rate criterion.

The Czech economy's strong **trade and ownership links with the euro area** magnify the benefits arising from the elimination of potential fluctuations in the exchange rate. The euro area is the partner for approximately 60% of Czech exports and imports and its share will increase to around 66% after Slovakia joins the euro area. Strong links are also apparent for the other economies under comparison. The Czech economy's ownership links with the euro area on the direct investment inflow side are slightly stronger than in the other countries under comparison, except for Slovakia, and are continuing to grow. The Czech economy's strong economic integration with the euro area creates conditions for increasing economic alignment with this area. Another positive aspect from this perspective is the high intensity of intra-industry trade with the euro area, which is only slightly lower than in Austria and Germany.

The analysis of the Czech **financial sector**, and, within it, the banking sector, reveals that despite its relatively smaller size and depth of financial intermediation in comparison with the euro area, it need not be expected to have a fundamentally different effect on the economy at a time of normal economic development. The monitored indicators have in recent years recorded further slight convergence towards the euro area. The depth of financial intermediation in the Czech Republic is currently roughly one-third of that in Germany, Austria and the euro area and 42% of that in Portugal. The Czech Republic has lower volume of lending in particular. However, as a result of dynamic growth in loans to households and corporations in the Czech Republic, client loans are rising as a percentage of both total loans and GDP. On the one hand, this trend implies convergence towards the corresponding ratios in the euro area, but on the other hand, it could pose a risk of loan defaults in the event of a further build-up in household and corporate debt. The historical experience of some countries with high long-term credit growth shows that at a time of crisis and economic slowdown, over-leveraging can cause extensive economic problems. Less prudent assessment of client creditworthiness and of the financial and economic outlook is often a source of credit risk growth and financial instability. The crisis on the global financial market and the related economic stagnation of the Czech Republic's major trading partner countries have so far spilled over into the Czech financial sector and domestic economy to only a limited extent, in the form of increased volatility of the koruna's exchange rate, slowing economic growth and a decline in prices of some assets. In the past, domestic financial institutions focused primarily on revenues from the dynamically expanding retail banking activities in the Czech market, while their owners generally concentrated the management of risky securities and derivatives portfolios in parent banks and branches in international financial centres. The stability of the domestic banking sector is aided by the banks' high balance sheet liquidity and solvency, the financing of loans mostly by primary deposits and hence minimum dependence on funds raised on foreign markets, and minimal investment in bonds backed by foreign subprime mortgages. Despite this, the effects of the crisis may, to a limited extent, directly affect some domestic financial institutions via their risky investments. However, the indirect effect through a worsening financial situation of households and corporations will be dominant. Owing to the financial crisis, the growth of the Czech Republic's major trading partner economies is slowing, which in turn is generating deteriorating export conditions. The ensuing slowdown in the domestic economy can potentially increase the loan default rate.

The structure of the financial assets and liabilities of Czech non-financial corporations and households maintains certain differences from that of euro area entities. The difference is particularly visible in a relatively high share of trade receivables in corporate assets and in the structure of households' liabilities. However, gradual convergence towards the structure in the euro area can be observed. The indebtedness of Czech corporations and households is

currently significantly lower than in the euro area countries under review. The use of the euro in the financial transactions of non-financial corporations is gradually growing, reflecting the Czech economy's openness and foreign trade integration. However, the degree of spontaneous euroisation is still relatively low, although there is a difference between corporations and households. The expansion of foreign currency cash holdings and deposits of households in the Czech Republic is roughly comparable with the selected Central European countries, but foreign currency borrowing is very low.

The degree of **integration of the Czech financial markets** (money, foreign exchange, stock and bond) with the euro area markets is comparable or higher than that in Hungary, Poland and Slovakia. In comparison with Austria and Portugal, the integration of the stock market is similar, but that of the bond market is lower. The speed of elimination of shocks on the Czech stock market has increased since 2002, but, like on other markets, the speed of adjustment has recently declined somewhat as a result of the global financial market turbulence. The degree of integration of the Czech money market with that in the euro area is at the level of Slovenia before it adopted the euro. The comparison with Slovenia regarding the degree of foreign exchange market integration is not very relevant, as it had a different exchange rate regime. Owing to recent developments, the degree of integration is lower than that in Slovakia, which is to enter the euro area.

Adjustment Mechanisms

As regards the **public finances** of the Czech Republic, the effectiveness of the stabilisation function within the European fiscal rules will be crucial. Under the Stability and Growth Pact, the Czech Republic committed itself to steering towards a structural general government deficit of no more than 1% of GDP by 2012. The closer the deficit is to zero, or the larger the surplus, in its structural part, the more room there will be at a time of economic downturn for the functioning of automatic stabilisers and, in the extreme case, for the implementation of discretionary measures. So far, the Czech Republic's government sector deficits have been due primarily to structural factors. The effect of the business cycle started to be felt more strongly only in 2007 and 2008. Eliminating the adverse structural effects is an important condition for the use of the stabilising function of public budgets. Developments in 2007 and 2008 suggest a gradual improvement in the state of public finances. Another condition for maintaining fiscal policy effectiveness will be to ensure public finance long-term sustainability, in particular by addressing the effect of demographic changes on pension and health care system expenditures.

Wage elasticity can enhance the economy's ability to absorb shocks to which the single monetary policy cannot respond. The analyses indicate that real wage elasticity in the Czech Republic is currently low, just like in the other countries under comparison, and has not improved substantially over time. Differences in **inflation persistence** in the countries of the monetary union might lead to different impacts of the single monetary policy. Inflation persistence in the Czech Republic is among the lowest of the countries under comparison.

Thanks mainly to recent cyclical developments, the Czech **labour market** has recently been experiencing some improvements in its performance, as the overall and long-term unemployment rates have declined. Structural unemployment is also probably falling. The improving business environment may also be contributing indirectly to labour market flexibility. In some respects, though, the labour market is considerably less flexible than in the countries under comparison, and no major improvement is occurring. The institutional rules do not create the right conditions for employment of people with low skills. The main risk factors are the interaction of taxes and social benefits and the costs of terminating open-ended employment contracts after a short period of employment.

Despite some improvements, the Czech Republic still has the largest regional differences in the unemployment rate. This may be due to regional gaps between the demand for, and supply of, labour and the low regional, occupational and sectoral mobility of the labour force, exacerbated, among other things, by the dominance of owner-occupied housing. It is thus reasonable to expect that the contribution of cross-border mobility of Czech citizens to the adjustment in the event of economic imbalances will be relatively limited, even after movement of labour between the Czech Republic and all the original EU countries has been fully liberalised by 2011. The inflow of foreign labour into the Czech Republic has been very dynamic since 2005, contributing to the flexibility of the Czech labour market. On the other hand, however, it suggests that some serious problems persist in this market (in particular low incentives to work among the long-term unemployed with low skills), since the foreigners work mainly in jobs requiring low qualifications. At the same time, the fact that movements of foreign workers can take place independently of labour demand and the business cycle in the Czech Republic poses a risk to labour supply.

Labour market flexibility is determined to a great extent by the **institutional rules**. Collective bargaining has a smaller effect on wage setting in the Czech Republic than in most of the countries under comparison. The impact of the minimum wage on the flexibility of low wages and on job creation is also rather low on average by international comparison. The halt in growth, or slight decline, of the minimum wage as a percentage of the average wage can be regarded as positive, since high minimum wages coupled with high labour taxation could have an adverse effect on labour market flexibility. Overall labour taxation in the Czech Republic increased slightly in 2007. The effect of taxation on long-term unemployment and job creation was roughly the same as in Austria, Hungary and Poland, but higher than in Portugal and Slovakia. Compared to other countries, the financial incentives to accept a job given by the combination of taxes and benefits in 2006 were comparable or higher for the short-term unemployed, but average for the long-term unemployed. According to the simulations, the financial incentives to seek employment weakened for some groups of the population in 2007 because of the reform of the social benefit system. The level of social benefits coupled with the tax burden may diminish efforts to seek or keep a job, particularly of households with children. Although the 2008 reform has halted the adverse trends, it has not delivered a significant reduction of the existing problems. The Czech Republic is one of the countries with a relatively high degree of job protection in the area of permanent employment but relatively low protection of temporary employment, which may present a risk in particular as regards the entry of young people to the labour market.

In the area of **product market flexibility**, the regulatory environment for entrepreneurship is more burdened with administrative obstacles by international comparison. However, the situation is slowly improving. In particular, gradual steps are being taken to simplify the procedures for setting up a business and carrying on business activities. These measures are likely to have a positive effect on job creation as well. As in the other countries under comparison, the corporate taxation rate has been declining recently and is currently one of the lower ones, but the overall tax burden on Czech corporations is higher than in Austria, Portugal, Poland and Slovakia.

Stability and effectiveness of the banking sector is a precondition for the sector to be able to assist in absorbing the impacts of economic shocks. The banking sector has achieved a high level of efficiency and profitability in the European context, and in past years has accumulated a sufficient capital reserve from its profits. The percentage of non-performing loans in the Czech Republic has in recent years declined to a level only just above the euro area average. At a time of falling economic growth amid a continuing global financial crisis, a

slowdown in lending and a deterioration of loan portfolios can be expected. This will adversely affect the capital adequacy and profitability of banks. Stress test results so far indicate that the Czech banking sector is sufficiently resilient to external shocks, although a strongly adverse macroeconomic scenario would naturally have a negative impact on the performance and stability of the banking sector.

C. Theoretical Foundations of the Analyses

The basic theoretical starting point for the analyses contained in this document is the theory of optimum currency areas.³ This theory is one of the approaches often used to determine the appropriate exchange rate regime and, in particular, to determine whether the countries included in the analysis are good candidates for introducing a single currency. In the context of the creation of the single European currency, knowledge of this theory has been used recently to assess the appropriateness of adopting the single currency by the euro area countries and the suitability of the same step for the new EU Member States.

Generalising somewhat, one can say that economists agree on the set of fundamental benefits and costs of the single currency, although this set may change over time or depending on the specific features of individual economies. The benefits consist chiefly in an improvement in the functionality of money and a decline in transaction costs (including, for example, the greater usability of the single currency, easier comparability of prices, a reduction in transaction costs, and the elimination of exchange rate risk and the costs of hedging against it) and increased macroeconomic and financial stability (thanks to the elimination of excessive exchange rate fluctuations, financial market integration, an increase in price stability and potentially an overall increase in the credibility of the monetary authority).⁴

The costs can be broken down into two groups. There are the costs associated with the change of legal tender, including the physical exchange of money, the conversion of all contracts to the new accounting unit, and similar costs, i.e. costs which can be viewed, to a large extent, as non-recurring.⁵ The main long-term costs include in particular a reduction in the effectiveness of domestic macroeconomic policies and the risk of greater volatility in output and consumption, because with the transition to the single currency the economy will lose its independent exchange rate and interest rate policies. The single monetary policy will not be able to respond sufficiently to shocks which affect only a small part of the currency area's economy. The costs of this loss will depend on the extent to which the exchange rate of the national currency absorbs real shocks or, on the contrary, generates financial shocks, on the degree of alignment of the business cycle with the cycle to which the currency area's monetary policy responds, and on the ability of the economy to employ other adjustment channels.⁶

However, despite the more than 40-year history of the above theory, the consensus is that there is no unambiguous definition of an optimum exchange rate regime. The potential costs and benefits differ depending on the specific situation, and political decisions play a

³ The papers by Mundell (1961), McKinnon (1963) and Kenen (1969) are regarded as the cornerstones of this theory. A survey of this literature can be found, for example, in Mongelli (2002), De Grauwe (2003) or Horváth (2003).

⁴ The increased macroeconomic stability and lower risk will facilitate a low and relatively stable interest rate level and higher investment growth. An increase in foreign trade and competition, productivity growth and subsequent GDP growth per capita can also be expected. However, financial market integration may be a drawback at times of financial crisis, which may spill over to countries, as current developments show.

⁵ In the context of transition to another currency, there is also risk of incorrectly setting the conversion ratio, as an excessively appreciated exchange rate may damage the competitiveness of the economy in the long term, while an excessively depreciated exchange rate will generate inflationary pressures.

⁶ From the viewpoint of the new EU members who are planning to join the euro area, another cost may be the fulfilment of the Maastricht criteria prior to entry, especially the price stability criterion. Another potential cost for converging countries is a persisting inflation differential, which may be reflected in a rise in nominal client rates and, conversely, a fall in real client rates and have an adverse effect on the economy (the welfare cost of inflation theory – Lucas, 2000, and Ireland, 2008).

significant role in the selection of exchange rate regime. Similarly, there is no method which in practice can unambiguously measure the potential benefits and costs associated with fixing the exchange rate and entering a monetary union (Vaubel, 1990). However, the current level of knowledge in this field can, *inter alia*, be used to identify potential sources of macroeconomic imbalances associated with entering the monetary union and to assess the ability of the economy to benefit from such a move. Properties that reduce the usefulness of nominal exchange rate adjustments by fostering internal and external balance, reducing the impact of some types of shocks and facilitating adjustment, make up the set of “optimum currency area properties” (Mongelli, 2002).

One of the key properties determining the appropriateness of joining a currency area is the degree of the openness of the economy and its economic links with the other countries of the currency area. The greater the integration, the higher the potential benefits of the single currency against which the costs are gauged. These benefits reflect above all the elimination of exchange rate risk in economic relations, which will reduce the costs of foreign trade and foreign investment and may lead to a strengthening of such relations (e.g. Rose, 2000). Micco, Stein and Ordonez (2003) have found this effect to be economically significant for the euro area countries. Baldwin (2006), on the other hand, points out that euro area accession cannot be expected to have such an upward impact on foreign trade as implied by the results set out in the earlier literature. According to his results, the introduction of the euro itself tends to act as a non-discriminating unilateral liberalisation of the product market and could therefore have a greater impact on a country’s imports than on its exports.⁷

Other properties tend to reduce the negative aspects of the loss of certain macroeconomic adjustment instruments at country level, and can be summarised under the heading of symmetry and flexibility (De Grauwe and Mongelli, 2005). The traditional optimum currency area criteria therefore also include similar economic structure and economic shocks, output and consumption diversification, a similar inflation rate, stable terms of trade, mobility of labour and other production factors, price and wage flexibility, and fiscal and political integration.⁸

Crucial to the discussion of the benefits and costs of the single currency was the formulation of the opinion that not only can the ability to benefit from a monetary union and the risks of unbalanced developments in a monetary union be affected by appropriate reforms, but that large shifts also seem to result from the very introduction of the single currency (the “endogeneity hypothesis”, Frankel and Rose, 1998). According to this hypothesis, the adoption of the single currency should lead to a strengthening of the free market (Engel and Rogers, 2004) and growth in trade with partners in the monetary union. Moreover, an increase in trade integration can lead to greater business cycle correlation (Frankel and Rose, 1997).⁹ As regards the introduction of the euro in the new Member States, however, this channel acting via an increase in the share of mutual trade is likely to be fairly weak (Baldwin, 2006).

⁷ A developed financial sector is capable of effectively reducing exchange rate risk even outside the currency area; in such case, the overall net benefits of currency integration may be lower than for a country with a less developed financial sector.

⁸ In the event of an asymmetric shock, fiscal policy can assist by means of either built-in stabilisers or discretionary measures. However, discretionary measures can give rise to further fluctuations (Feldstein, 2002). What is more, research has shown that a fiscal expansion can have a much lower impact on demand than expected (Blanchard and Perotti, 2002).

⁹ However, Kenen (2000) finds that although trade intensity can increase the correlation between cycles, asymmetric shocks are not necessarily fully eliminated. Hughes-Hallett and Piscitelli (2002) show that this causality between monetary union participation and cycle alignment exists provided that the convergence in institutional structures and the symmetry of shocks are sufficient.

The endogeneity paradigm is opposed by the view that greater openness of the economy leads to a greater degree of specialisation, a decrease in structural similarity and thus a higher probability of asymmetric shocks, which increase the costs of currency area participation (the “specialisation hypothesis”, Krugman, 1993). Kalemli-Ozcan, Sorensen and Yosha (2003) find that high financial integration can have a similar impact, thanks to risk sharing, which fosters greater specialisation.

De Grauwe and Mongelli (2005) review the literature on the endogeneity of foreign trade, financial integration, symmetry of shocks and product and labour market flexibility. Based on developments to date in the euro area, they conclude that it is more likely that the endogeneity hypothesis holds, i.e. that the similarity of economic shocks probably increases with greater economic integration. According to Lane (2006), the introduction of the euro had a clear impact in terms of increasing the integration of the euro area financial markets; however, there was growth in foreign trade with both members and non-members of the euro area, hence it can be expected that it did not unambiguously cause a reduction in the probability of asymmetric shocks.

D. Results of the Analyses

1. CYCLICAL AND STRUCTURAL ALIGNMENT

Greater similarity in economic structure and the business cycle between the Czech Republic and the euro area will lead to lower euro adoption costs.¹⁰ For the Czech economy, the risk of time misalignment or a suboptimal intensity of the response of the single monetary policy to economic shocks will decrease. The functioning of the monetary policy transmission mechanism will also converge. The direct indicators of alignment (describing various aspects of convergence with the euro area) and the effect of international relations and the financial sector (which can increase or decrease alignment) are both monitored.

1.1 Direct alignment indicators

The principal direct alignment indicators are the development of domestic economic activity, the exchange rate and interest rates compared to the euro area. Convergence in economic and price levels increases the likelihood of similar processes proceeding in the economy and of there being no major differences in equilibrium development. High synchronisation of the business cycle and economic shocks increases the probability that economic developments will not differ substantially going forward, either. Disequilibrium pressures could stem from different economic structures and from insufficient convergence at the real interest rate level.

1.1.1 Real economic convergence

The degree of real convergence, as measured by GDP per capita at purchasing power parity and the relative price level of GDP, is a fundamental indicator of an economy's similarity to the euro area.¹¹ A high degree of real convergence is not a necessary precondition for joining the monetary union, but a low degree of real convergence could indicate some challenges for the adoption of the single currency. The real convergence process is often associated with the alignment of price levels and structures with more advanced countries. The related real appreciation of the exchange rate vis-à-vis the euro may make fulfilment of the Maastricht convergence criteria more difficult and, in the run-up to joining the euro area, necessitate a combination of economic policies which will move the economy away from equilibrium.¹² This departure from equilibrium can be viewed as a type of asymmetric shock acting primarily in the initial years of monetary integration. Following the adoption of the euro, price convergence will imply a positive inflation differential compared to the euro area average because the option of a real strengthening of the exchange rate through nominal appreciation will be closed. One of the consequences, given the elimination of the risk premium thanks to euro adoption, will be lower real interest rates compared to both the pre-euro adoption period

¹⁰ On the other hand, achieving a high degree of alignment in some areas, e.g. convergence of nominal interest rates, however, may at the same time reduce the benefits of the single currency.

¹¹ The indicators for the euro area are monitored at the EA-13 level throughout this document. The EA-13 comprises the euro area member states as of 1 January 2007, i.e. Belgium, Finland, France, Ireland, Italy, Luxembourg, Germany, the Netherlands, Portugal, Austria, Greece, Slovenia and Spain.

¹² The simultaneous restriction placed on the inflation differential and the appreciation of the nominal exchange rate represents an implicit restriction on the appreciation of the real exchange rate. If the equilibrium real appreciation is faster than this restriction, the fulfilment of the Maastricht convergence criteria may require a temporary departure of the exchange rate from equilibrium, with impacts on the development of the entire economy. However, this potential problem is mitigated by the fact that the exchange rate criterion is significantly more tolerant of appreciation than depreciation.

and the euro area average. Real interest rates may even be negative in some cases. Although the lower real interest rates may have many favourable impacts, they may also create some challenges to macroeconomic and financial stability and thus raise questions about the appropriateness of the single monetary policy for an accession country.

As Table 1 shows, the Czech economy has been converging towards the euro area in terms of **GDP per capita** since 2001. This process has accelerated in the last five years or so. With this indicator currently at almost 75% of the euro area average, the Czech Republic ranks between Portugal and Slovenia, i.e. it has a standard of living comparable with the least advanced countries of the monetary union. It is thus more advanced than the other new EU Member States (Hungary, Poland and Slovakia). However, it still lags well behind the wealthier euro area countries (e.g. Austria and Germany).

Table 1: GDP per capita at purchasing power parity (EA-13 = 100)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	61.7	60.9	60.2	62.0	62.6	65.8	68.0	69.0	70.8	74.1
AT	115.2	114.9	115.6	110.4	112.2	113.7	114.7	115.6	115.1	115.7
DE	107.2	107.0	104.3	102.9	102.5	104.5	105.3	103.8	103.4	102.9
PT	67.1	68.6	68.7	68.2	68.5	68.7	67.5	68.0	67.5	67.8
HU	46.1	46.9	49.3	51.9	54.7	56.7	57.2	57.9	58.8	57.6
PL	41.8	42.6	42.5	42.0	42.9	43.8	45.8	46.2	47.4	48.7
SK	45.5	44.2	44.1	46.1	48.1	49.7	51.7	54.6	57.7	62.3
SI	67.9	69.6	69.2	69.5	72.0	73.5	77.1	78.2	79.5	80.6

Source: Eurostat, CNB calculations.

Table 2 illustrates the **price level of GDP** compared to the euro area. In the case of the Czech Republic, this indicator showed the greatest convergence in 2001–2002 and again in 2004–2007. In both cases, this was due to fast nominal appreciation of the koruna. The distance of the Czech Republic’s price level from the original EU Member States, however, remained greater in 2007 than in the case of GDP. The Czech Republic in this indicator continued to lag markedly behind not only Austria and Germany, but also Portugal and Slovenia.¹³ Of the countries under review, only the price levels in Poland, Hungary and Slovakia are comparable to that in the Czech Republic.

Table 2: Average price level of GDP (EA-13 = 100)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	43.4	42.9	45.2	47.7	53.3	50.1	51.2	55.4	58.4	59.8
AT	102.6	102.7	101.9	104.8	102.6	100.7	99.9	100.2	101.1	101.1
DE	110.4	109.2	109.4	109.2	107.9	104.3	102.4	102.3	102.2	102.7
PT	77.5	78.0	79.2	80.7	81.2	80.3	81.8	81.1	81.5	81.1
HU	44.1	44.8	46.9	49.3	54.2	54.0	57.4	59.4	57.0	62.6
PL	47.6	46.1	52.0	57.9	54.4	47.6	47.0	54.1	56.3	59.5
SK	40.3	38.3	42.1	41.5	42.7	45.9	49.3	51.1	53.7	58.5
SI	70.3	70.4	69.8	71.1	71.5	71.7	70.0	70.4	71.5	73.9

Source: Eurostat, CNB calculations.

An analysis of the empirical relationship between the price level of GDP and GDP per capita at purchasing power parity for the 32 European countries reveals that the Czech price level in 2007 continued to lie below the level corresponding to its economic level – by roughly 17.5 percentage points. Nevertheless, due to exceptionally fast real appreciation of the koruna

¹³ However, it can be expected that the Czech Republic will converge markedly towards these two countries in 2008 thanks to the exceptionally fast real appreciation of the koruna’s exchange rate against the euro.

against the euro during 2008 to date, one can suggest, that this difference will decline markedly in 2008.¹⁴

Table 3 presents the **evolution of the real exchange rate** vis-à-vis the euro. Between 1998 and 2007, the real exchange rate of the koruna appreciated roughly by 33%, i.e. at an average rate of 3.2% a year (since 1993 by 4.1% a year).¹⁵ The rate of real appreciation in the Czech economy has been distinctly higher since both 1998 and 1993 than in the current EU countries under comparison, while in the case of Austria and Germany the real exchange rate has even depreciated somewhat. A lower rate of real appreciation than the Czech koruna has also been recorded by the Polish zloty and, from the longer-term perspective, the Hungarian forint. The Slovak koruna, on the other hand, has recorded a faster real appreciation than the Czech koruna.

Table 3: Real exchange rate against the euro (1998 = 100; HICP deflated)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	Annual rate of appreciation	
										since 1993	since 1998
CZ	98	104	111	122	115	115	123	129	133	4.1%	3.2%
AT	100	100	100	99	99	98	98	98	98	-0.4%	-0.2%
DE	100	100	99	98	97	97	97	96	96	-0.6%	-0.4%
PT	102	102	104	106	107	107	107	108	109	0.5%	0.9%
HU	104	108	117	127	125	132	135	129	144	2.8%	4.1%
PL	98	112	125	119	103	101	114	117	121	3.2%	2.1%
SK	98	111	115	118	129	141	147	155	170	5.4%	6.1%
SI	100	101	101	103	103	102	102	102	104	1.2%	0.4%

Source: Eurostat, CNB calculations.

Based on the results of numerous studies (see Čihák and Holub, 2003 and 2005; Brůha and Podpiera, 2007), continued equilibrium real appreciation can be expected for the currencies of the countries striving to join the euro area (the Czech Republic, Hungary, Poland and Slovakia). In the case of the Czech koruna, this range is 1.3%–2.4%. Compared to the analyses conducted in past years, this range has declined thanks mainly to the substantial acceleration of price convergence in 2008.¹⁶ Its midpoint is thus now similar to, or slightly lower than, that in the other Central European countries,¹⁷ although it remains markedly higher than that of the current members of the euro area. This range corresponds to the average inflation differential vis-à-vis the euro area which could be expected in the Czech Republic if the euro were to be adopted within the next five years. Assuming average euro area inflation of around 2%, inflation in the Czech Republic could therefore increase to about 3.4%–4.4% during the initial years following euro area entry, as in the other countries of the region. This would mean a marked increase in inflation compared to the values targeted by the Czech National Bank from 2010 until euro area entry.

¹⁴ The price level of the Czech Republic can be estimated at 68%–70% of the EU-13 average for 2008. The deviation from the empirically estimated relationship would thus fall to roughly 10 percentage points.

¹⁵ In 2008, the real appreciation of the koruna against the euro accelerated well above the long-term average (to approximately 15% for the year as a whole).

¹⁶ The logic of this shift is based on the principle of convergence to the GDP per capita level, and thus also to the price level, in the euro area. The higher starting level thus in both cases means a lower rate of convergence going forward. Other methods of estimating the equilibrium real appreciation (e.g. Šmídková and Bulíř, 2004) provide different estimates and this principle of convergence does not necessarily apply to them.

¹⁷ The slightly lower midpoint of the interval vis-à-vis the other countries of the region is given by the results of Method 2, which forecasts a lower rate of real appreciation for the Czech Republic than in other countries. By contrast, Method 1 continues to forecast somewhat faster real appreciation for the Czech Republic than in Hungary and Poland, and roughly the same rate as in Slovakia.

Table 4: Estimate of equilibrium real appreciation (in p.p.; annual average for 2009–2013)

	Method 1		Method 2	Range of estimates
	Min	Max		
CZ	1.6	2.4	1.3	(1.3 ; 2.4)
AT	0.4	1.1	n.a.	(0.4 ; 1.1)
DE	0.1	0.3	n.a.	(0.1 ; 0.3)
PT	0.3	0.5	n.a.	(0.3 ; 0.5)
HU	1.6	1.9	2.7	(1.6 ; 2.7)
PL	1.2	1.3	3.0	(1.2 ; 3.0)
SK	1.7	2.3	3.0	(1.7 ; 3.0)
SI	1.2	1.9	0.1	(0.1 ; 1.9)

Source: CNB calculations.

As a result, the Czech Republic and the other countries of the region would face lower **real interest rates** (see Table 5) compared to the average in the euro area and the selected Member States (Austria, Germany, Portugal and Slovenia) as well as to the real interest rates they have been facing up to now. Their short-term real money-market interest rates would probably be negative, in fact. In the Czech Republic, the three-month real interest rate would drop to -0.6%–0.5% on average.¹⁸ Compared to the results of the analyses in 2007 this is an increased estimate, reflecting the lower range of the estimated equilibrium real appreciation. This estimate, however, still contrasts with the estimates of the current equilibrium interest rate level.¹⁹ On the other hand, the Czech Republic has in the last four years had the advantage of low real interest rates, which implies a need for a smaller future adjustment towards the post-euro adoption situation.

Table 5: Three-month ex-post real interest rates (in %; HICP deflated)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Average	Outlook ^{a)}
CZ	4.2	5.0	1.4	0.6	2.1	2.4	-0.2	0.4	0.2	0.1	1.6	(-0.6;0.5)
AT	2.8	2.4	2.3	1.9	1.6	1.0	0.1	0.1	1.4	2.0	1.6	(0.7;1.4)
DE	2.9	2.3	2.9	2.3	1.9	1.3	0.3	0.3	1.3	1.9	1.8	(1.5;1.7)
PT	2.1	0.7	1.5	-0.1	-0.4	-0.9	-0.4	0.1	0.1	1.8	0.5	(1.3;1.5)
HU	3.3	4.6	1.3	1.6	3.8	3.6	4.4	3.1	3.1	0.0	2.9	(-0.9;0.2)
PL	7.7	7.0	7.9	10.2	6.9	4.9	2.5	3.0	2.9	2.1	5.5	(-1.2;0.6)
SK	12.2	9.0	-0.3	-0.8	0.3	0.5	0.9	0.4	1.8	0.5	2.5	(-1.2;0.1)
SI	3.4	-1.6	-1.1	3.4	4.4	-1.5	-2.6	1.2	-0.7	2.3	0.7	(-0.1;1.7)

Note: a) Estimated real average interest rate for the next five years based on the range of the estimated rate of equilibrium real appreciation as set out in Table 4, assuming an unchanged nominal exchange rate and a zero risk premium.

To sum up, the Czech economy is gradually converging to the euro area level in terms of GDP per capita and the price level. In particular, the convergence of real GDP has accelerated over the last five years. At the same time, it can be assumed that the price level convergence will accelerate in 2008 as a result of the pronounced real appreciation of the koruna against the euro. Going forward, however, there is still substantial room for faster growth of

¹⁸ Three-month interest rates were selected due to the availability of data for all the countries under review for the entire monitored period (see the *Methodological Part*). Twelve-month interest rates would be more appropriate from the economic point of view, but the differences compared to three-month rates are small on average. Twelve-month real interest rates for the Czech Republic following euro area entry would be estimated at -0.5%–0.6%, as compared to an average of 1.8% for the last ten years and 0.4% for the last four years.

¹⁹ Until mid-2008, the CNB's forecasts explicitly assumed a three-month equilibrium real money market rate of just below 1%.

economic activity compared to the current euro area countries. The equilibrium real appreciation of the koruna associated with this process may thus still pose a challenge to the functioning of the economy in the euro area, in terms of higher inflation and low or even negative real interest rates.

1.1.2 Correlation of economic activity

Upon entering the euro area, monetary policy decision-making independence will be replaced by the adoption of single union monetary policy decisions responding to average economic developments at the monetary union level. For a country that is in a different phase of the business cycle than the euro area average, such monetary policy setting does not necessarily have to be entirely optimal and this can lead to additional economic costs. From the point of view of the optimum currency area theory, participation in the euro area is less costly for a country with a higher business cycle correlation. The analysis below therefore focuses on to what degree the cyclical development of the Czech economy and the other countries under comparison is similar to the overall development at the euro area level.

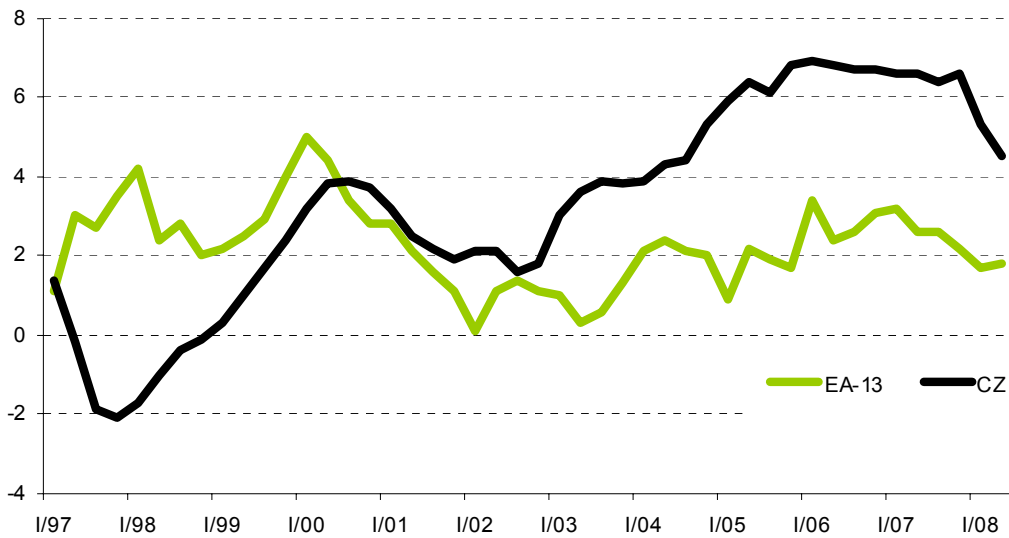
To measure the degree of cyclical alignment of economic activity in the selected economies with that in the euro area, a simple correlation coefficient and a dynamic correlation method, based on the spectral analysis of time series, have been applied. For comparison, two detrending methods have been applied to the time series under comparison: year-on-year differences on the logarithm of the original time series and quarter-on-quarter (or month-on-month) differences on the logarithm of the seasonally adjusted time series.

To monitor the evolution of alignment over time, the data have been divided into two periods. This also enables us to isolate the influence of clearly asymmetric developments at the start of the period under review which had non-cyclical causes. A view of the time development of the correlation of economic activity is enabled by the calculation of the correlation for moving five-year time periods (rolling correlation).

The overall economic activity of the countries under review is described by real GDP growth. To obtain a more comprehensive picture, the correlation of economic activity in industry (as measured by the Industrial Production Index, IPI) and the correlation of export activity (the correlation of overall exports with overall euro area exports and the correlation of the exports of a specific country to the euro area with euro area GDP) have also been examined.

Chart 1 illustrates annual real GDP growth in the Czech Republic and the euro area. Divergent trends are apparent in these economies at the beginning of the period under review. The economic decline in the Czech Republic during that period was due to a combination of abating transformation problems, structural changes and the occurrence of some specific shocks (such as the 1997 financial crisis). During 2000–2002, the rate of Czech economic growth copied the adverse trend in the euro area to some extent, although the effect of the external slowdown was magnified by appreciation of the exchange rate. The growth of the Czech economy has increased rapidly since 2003 thanks to reforms and changes on the supply side. Economic growth in the euro area countries has also risen in this period, but has remained significantly slower than in the Czech economy. Economic growth in the Czech economy has been gradually decreasing since 2007. This can be interpreted as the reaching of the peak of the cycle and a subsequent downward phase. This period has also seen a decline in economic growth in the euro area.

Chart 1: Annual percentage changes in real GDP (%)



Source: Eurostat, CNB calculations.

Table 6 summarises the results of the **simple correlation analysis** for GDP and the IPI. For the first period, neither of the methods finds a statistically significant correlation between GDP growth in the Czech Republic and that in the euro area. This result is not surprising given the aforementioned trend in the Czech Republic in the late 1990s. In the second period, the correlation takes on higher values. According to Method 1 the positive correlation is statistically significant, while according to Method 2 it is positive but at the boundary of statistical significance at the 10% level of probability. Compared to last year's analysis, both values have increased. This improvement can be explained, among other things, by a longer time gap since the specific shocks at the start of the period under review. It can be said that the alignment is possibly increasing over time. The question remains, however, to what extent this period was affected by the combined cyclical pattern in the euro area and trend growth in the Czech Republic associated with the real convergence of the transforming economies and changes on the supply side of economy. The correlation analysis is not able to differentiate these developments.²⁰

The correlation increased between the two periods under review for all the countries under review except Hungary. The highest values of real GDP alignment are traditionally recorded by Germany.²¹ High correlation of economic activity in both periods was also recorded by Austria and, since 2002, also Slovenia. Compared to the countries under review, the cyclical alignment of the Czech Republic is roughly average and the measured correlation is, for example, somewhat higher than that for the currently acceding Slovakia.

²⁰ The Czech Republic's high GDP and export growth to date has reflected an increase in production capacity as a result of strong inflows of FDI.

²¹ This is largely because Germany alone accounts for approximately 30% of euro area GDP, which distorts the result upwards. This indicator is thus only illustrative.

Table 6: Correlation coefficients of economic activity – evolution over time^a

		1997 Q1–2001 Q4		2002 Q1–2008 Q1		Jan 1999–Dec 2001		Jan 2002–Dec 2008	
		GDP		GDP		IPI		IPI	
Method 1	CZ	0.10	(-0.29 ; 0.46)	0.73 **	(0.52 ; 0.86)	0.29 *	(0.02 ; 0.53)	0.74 **	(0.64 ; 0.81)
	AT	0.68 **	(0.41 ; 0.84)	0.86 **	(0.74 ; 0.93)	0.82 **	(0.70 ; 0.89)	0.73 **	(0.63 ; 0.81)
	DE	0.92 **	(0.84 ; 0.96)	0.95 **	(0.91 ; 0.98)	0.98 **	(0.96 ; 0.99)	0.90 **	(0.86 ; 0.93)
	PT	.		.		-0.13	(-0.39 ; 0.16)	0.42 **	(0.25 ; 0.56)
	HU	0.75 **	(0.52 ; 0.88)	-0.26	(-0.55 ; 0.09)	0.86 **	(0.77 ; 0.92)	0.60 **	(0.46 ; 0.71)
	PL	0.55 **	(0.21 ; 0.77)	0.68 **	(0.44 ; 0.83)	0.76 **	(0.61 ; 0.86)	0.58 **	(0.44 ; 0.69)
	SI	0.37	(-0.01 ; 0.66)	0.87 **	(0.76 ; 0.94)	0.66 **	(0.47 ; 0.79)	0.59 **	(0.46 ; 0.70)
	SK	-0.01	(-0.39 ; 0.37)	0.68 **	(0.44 ; 0.83)	0.43 **	(0.17 ; 0.63)	0.60 **	(0.47 ; 0.71)
Method 2	CZ	0.00	(-0.35 ; 0.35)	0.34	(0.00 ; 0.60)	0.50 **	(0.25 ; 0.68)	0.31 **	(0.13 ; 0.47)
	AT	0.54 **	(0.23 ; 0.75)	0.43 **	(0.10 ; 0.67)	0.38 **	(0.11 ; 0.59)	0.31 **	(0.13 ; 0.47)
	DE	0.77 **	(0.57 ; 0.88)	0.82 **	(0.67 ; 0.91)	0.81 **	(0.69 ; 0.89)	0.50 **	(0.34 ; 0.63)
	PT	.		.		0.03	(-0.25 ; 0.30)	0.36 **	(0.19 ; 0.52)
	HU	0.55 **	(0.25 ; 0.76)	-0.15	(-0.47 ; 0.19)	0.22	(-0.06 ; 0.47)	0.14	(-0.05 ; 0.32)
	PL	0.26	(-0.10 ; 0.56)	0.38 *	(0.05 ; 0.64)	0.42 **	(0.16 ; 0.63)	0.42 **	(0.25 ; 0.57)
	SI	-0.11	(-0.44 ; 0.25)	0.71 **	(0.48 ; 0.84)	0.41 **	(0.15 ; 0.62)	0.29 **	(0.10 ; 0.45)
	SK	0.10	(-0.26 ; 0.44)	0.30	(-0.04 ; 0.58)	0.26	(-0.02 ; 0.50)	0.17	(-0.02 ; 0.34)

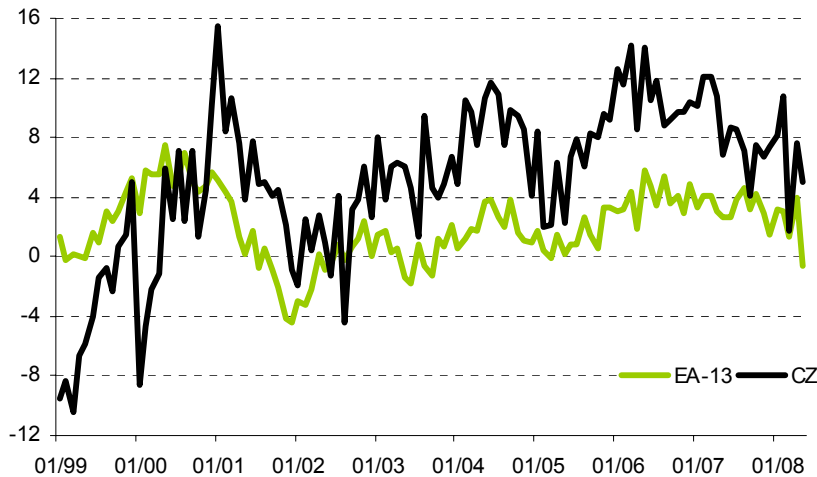
Note: a) Method 1 – annual difference, Method 2 - quarter-on-quarter (or month-on-month) difference. The significance of the correlation coefficient is marked ** and * for the 5% and 10% significance levels respectively. The 90% confidence interval is in parentheses.

Source: IMF, CNB calculations.

Chart 2 illustrates the annual changes in the **Industrial Production Index**. Under Method 1 the correlation analysis of the Industrial Production Index (see Table 6) signals an increase in correlation between the periods under review, while under Method 2 this correlation, in contrast, recorded a decline. The decrease in correlation based on month-on-month data is affected by a slowdown in industrial production in the Czech Republic in 2008 Q1, which far exceeded that in the euro area. However, a statistically significant positive correlation between industrial production in the Czech Republic and that in the euro area is observed in both periods. A positive correlation is also observed for the other countries under review. The information acquired by comparing the correlation of industrial production is auxiliary only, as industry typically accounts for less than one-third of total output in the advanced economies, and, moreover, the economies of the countries under comparison also differ in terms of structure (see section 1.1.5).²²

²² Boone and Maurel (1999) criticise the use of the industrial production index for analysing the similarity of economies and business cycles, because of its high volatility.

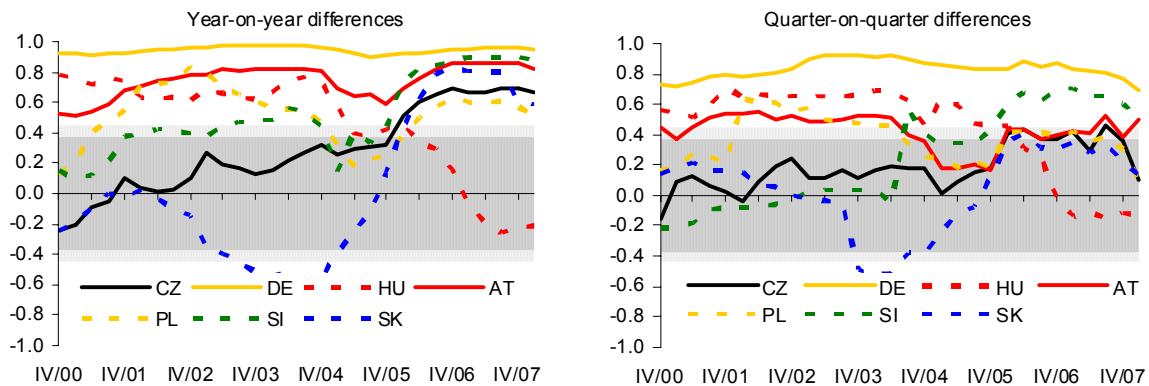
Chart 2: Year-on-year changes in the Industrial Production Index (%)



Zdroj: Eurostat, výpočet ČNB.

Chart 3 shows the **rolling correlation** of GDP growth for the two methods. The results for the Czech economy are not clear-cut. According to Method 1, the Czech Republic showed the most marked increase in alignment of all the countries under review and the positive correlation values have been statistically significant since 2006.²³ However, the trend of increasing correlation is much weaker when the economic growth data are reviewed in the correlation analysis according to Method 2. The correlation values are not statistically significant for most of the period under review and fall considerably at the end of the period as a consequence of the aforementioned slowdown.

Chart 3: Rolling correlation of economic activity^a



Note: a) The time data on the horizontal axis indicate the end of the rolling window of 5 years

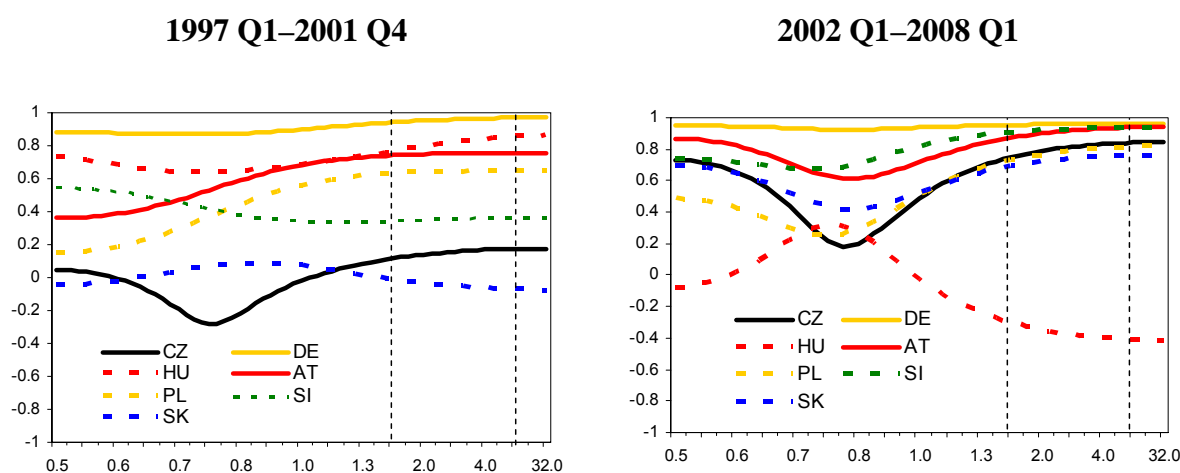
Source: Eurostat, CNB calculations.

Chart 4 illustrates the results of the **dynamic correlation** using spectral analysis of the time series of annual GDP changes. This method endeavours to separate medium-term economic fluctuations, which correspond to the business cycle, from short-term and long-term movements of the variables describing economic activity. The results of this analysis confirm

²³ The statistical significance of the correlation coefficients is indicated in the chart: values statistically significant at the 5% level lie in the white area of the chart, and values statistically significant at the 10% level lie in the white and light grey parts of the chart. The values in the dark grey part of the chart are not statistically significant at the 10% level.

the previous conclusions. The alignment increased markedly in the second period under review compared to the first period across the entire frequency range. The situation is similar in the other countries under comparison except for Hungary. For a period of around 1.5–8 years, i.e. the standard business cycle length considered, the correlation is higher than for shorter frequencies. This means that the rate of alignment affecting the formation of economic policy is in fact higher than the aforementioned values of the static correlation, which approximately average the values of the dynamic correlation across the entire spectrum of frequencies, thus slightly undervaluing the alignment in terms of the course of the business cycle. However, as with the static correlation, the dynamic correlation indicator also showed a positive shift in the alignment of economic growth compared to last year's analysis; then, the Czech Republic's correlation values were lower than those of the other countries under comparison except for Hungary, whereas now only the current euro area members have higher levels in this regard than the Czech Republic.

Chart 4: Dynamic correlation of economic activity (annual changes in real GDP) with the euro area^a



Note: a) The x-axis shows the spectrum of possible duration of the cycle in years on a logarithmic scale. The interval depicted by the two vertical dashed lines indicates the cycle length considered, i.e. 1.5–8 years.

Source: Eurostat, CNB calculations.

The results of the export performance correlation analysis are summarised in Table 7. The measured correlation of the total exports of the Czech Republic and the euro area is positive and statistically significant in both periods and according to both methods. According to Method 2, the correlation coefficient has also increased over time. The conclusion of a positive correlation of total exports can be viewed as more robust compared to last year. The correlation of Czech exports to the euro area with euro area GDP is lower than the correlation with euro area exports. This correlation is virtually unchanged compared to last year's analysis; nevertheless, according to Method 1 it was statistically significant in the second period under review.²⁴ The other values for the Czech Republic are not statistically significant from zero.

²⁴ However, relatively high alignment can be seen at the level of some industries. See section 1.4.3.

Table 7: Correlation coefficients of overall export activity and exports to the euro area with euro area GDP – evolution over time^a

		Jan 1997–Dec 2001		Jan 2002–Nov 2007		1997 Q1–2001 Q4		2002 Q1–2007 Q3	
		EXP _{TOTAL}		EXP _{TOTAL}		EXP _{to EA-12} vs HDP _{EA-13}		EXP _{to EA-12} vs HDP _{EA-13}	
Method 1	CZ	0.53 **	(0.37 ; 0.66)	0.63 **	(0.50 ; 0.74)	0.24	(-0.12 ; 0.54)	0.38 *	(0.03 ; 0.64)
	AT	0.79 **	(0.70 ; 0.85)	0.75 **	(0.65 ; 0.82)	0.73 **	(0.52 ; 0.86)	0.70 **	(0.45 ; 0.84)
	DE	0.94 **	(0.91 ; 0.96)	0.82 **	(0.75 ; 0.88)	0.74 **	(0.53 ; 0.86)	0.85 **	(0.70 ; 0.92)
	PT	0.47 **	(0.30 ; 0.61)	0.67 **	(0.55 ; 0.77)	0.24	(-0.11 ; 0.54)	0.74 **	(0.53 ; 0.87)
	HU	0.48 **	(0.32 ; 0.62)	0.58 **	(0.43 ; 0.70)	0.24	(-0.11 ; 0.54)	0.74 **	(0.53 ; 0.87)
	PL	0.67 **	(0.55 ; 0.77)	0.20 *	(0.01 ; 0.38)	0.29	(-0.06 ; 0.57)	0.60 **	(0.31 ; 0.78)
	SI	0.67 **	(0.55 ; 0.77)	0.20 *	(0.01 ; 0.38)	0.55 **	(0.26 ; 0.75)	0.48 **	(0.16 ; 0.71)
	SK	0.73 **	(0.62 ; 0.81)	0.52 **	(0.36 ; 0.65)	0.03	(-0.32 ; 0.37)	0.35	(-0.01 ; 0.62)
Method 2	CZ	0.24 **	(0.05 ; 0.42)	0.36 **	(0.17 ; 0.52)	0.14	(-0.21 ; 0.46)	0.27	(-0.09 ; 0.57)
	AT	0.46 **	(0.29 ; 0.60)	0.04	(-0.16 ; 0.24)	0.62 **	(0.35 ; 0.80)	0.23	(-0.13 ; 0.54)
	DE	0.52 **	(0.36 ; 0.65)	0.36 **	(0.18 ; 0.52)	0.34	(-0.01 ; 0.61)	0.53 **	(0.22 ; 0.74)
	PT	0.20 *	(0.01 ; 0.38)	0.28 **	(0.09 ; 0.45)	0.36 *	(0.02 ; 0.63)	0.18	(-0.19 ; 0.50)
	HU	0.26 **	(0.07 ; 0.44)	0.33 **	(0.14 ; 0.50)	0.36 *	(0.02 ; 0.63)	0.18	(-0.19 ; 0.50)
	PL	0.17	(-0.03 ; 0.35)	0.40 **	(0.23 ; 0.56)	0.22	(-0.13 ; 0.53)	0.35 *	(0.00 ; 0.63)
	SI	0.17	(-0.03 ; 0.35)	0.40 **	(0.23 ; 0.56)	0.42 **	(0.08 ; 0.66)	0.15	(-0.21 ; 0.48)
	SK	0.18	(-0.02 ; 0.36)	0.18	(-0.02 ; 0.36)	-0.11	(-0.43 ; 0.25)	-0.03	(-0.38 ; 0.32)

Note: a) Method 1 – year-on-year differences, Method 2 – quarter-on-quarter (or month-on-month) differences. The significance of the correlation coefficient is marked ** and * for the 5% and 10% significance levels respectively. The 90% confidence interval is in parentheses.

Source: IMF, CNB calculations.

1.1.3 Synchronisation of economic shocks

In the optimum currency area literature, similarity of economic shocks is viewed as another precondition for an appropriate monetary policy effect in a monetary union (e.g. Frankel and Rose, 1998). However, there is no consensus on the effect of demand and supply shocks.

While insufficient symmetry of demand shocks is a general argument against joining a single currency area, the literature does not provide a unanimous opinion on the need for the alignment of supply shocks. The following analysis assesses the degree of synchronisation of demand and supply shocks between the countries under review and the euro area. The estimates were made using a method identifying demand and supply shocks²⁵ on quarterly data for 1996 Q1–2008 Q2 and for two sub-periods: 1996–2001 and 2002–2008. The correlation of the shocks can take values in the range of [-1, 1]. Positive values indicate that the shocks are symmetric with respect to the euro area. Low or negative values correspond to asymmetric shocks. When interpreting the results on the correlation of demand and supply shocks, one should keep in mind the possible distorting effect of the excessive exchange rate volatility recorded in some periods on the correlation of demand and supply shocks. Euro area entry would eliminate this volatility.

The results of the **demand shock correlation analysis** are shown in Table 8. The measured correlation of the demand shocks identified for the Czech Republic in relation to the euro area has been moving close to zero, or at statistically insignificant negative levels, both for the overall period 1996–2008 and for the two sub-periods. So far, then, there has been no statistically significant change in the alignment of this type of shock. For the other countries under review except for Germany and Slovakia, the demand shocks were also not statistically

²⁵ At the same time one needs to take into account that this method identifies economic shocks using econometric methods and does not ascribe specific interpretations to them, for example their source or form. The individual types of shocks are dealt with in section 1.4.

significantly correlated with the demand shocks identified for the euro area as a whole.²⁶ Germany records the strongest demand shock correlation, with a value of 0.55 for the whole of the period under review (and 0.68 for 2002–2008). However, given the significant share of German GDP in euro area GDP, this result is not surprising. For Slovakia, the correlation is negative and statistically significant for 1996–2001 and for the overall period, although for 2001 onwards we observe a disappearance of this correlation. The low synchronisation of shocks on the demand side in the Czech Republic is in line with the average for the selected current members of the euro area (except for Germany). This suggests that the risk due to asymmetry of shocks is no higher in the Czech economy than in the countries under comparison.

The correlation between the Czech Republic and the euro area as regards **supply shocks** (see Table 9) for the period 2002–2008 is slightly positive. However, even here the correlation coefficients are not statistically significantly different from zero, nor are the changes over time statistically significant. The analysis revealed statistically significant shifts towards higher supply shock alignment in Germany, Portugal and Slovenia, but in the other countries it identified no statistically significant correlation of shocks with the euro area recently. The strongest alignment of shocks is shown by Germany (whose coefficient is statistically significant and increased slightly). Portugal and Slovenia showed a statistically significant increase in supply shock alignment.

Table 8: Correlation of economic shocks vis-à-vis the euro area – demand shocks

	1996–2008	1996–2001	2002–2008
CZ	-0.11	-0.06	-0.11
AT	0.15	0.18	-0.06
DE	0.55 ***	0.44 **	0.68 ***
PT	0.01	0.02	-0.06
HU	0.02	-0.13	0.25
PL	-0.01	0.11	0.03
SI	0.07	0.24	-0.04
SK	-0.24 *	-0.36 *	0.16

Note: The significance of the correlation coefficient is marked ***, ** and * for the 1%, 5% and 10% significance levels respectively.

Source: CNB calculations.

²⁶ Some of the results of the economic shock correlation analysis differ quite considerably from last year's results. The change in the calculated correlations may reflect GDP data revisions, the addition of new observations or the occurrence of shocks in a later period, since the occurrence of an economic shock is an unobservable variable and the identification thereof is not always entirely robust.

Table 9: Correlation of economic shocks vis-à-vis the euro area – supply shocks

	1996–2008	1996–2001	2002–2008
CZ	0.14	0.15	0.15
AT	0.25 **	0.32	0.17
DE	0.78 ***	0.74 ***	0.83 ***
PT	0.10	-0.10	0.36 *
HU	-0.07	-0.06	-0.07
PL	0.23 *	0.29	0.16
SI	0.23 *	0.00	0.49 **
SK	0.15	0.14	0.20

Note: The significance of the correlation coefficient is marked ***, ** and * for the 1%, 5% and 10% significance levels respectively.

Source: CNB calculations.

1.1.4 Analysis of cyclical alignment using the Taylor rule

In the presence of misalignment of economic cycles within the euro area, economies in the upward phase of the cycle could be further accelerated by the single monetary policy, since the single nominal interest rate coupled with locally higher inflation would lead to lower real rates. Conversely, economies in the contractionary phase of the cycle have *ceteris paribus* lower inflation and hence higher real rates. In this regard, the single monetary policy can have a pro-cyclical impact (see Björkstén and Syrjänen, 1999).

The divergence of optimum monetary policy settings in the individual countries of the monetary union, and thus the divergence of the cyclical situation of their economies, can be analysed using a calculation of the “appropriate” monetary policy rates for these countries. However, the analysis is aimed not at providing a precise estimate of the monetary policy rate settings, but at identifying in a robust way the phase of the cycle in which a given economy is. The Taylor rule (Taylor, 1993), namely a simple but a robust version of the estimate of the central bank’s reaction function, is applied to estimate these rates in the text below.²⁷

Chart 5 illustrates the monetary policy rates implied by the Taylor rule in all the economies under review. The grey area marks out the space between the maximum and minimum implied rates for the countries under review. In addition, the implied rates for the Czech Republic and the euro area as a whole and the actual ECB rate settings are illustrated.

The results suggest a slight narrowing of the spread between the maximum and minimum implied rates (a narrowing of the grey range).²⁸ This is a consequence of the stabilisation of the transforming economies, for which the Taylor rule prescribes relatively higher rates at the start of the period under review. Looking only at the euro area countries, we do not observe any divergence resulting from the above-discussed pro-cyclical effect of the single monetary policy.²⁹ We also observe that the estimate of the rates for the entire euro area is systematically above the actual ECB rate settings.³⁰

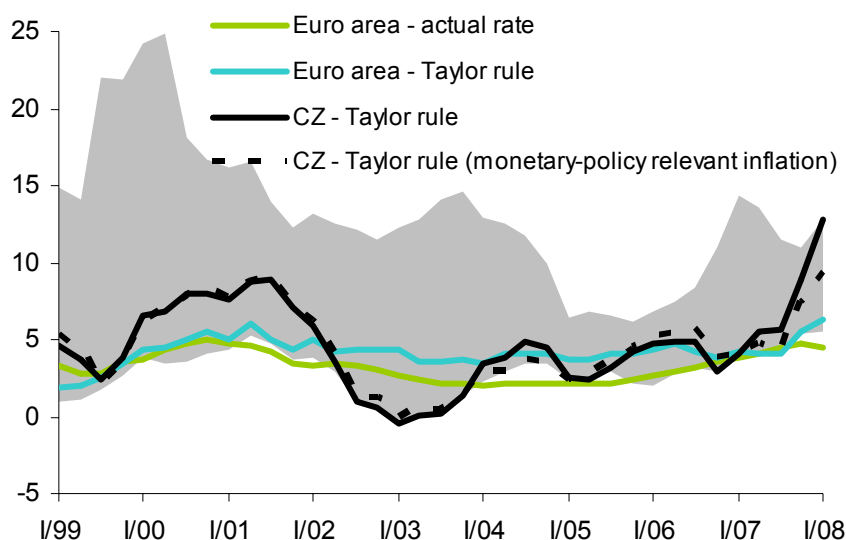
²⁷ Horváth (2007) also estimates the optimal interest rate using the Taylor rule.

²⁸ Prior to 1999, the maximum (and thence also the spread) was even higher than in the depicted time-period.

²⁹ This might be in line with the endogenous business cycle hypothesis (see, for example, Frankel and Rose, 1997), which assumes that after the adoption of a single currency, the business cycles of individual countries will converge and hence the *ex post* costs ensuing from sub-optimal monetary policy are lower than their *ex ante* estimates.

³⁰ The implied rates thus do not exactly copy the actual rates. This is probably because an identical and intertemporally constant monetary policy neutral rate is assumed for all countries. However, this analysis sets out

Chart 5: Implied monetary policy rates



Source: Eurostat, CNB calculations.

For the larger part of the period under review, the estimate of the monetary policy rates for the Czech economy is somewhat lower than for other countries, and sometimes even forms the lower boundary of the depicted range. There are two periods that are exceptions. The first is approximately 2000 Q1–2002 Q1, when a domestic economic recovery replaced the previous recession, amid a concurrent weakening of the previously relatively robust economic growth in the euro area. The second period is 2007 Q3–2008 Q1, for which part of the increase in implied rates can be explained purely cyclically and partly also by the effect of higher inflation resulting from some government administrative measures.

This second period can be used to illustrate that the Taylor rule analysis does not seek to estimate the optimum interest rate level. The Czech National Bank's current interest rate settings are well below the rates implied by the Taylor rule because the central bank expects inflation to be declining towards the target at the monetary policy horizon. The lower rates are therefore consistent with a forward-looking rule, but difficult to explain using a backward-looking rule. The results of this analysis should therefore be interpreted cautiously. It is important to focus on the medium term and not to assess the appropriateness of the implied monetary policy rates at any given moment.

The sum of the squares of the difference between the “appropriate” interest rate of a specific country from the “appropriate” rate for the entire euro area can be considered a certain measure of cyclical deviation. Table 10 shows the individual results. From this point of view, the Czech economy's alignment with the euro area is relatively high.³¹ This might be interpreted as meaning that upon euro area entry the Czech economy should face no greater problems than Slovenia (i.e. a country that is already in the euro area) or Poland, or should face much smaller problems than Hungary and Slovakia. On the other hand, the data in the table signal larger problems for the Czech Republic than for Germany and Austria. The table

to compare the individual economies' cycles in an alternative way, not to estimate the interest rate settings exactly.

³¹ Owing to decreasing spreads, the other converging countries would also be assessed by the analysis as being relatively more aligned if the interval on which the deviations are calculated started nearer to the present.

also gives statistics for the deviations of the actual rate in the euro area from the Taylor rule (EA-13 actual rate) and the deviation using monetary-policy relevant inflation instead of headline inflation for the Czech Republic (CZ monetary-policy relevant inflation).

Table 10: Sum of squares of deviations from “appropriate” euro area rates

	from 1999 Q1	from 2001 Q1	from 2003 Q1
EA-13 (actual rate)	3.9	3.1	2.7
CZ	12.5	8.4	5.6
CZ (monetary-policy relevant inflation)	12.6	9.0	7.6
AT	1.4	1.1	0.9
DE	2.2	1.5	1.1
PT	9.0	4.4	1.4
SI	99.5	36.6	11.7
HU	214.8	59.4	42.0
PL	100.0	8.6	4.9
SK	237.0	53.0	45.7

Note: Periods always ending with 2008 Q1.

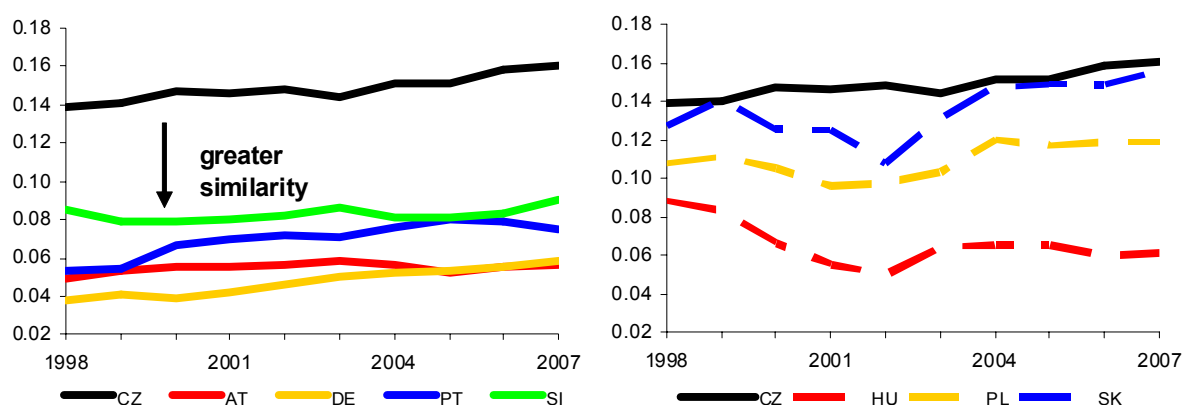
Source: Eurostat, CNB calculations.

1.1.5 Structural similarity of the economies

Greater similarity of the structure of economic activity between the acceding economy and the other economies of the monetary union decreases the risk of occurrence of an asymmetric economic shock. The structural similarity of the economies of the countries under comparison with the euro area is expressed using the Landesmann structural coefficient, which compares the shares of six sectors of the economy in total value added in the countries under comparison and the euro area. The coefficient takes values in the range of [0, 1]. The closer the coefficient is to zero, the more similar is the structure of the economies under comparison. Chart 10 shows that the Landesmann coefficient for the Czech Republic is the highest of all the selected countries. The structure of economic activity in the Czech Republic is the least similar to the euro area average of all the countries under comparison. However, the index for the Czech Republic is relatively close to the lower boundary of the interval [0, 1]. The difference in the structure of value added in the Czech economy consists mainly in a high share for industry³² and in a lower share for services, in particular financial intermediation, real estate and other services (see Table 12). The lower share of financial intermediation in economic activity in the Czech Republic will be a factor underlying the smaller first-round effects of the global financial crisis on the Czech economy (see Box 1, section 1.3).

³² The share of industry in value added has increased slightly since 1998, but has been broadly flat since 2004.

Chart 6: Structural similarity vis-à-vis the euro area



Source: Eurostat and CZSO, CNB calculations.

Table 11: Shares of economic sectors in GDP in 2007 (%)^a

	A, B	C, D, E	F	G, H, I	J, K	L-P
EA-13	2	20	6	21	28	22
CZ	3	32	6	25	17	17
AT	2	23	7	23	24	20
DE	1	26	4	18	29	22
PT	3	18	6	24	22	26
HU	4	25	4	21	23	22
PL	4	23	8	28	18	18
SI	2	28	7	23	22	19
SK	3	30	7	27	18	16

Note: a) The sectors are broken down according to the NACE classification: A, B – agriculture, forestry and fishing; C, D, E – industry; F – construction; G, H, I – wholesale and retail trade, repair, accommodation, transport and communication; J, K – financial intermediation, real estate, renting and business activities; L-P – other services.

Source: Eurostat and CZSO, CNB calculations.

1.1.6 Convergence of the interest rate differential

Some countries entering the currency area in the past faced rapid nominal interest rate convergence to the union level, which acted as an asymmetric shock.³³ Therefore, earlier nominal interest rate convergence is better for smooth accession to the euro area, as it will facilitate better adjustment of economic processes and eliminate the additional asymmetric shock associated with euro adoption and sudden elimination of the risk premium.³⁴

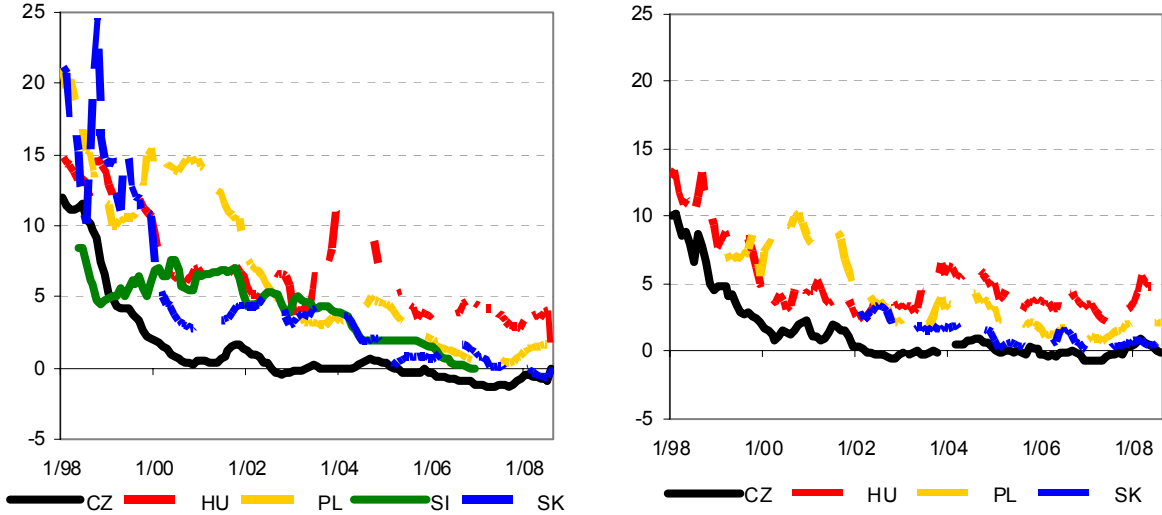
The following comparison of the **nominal interest rate differential** vis-à-vis the euro area attempts to express the probability of the asymmetric shock described above. The closer the nominal interest rate differential is to zero, the smaller is the risk that joining the monetary union will cause a rapid change in both nominal and real interest rates, which would have a destabilising effect on the economy. Chart 7 illustrates the interest rate differentials in the

³³ Although real economic activity is affected primarily by real interest rates, nominal interest rates may also have a significant effect via some credit or budgetary constraints (e.g. the loan repayment to financial income ratio).

³⁴ See also section 1.1.1.

Czech Republic, Hungary, Poland, Slovenia and Slovakia vis-à-vis the euro area for three-month rates on the interbank market and five-year government bonds.

Chart 7: Differences in interest rates vis-à-vis the euro area 1998-2008 (percentage points)



Source: Eurostat, Bloomberg, CNB calculations.

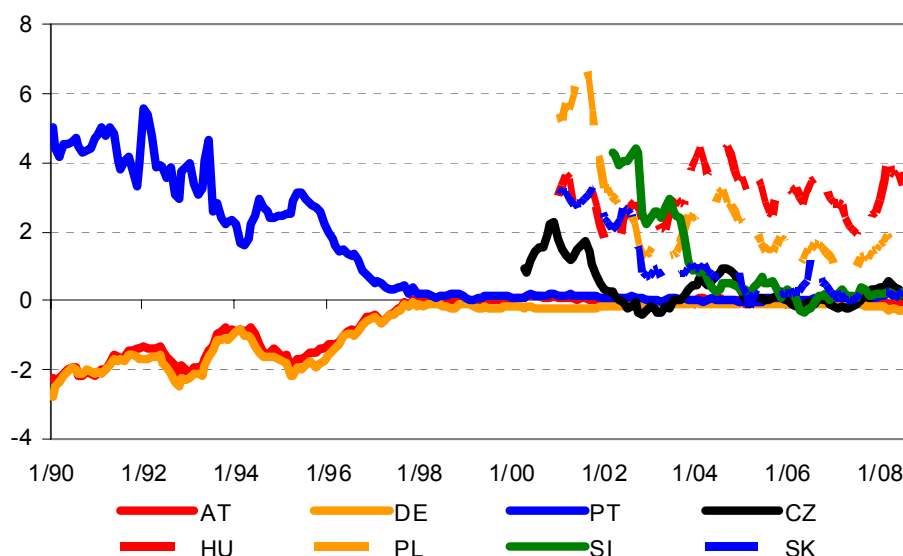
Interest rate convergence is observable for all the countries compared and for both maturities. The only exception in recent years has been Hungary, where a significant difference in interest rates still persists. In the Czech Republic, high convergence has existed since 2002.

The interest rate differential in three-month rates in the Czech Republic has been negative since March 2005 and reached its minimum in April 2007. A negative short-term interest rate differential has also been observed in Slovakia since August 2008. Unlike the other countries under review and the euro area, where these rates have mostly been rising over the past twelve months, three-month rates in Slovakia have fluctuated within a narrow range.

The difference in five-year interest rates is currently only slightly higher than that in three-month rates for almost all countries. The only exception is Hungary, where the difference is more pronounced. In the Czech Republic, the difference in five-year rates switched from negative to positive at the end of 2007, but declined to zero again in August 2008. However, interest rates have recently been affected by the US credit crisis and by higher inflation in the European region, and hence do not necessarily reflect long-term factors.

The evolution of interest rates in the euro area countries prior to the introduction of the euro may be an indication for countries planning to introduce the euro. Chart 8 shows, for all the countries under comparison, the differentials for ten-year government bond yields, which are monitored as one of the Maastricht convergence criteria, against the euro area average. For Austria, Germany and Portugal, the run-up to the introduction of the euro is included. However, when comparing the levels and evolution of these interest rate differentials, the fact that the structural characteristics of the economies have changed since the 1990s should be taken into account.

Chart 8: Differences in interest rates vis-à-vis the euro area 1990-2008, long-term interest rates (percentage points)



Source: Eurostat, CNB calculations.

The current average interest rate level in the new Member States is broadly comparable to the time-corresponding level of the interest rate differential in Portugal. Among non-euro area countries, the lowest long-term interest rates are in the Czech Republic and Slovakia, which are showing an almost zero interest rate differential in 2008 and have thus progressed the furthest in terms of interest rate convergence.³⁵ Although it is not possible to guarantee that this situation will persist until adoption of the euro, it can be expected from the current perspective that the effects due to changes in nominal interest rates connected with the Czech Republic's future entry into the euro area will be rather small.

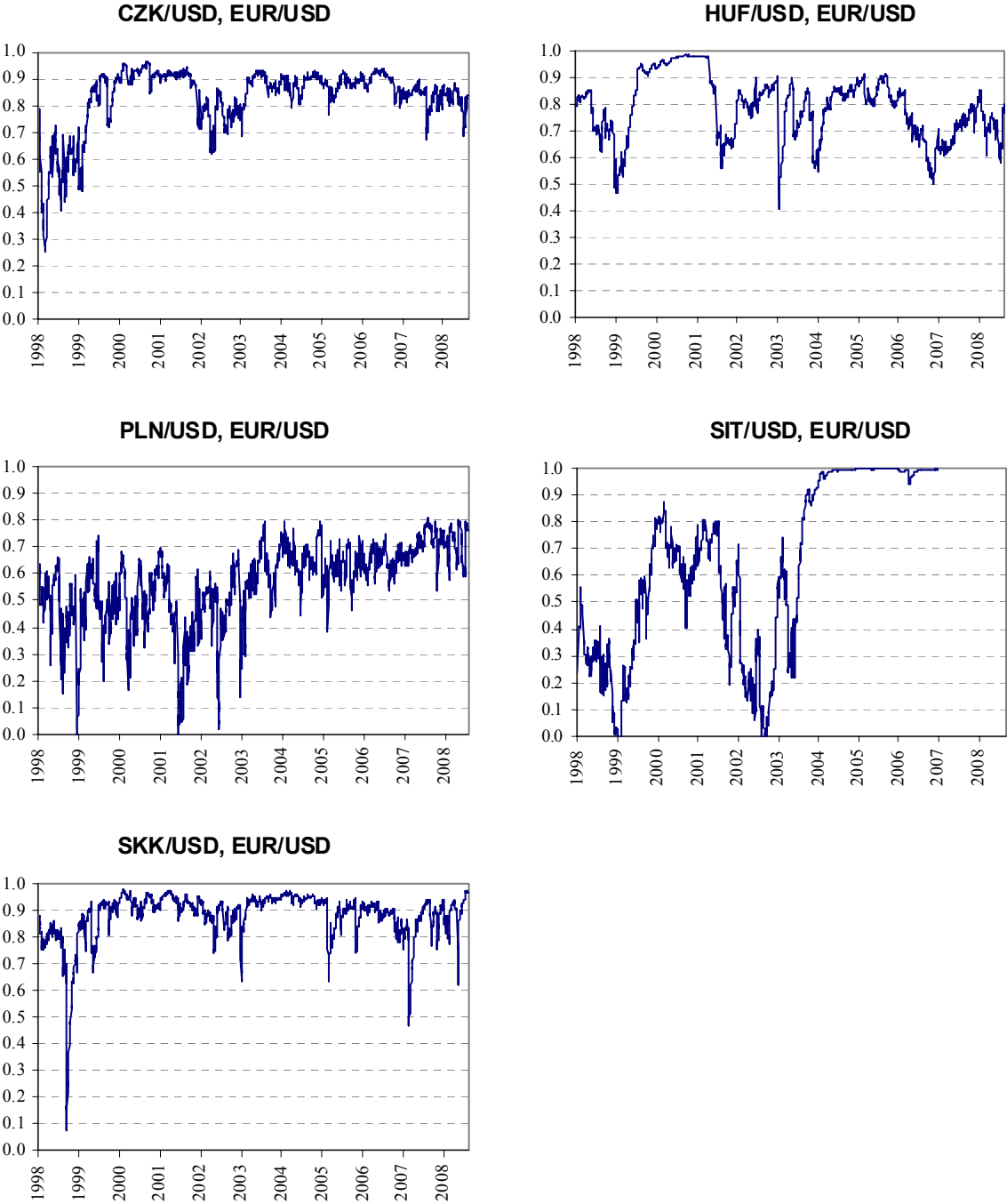
1.1.7 Exchange rate convergence

Similar movement in the exchange rates of two currencies in the long term vis-à-vis a third (reference) currency reflects similarity in the factors which affect those exchange rates. A high **exchange rate correlation** of two currencies vis-à-vis a third currency can thus be an indicator that the two countries can share a single currency (Aguilar and Hördahl, 1998).³⁶ The following analysis uses a GARCH model to estimate the correlation between the exchange rates of the Czech koruna, the Hungarian forint, the Polish zloty, the Slovenian tolar and the Slovak koruna and the euro vis-à-vis the US dollar. A high degree of correlation reflects high similarity of exchange rate movements and less intense asymmetric pressures; the exchange rate correlation of currencies in a monetary union would be one. Chart 9 illustrates the development of the correlation coefficients.

³⁵ Holinka (2005) uses data for 1999–2004 and explains the decrease in the differential of five- and ten-year interest rates in the Czech Republic vis-à-vis the euro area over the period under review in terms of expectations of a lower short-term rate due to a decrease in inflation expectations in the Czech Republic and the inflation premiums. However, the impact of short-term rate expectations becomes lower for ten-year interest rates.

³⁶ Aguilar and Hördahl (1998) express the probability of euro adoption in the countries which at that time were EMU candidate countries using the correlation of the exchange rates of their currencies and the Deutsche Mark (as a proxy for the euro) vis-à-vis the US dollar. Babetskaia-Kukharchuk et al. (2008) use the same method to calculate the correlation of four Central European currencies vis-à-vis the euro.

Chart 9: Correlation coefficients of exchange rates against the US dollar



Source: Eurostat, CNB calculations.

The charts show that the correlation between the Czech koruna and the euro has been relatively high since 2000 (although the period 2001–2002 saw a short-lived decline related to an appreciation episode). In 2007–2008, we can observe a decline in the correlation coefficient to about 80%, with a temporary fluctuation to somewhat lower figures in the first half of 2008, but this can be partly explained by the dollar’s exchange rate volatility and by appreciation of the region’s currencies. We can see that the Czech and Slovak korunas have a

higher and less volatile correlation with the euro by comparison with the Polish zloty and the Hungarian forint³⁷. Slovakia will introduce the euro on 1 January 2009. Prior to the setting of the conversion rate vis-à-vis the euro (8 July 2008) the Slovak koruna had the highest correlation of all the countries under review.³⁸

To assess the importance of exchange rate convergence it would be useful to compare the aforementioned results with the exchange rate correlation of the Austrian and Portuguese currencies and the Deutsche Mark before they adopted the euro. However, the direct comparison unfortunately has a limited information value, owing to the different exchange rate regimes in these countries. The Austrian and Portuguese currencies were in essence pegged to the Deutsche Mark since 1985,³⁹ so the observed correlation should be very close to one, as the data confirm. We can, however, draw on the experience of Slovenia, where the correlation of its national currency with the euro increased sharply after it joined the European Union and ERM II. Before joining ERM II, Slovakia had a higher correlation than Slovenia and the effect of ERM II entry itself (in November 2005) was not so high. Moreover, it can be seen from the chart that the correlation coefficient for the Slovak koruna is more similar to the correlation coefficient for the Czech Republic than that for Slovenia before it entered the euro area. The observed difference in the convergence of the exchange rates of Slovenia and Slovakia chiefly reflects differences in their foreign exchange regimes and the fact that Slovakia continued to pursue inflation targeting after it joined ERM II (see NBS, 2004).

1.1.8 Analysis of exchange rate volatility

Another way of assessing the risk of occurrence of asymmetric shocks in the Czech economy vis-à-vis the euro area is to analyse the determinants of exchange rate volatility. Low volatility of the exchange rate between two countries may be regarded, in the case of a floating exchange rate regime, as an indicator of their potential to share a single currency (see also section 1.1.7).

Chart 10 describes the historical evolution of the volatility of the exchange rates of the new EU Member States under review vis-à-vis the euro between 1999 and 2008.⁴⁰ The measure of historical volatility is based on the annualised standard deviation of daily changes for the last six months. The chart shows that the lowest volatility was recorded for the Slovenian tolar, whose daily changes were negligible owing to a different exchange rate regime. The Czech koruna was among the currencies with average to lower volatility in the sample of countries under comparison. However, the volatility of the Czech koruna – like that of the Hungarian forint and the Polish zloty – increased at the end of 2007. This probably reflects the generally higher uncertainty in global financial markets and the related strengthening of currencies of some countries in the Central Europe region. The volatility of the Slovak koruna was generally falling in this period, owing to the planned adoption of the euro in Slovakia.

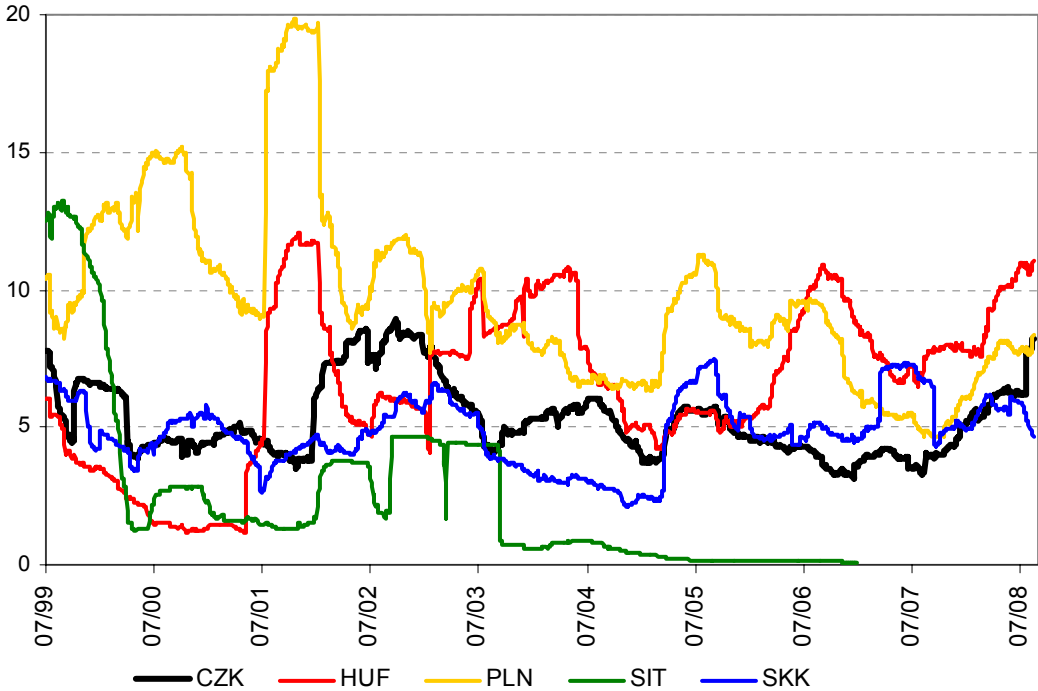
³⁷ The correlation of the Hungarian forint with the euro increased in 2007, but decreased again in February 2008 when the fluctuation band was abandoned. At present, the forint is being affected quite strongly by the global financial crisis.

³⁸ The one-off declines in the Slovak koruna's correlation at the start of 2007 and in mid-2008 were due to NBS interventions and central parity revaluations of 8.5% in March 2007 and 17.6% at the end of May 2008.

³⁹ From 1985 on, these countries essentially had a fixed rate, a crawling peg or a moving band of up to $\pm 2\%$ vis-à-vis the Deutsche Mark (Reinhart and Rogoff, 2004). This link undoubtedly reduced the costs and benefits of entering the euro area.

⁴⁰ The calculation of the historical volatility uses the standard deviation of changes over a six-month period. This is why the data in the chart start in mid-1999.

Chart 10: Historical volatility of exchange rates vis-à-vis the euro (%)

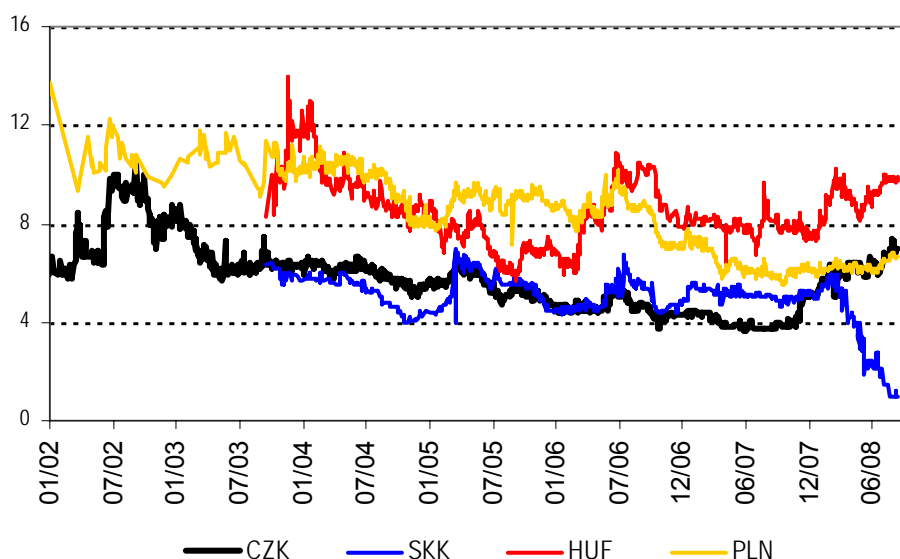


Source: CNB.

Note: Six-month annualised historical volatility of daily changes.

An outlook for exchange rate volatility can also be derived from financial markets data. Chart 11 shows movements in the volatility of the exchange rates under comparison which is expected by the financial markets and reflected in the prices of options for the individual currencies. Until the end of 2007, this implied volatility had been falling moderately for all currencies and was lower for the Czech Republic and Slovakia than for Hungary and Poland during this period. As from the end of 2007 the implied volatility increased slightly for the Czech, Hungarian and Polish currencies. By contrast, the implied volatility of the Slovak koruna started to fall significantly owing to the expected adoption of the euro in Slovakia.

Chart 11: Implied volatility of exchange rates vis-à-vis the euro (%)



Source: Bloomberg.

In addition to changes in historical exchange rate volatility or volatility expected by the markets, their determinants can also be monitored and used to compile an indicator of fundamental-based (i.e. theoretically expected) exchange rate volatility. It can be said that the lower the fundamental-based exchange rate volatility, the higher the ability of two countries to share a common currency.⁴¹

Table 12 provides a comparison of historical and fundamental-based exchange rate volatility for the Czech and Slovak korunas, the Hungarian forint and the Polish zloty vis-à-vis the euro based on data from the period 1999–2007. For the purposes of comparison with fundamental-based exchange rate volatility, historical volatility is calculated as an annualised standard deviation of quarterly changes for the whole period under review.

Table 12: Historical and fundamental-based volatility of exchange rates vis-à-vis the euro (%)

Exchange rate volatility	CZ	HU	PL	SK	SI
Historical	3.6	4.4	8.4	4.1	.
Fundamental-based	5.8	6.1	6.8	5.6	6.1

Source: CNB calculations.

The historical volatility of the exchange rate of the Czech koruna in 1999–2007 so defined was slightly lower than that of the Hungarian forint and the Slovak koruna and significantly lower than that of the Polish zloty, which is consistent with the aforementioned results based on high-frequency data. According to the model used, fundamental-based exchange rate volatility is similar for all the currencies analysed.

⁴¹ Horváth (2005) shows that the exchange rate stability of two currencies is greatly affected by the extent to which those countries meet the criteria for optimum currency areas.

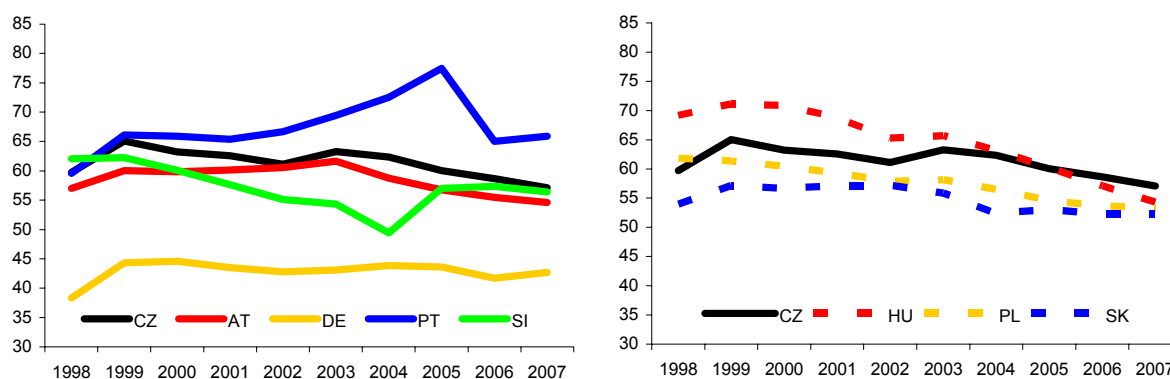
1.2 The effect of international economic relations

The integration of an economy into international economic relations has an influence on the effectiveness of independent monetary policy and the probability of asymmetric economic shocks. Similarity of economic developments of two economies can be fostered both by trade links and by ownership links. An analysis of the openness of the economy is therefore an important addition to the other analyses of economic alignment.

1.2.1 The integration of the economy with the euro area

Greater economic integration with countries using a single currency, as measured by the share of foreign trade on both the export and import sides, leads to a lower risk of markedly different economic developments in the observed country with respect to the other countries of the single currency area. Closer trade links thus foster higher correlation of economic activity within a single currency area (Frankel and Rose, 1997).⁴² The intensity of mutual trade of the countries under review with the euro area is illustrated in Chart 12 and Chart 13. All the countries under review currently have a high degree of economic integration with the euro area. The Czech Republic's mutual trade with the euro area accounts for 60% of its total exports and imports,⁴³ which is a level comparable to, or even higher than, that of the euro area countries under comparison and of the countries of the Central Europe region.⁴⁴ Thus there exists a relatively wide channel for transmission of economic impulses from the euro area to the Czech economy.

Chart 12: Shares of exports to the euro area in total exports



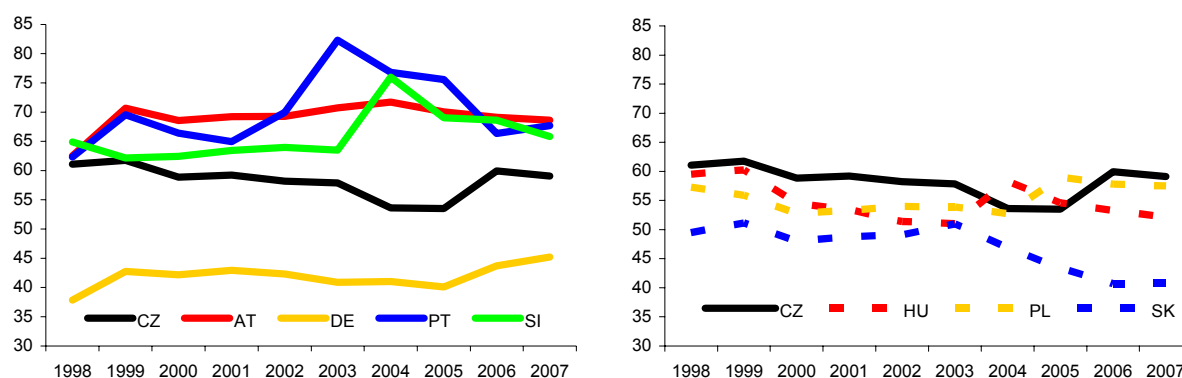
Sources: IMF, CNB calculations.

⁴² On the other hand, higher trade intensity may lead to growing specialisation and decreasing structural similarity and thus to less economic symmetry (Krugman, 1993).

⁴³ However, the share of exports to the euro area in total exports has been falling moderately since 2003. The main determinants of the dynamics and structure of Czech foreign trade are analysed in the paper by Benáček et al. (2005).

⁴⁴ After Slovakia joins the euro area, the share of the euro area in the total exports and total imports of the Czech Republic will increase to about 66%.

Chart 13: Shares of imports from the euro area in total imports



Sources: IMF, CNB calculations.

Like trade links, ownership links foster higher correlation of economic activity. If domestic companies are part of multinational groups, this may help to transmit economic impulses. In addition, capital integration between two countries can help to dampen a negative unilateral demand shock.⁴⁵

Ownership links with the euro area are measured by the share of foreign direct investment (FDI) from the euro area in the surveyed countries in GDP (see Table 13) and by the share of direct investment (DI) from the surveyed country in the euro area in GDP (see Table 14).

Table 13: Shares of FDI from the euro area in GDP (%)

	1998	1999	2000	2001	2002	2003	2004	2005	2006
CZ	17.1	24.9	30.1	36.6	36.8	34.4	37.9	41.0	43.0
AT	6.9	7.3	11.0	11.9	11.3	11.0	.	13.7	.
DE	5.1	7.3	15.7	13.8	15.2	15.5	14.6	14.4	.
PT	15.4	15.3	19.9	20.8	20.7	20.5	21.4	23.2	.
HU	.	.	.	.	.	.	37.0	36.4	39.4
PL	.	11.7	13.9	16.1	15.9	17.5	22.8	22.8	25.4
SI	.	.	.	10.3	11.6	12.4	14.0	15.0	16.0
SK	6.4	.	.	.	23.0	31.5	33.6	38.1	49.7

Sources: Eurostat, CNB calculations.

The Czech Republic's share of foreign direct investment in the euro area in GDP has gradually been rising and, together with Hungary and Slovakia, is the highest among the countries under review.⁴⁶ The ownership links of the other new member countries under review with the euro area has also grown gradually over time, testifying to an increasingly important role played by multinational companies and the external environment in the economies of the countries surveyed.

⁴⁵ A negative demand shock hitting one country may be partly offset by holding diversified investment portfolios. In this way, there may be "private insurance" against potential asymmetric shocks in addition to public transfers between countries (De Grauwe, 2003).

⁴⁶ Approximately 29% of FDI in the Czech Republic comes from the Netherlands, via which non-European companies often invest in Europe. The actual ownership links with the euro area may thus be slightly overestimated. For the other countries surveyed, the share of direct investment from the Netherlands was lower, reaching 25% at most (for Germany).

Table 14: Shares of DI in the euro area in GDP (%)

	1998	1999	2000	2001	2002	2003	2004	2005	2006
CZ	0.3	0.3	0.2	0.2	0.3	0.6	0.8	0.9	0.7
AT	2.8	3.1	4.4	4.8	5.9	5.8	.	6.4	.
DE	6.1	7.2	9.9	10.5	11.3	11.1	10.8	11.7	.
PT	3.9	2.8	5.4	8.7	10.1	10.9	12.0	13.1	.
HU	.	.	.	.	.	.	0.6	1.4	9.8
PL	.	0.2	0.2	0.2	0.3	0.4	0.5	0.4	1.6
SI	.	.	.	0.8	1.2	1.4	1.7	1.8	1.9
SK	0.1	.	.	.	0.3	0.2	-0.3	-0.5	0.1

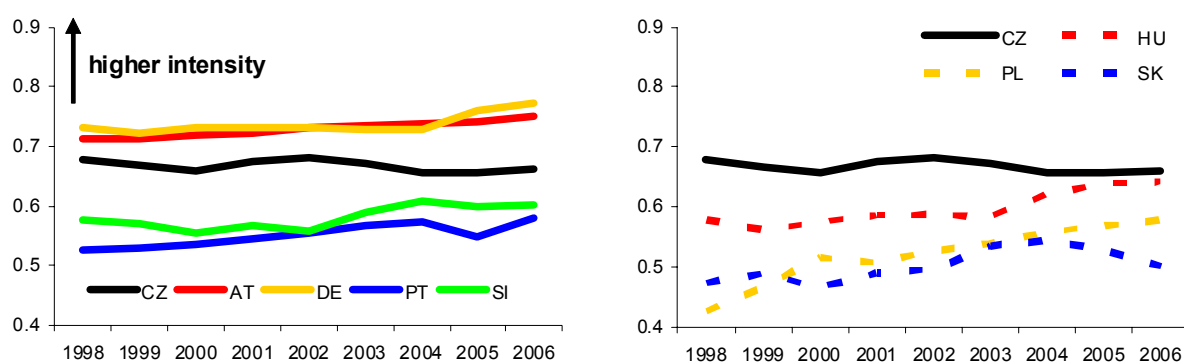
Sources: Eurostat, CNB calculations.

Ownership links in the other direction, i.e. direct investment from the surveyed countries in the euro area as a percentage of their GDP, are so far negligible, particularly in the case of the new EU members.⁴⁷

1.2.2 Intra-industry trade

Intra-industry trade is typical of countries with a similar factor structure and is thus one of many indicators of the structural similarity of economies. Intra-industry trade fosters cyclical convergence (Frankel and Rose, 1997) and can also affect the economy's ability to absorb economic shocks.⁴⁸ The theory of intra-industry trade (Krugman, 1981, Hoekman and Djankov, 1996) assumes the greatest intensity of intra-industry trade in capital- and research-intensive industries which can benefit most from economies of scale; as a rule these are industries with high market concentration. The lowest level can be expected in industries associated with particular natural resources.

To analyse intra-industry trade we used the Grubel–Lloyd index, which indicates the share of the absolute amount of intra-industry trade in foreign trade turnover. Chart 14 illustrates the evolution of this indicator in the countries under comparison.

Chart 14: Intensity of intra-industry trade with the euro area

Sources: OECD, CNB calculations.

⁴⁷ A negative direct investment position may occur if a subsidiary provides credit to its parent corporation or if a subsidiary records a long-running loss (negative reinvested earnings) in excess of its capital.

⁴⁸ Among other things, intra-industry trade growth may have a positive effect on the costs and speed of restructuring, since the transfer of resources may be faster and less expensive if effected within an industry than between industries. A larger proportion of intra-industry trade also acts to refute the specialisation hypothesis based on inter-industry foreign trade.

The Czech Republic's share of intra-industry trade with the euro area oscillates slightly in time. This indicator was comparable with that for Austria and Germany throughout the period under review and was higher than for all the other countries compared.⁴⁹ This can be assessed as a positive factor in terms of euro area accession.

1.3 Financial market

From the viewpoint of the optimum currency area theory it is useful to examine how advanced and how similar to the markets within that area the financial sectors and capital markets of the countries considering participation in a single currency area are.⁵⁰ The financial sector and capital market play an important role in the functioning of transmission mechanisms, and at the same time they can be a source of asymmetric shocks. Their structural similarity and their integration into European markets would be a positive signal in terms of euro adoption.⁵¹

1.3.1 Financial sector

A similar level of financial sector development and functioning increases the probability that the financial sectors in both economies will transmit external economic shocks and monetary policy impulses in the same way. The main characteristics under review are the depth and structure of financial intermediation.

The **depth of financial intermediation** in the Czech Republic, as measured by the ratio of financial system assets to GDP, is approximately one-third of the value for the euro area, Germany and Austria, and almost 42% compared to Portugal. The ratio of Czech financial system assets to GDP is, however, greater than that in some of the other Central European countries, especially in comparison with Poland. The financial system's assets as a percentage of GDP gradually fell in the Czech Republic in 2000–2004, as their growth rate lagged behind that of GDP. In 2007, however, there was a renewed rise to values comparable with 2000 (see Table 15). The year-on-year asset growth of 17% in 2007 reflected a pick-up in financial intermediation and an expansion in financial services.

⁴⁹ Our conclusions in this respect are identical to those of Fidrmuc (1999). The value of this indicator depends on the level of detail of the branch breakdown. Compared to last year's analyses, the current results have been calculated on the basis of more detailed breakdown using the three-digit SITC classification. The breakdown according to the two-digit SITC classification, i.e. a somewhat broader sector breakdown, which may put together in one category branches whose output is not closely related (particularly in SITC 7), in line with expectations results in a higher value of this indicator for all countries. The qualitative result of the analysis remains virtually unchanged, however.

⁵⁰ For completeness it should be added that the advanced state of the financial sector may also be reflected in its high ability to cover exchange rate risks and thereby reduce the costs associated with an independent currency.

⁵¹ In the current situation of a global financial crisis, however, weaker financial market integration with the euro area may be an advantage. At the same time, simple indicators of the depth of financial intermediation for the euro area average and for the individual euro area members are not necessarily an appropriate measure for balanced and sustainable financial market development in converging economies.

Table 15: Financial system assets/GDP (%)

	2000	2001	2002	2003	2004	2005	2006	2007 ^a
CZ	140	137	134	133	127	134	133	142
AT ^c	332	341	328	344	359	394	408	426
DE ^{b,c}	379	379	379	383	386	398	395	398
PT ^c	330	283	281	307	298	308	327	341
HU	79	81	84	93	100	115	128	141
PL	66	71	72	76	79	85	96	105
SI ^b	105	114	119	121	129	147	158	173
SK ^b	99	101	103	93	101	111	102	113
EA-13 ^{c,d}	365	348	341	351	367	399	420	442

Notes: a) Preliminary data.
b) Excluding pension funds (SI until 2001, SK until 2004). DE includes only part of private pension funds.
c) Total assets of credit institutions, insurance companies, pension funds and investment funds.
d) Weighted average. EA-12 until 2006.

Sources: CNB, national central banks. Unconsolidated data.

The extent of lending is indicated by the ratio of loans to GDP (see Table 16). This indicator is lower in the Czech Republic than in the euro area countries under review.⁵² The volume of loans (including loans to general government) in relation to GDP is one-third of that in Germany, Austria and Portugal. Of the selected new EU Member States, Slovenia has the highest ratio of loans to GDP. Bank loans in the Czech Republic rose at a fast pace and their share of GDP grew quite considerably in 2006 and 2007. Underlying this was growth in both loans to corporate clients (17% year on year as at the end of 2007, and 14% as at 30 June 2008) and loans to households (35% and 30% respectively).

Table 16: Bank loans to non-bank clients/GDP (%)

	2000	2001	2002	2003	2004	2005	2006	2007 ^a
CZ	48	41	39	40	39	40	45	52
AT	125	124	124	124	127	134	136	140
DE	144	144	141	140	136	135	131	130
PT	133	132	135	134	135	140	149	158
HU ^b	25	26	26	32	35	39	43	48
PL ^b	25	26	25	26	25	26	31	37
SI ^b	38	40	41	44	52	60	70	87
SK ^b	45	34	32	33	33	38	41	45
EA-13 ^c	116	113	113	114	116	122	128	136

Notes: a) Preliminary data.
b) Loans to the non-financial sector (excluding general government).
c) Weighted average. EA-12 until 2006.

Sources: CNB, national central banks. Unconsolidated data.

From the point of view of the effects on the transmission mechanism and financial sector stability it is necessary to monitor above all the very dynamic growth in **loans to households**.⁵³ The share of bank loans to households in total lending has increased considerably in recent years. At present, it stands at 40% in the Czech Republic and is thus at the euro area average. The ratio of bank loans to households to GDP is rising constantly in the Czech Republic and currently stands at 21%. It is considerably lower than the corresponding

⁵² The euro area indicators may be too high and imply overleveraging.

⁵³ Loans extended to households by non-banking institutions are not taken into consideration.

figure for the euro area (roughly 54%; see Chart 12). However, thanks to its buoyant growth in recent years it has neared the euro area average.

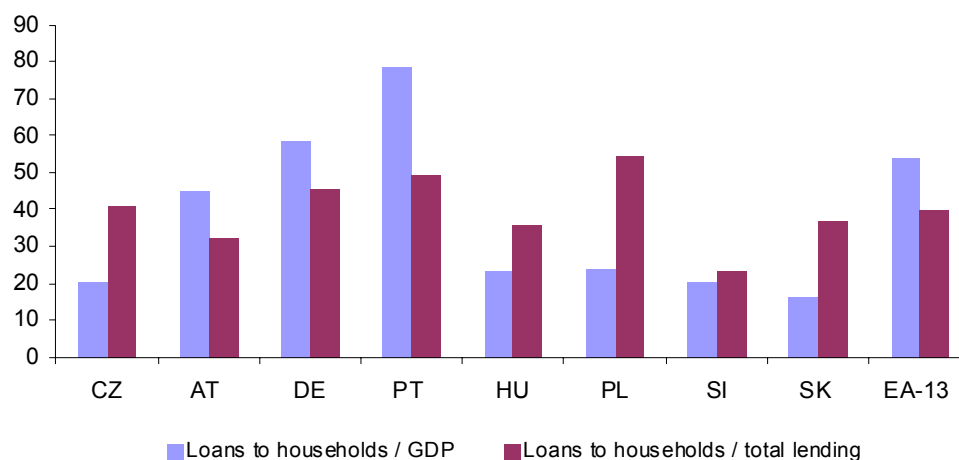
In the past, the significant growth in loans to households was not considered a direct risk to financial stability. However, the historical experience of some current euro area countries with high growth in household borrowing suggests that such a trend may lead to problems.⁵⁴ The factors behind rising credit risk can include the rate of growth of household debt and reduced ability to repay loans at a time of economic slowdown.

The provision of consumer loans and mortgages in domestic currency from primary deposits and from the issuing of mortgage bonds backed by high-quality claims, as well as the relatively good collateralisation of mortgage loans and, above all, limited investment in bonds backed by subprime foreign mortgages are all positive factors acting against the transmission of credit, exchange rate and liquidity risks from global financial markets to the Czech market.

The US financial market crisis and the global financial market turbulence have so far affected the Czech economy to only a limited extent, for example in the form of a drop in asset prices, rapid appreciation of the koruna's exchange rate in the first three quarters of 2008 and its increased volatility in 2008 Q4, and slowing external demand. With respect to the corporate sector, and exporters in particular, this combination of factors increases credit risk. Investment in stocks and bonds has resulted in the usual revaluation of assets due to falls on the financial markets in a manner that has not yet endangered the stability of banks and non-banks. In the past, domestic financial institutions focused primarily on generating revenues from the dynamically expanding retail banking activities in the Czech market, while their owners concentrated on management of securities and derivatives portfolios in parent banks and branches in international financial centres. Despite this, the manifestations of the crisis may, in addition to indirect effects through a worsening financial condition of corporations, affect some domestic financial institutions directly via their risk exposures.

⁵⁴ The credit risk associated with a loss of ability to repay loans can be affected by a rise in interest rates on loans as well as with a change in the exchange rate if loans are denominated in foreign currencies. In some countries, households preferred to borrow from abroad in foreign currency because of higher interest rates on the domestic market (see section 1.3.2). Households were then exposed to multiple risks and market shocks resulting from the financial crisis and economic slowdown.

Chart 15: Bank loans to households
(shares in GDP and in total bank lending in 2007, %)



Sources: CNB, national central banks.

The banking sector accounts for 74% of the Czech Republic's total financial system assets.⁵⁵ The structure of the Czech financial sector is thus approaching that of other euro area countries; banking assets account for 72% of financial system assets in euro area countries on average (see Table 17). The situation in other countries of the region is similar.

Table 17: Banking sector assets/financial system assets (%)

	2000	2001	2002	2003	2004	2005	2006	2007 ^a
CZ	81	78	76	74	74	74	73	74
AT ^c	78	78	77	76	76	75	75	77
DE ^{b,c}	78	78	78	77	77	76	78	78
PT ^c	83	82	81	82	81	78	78	79
HU	84	82	81	82	81	78	77	77
PL	88	85	80	76	74	70	67	66
SI ^b	71	73	73	73	71	72	72	73
SK ^b	94	93	92	89	87	86	85	79
EA-13 ^{c,d}	75	72	73	72	72	70	70	72

Notes: a) Preliminary data.
b) Excluding pension funds (SI until 2001, SK until 2004). DE includes only part of private pension funds.
c) Total assets of credit institutions, insurance companies, pension funds and investment funds.
d) Weighted average. EA-12 until 2006.

Sources: CNB, national central banks. Unconsolidated data.

The Czech financial sector can be described as relatively similar to that of the euro area from the structural point of view, despite its smaller depth of financial intermediation relative to the euro area countries surveyed. It can be assumed on this basis that the sector operates in a standard manner and, its ownership structure being settled, is able to ensure a monetary policy transmission process comparable with that in the euro area.

The present financial crisis can be viewed as an asymmetric shock originating from the financial sector. Box 1 analyses the crisis.

⁵⁵ A total of 97% of banking assets are controlled by foreign capital (and 83% by banks from EU countries).

Box 1: The current financial crisis

The extent, impacts and solutions of the global financial crisis in 2008 have, to a certain extent, an asymmetric effect on the individual national economies in the European Union. Although this problem has arisen at a similar moment and is acting in the same direction in all the economies (weaker economic growth, lower future inflation and pressure for lower interest rates), the extent to which the various countries are hit by this problem varies. This is mostly due to the different magnitudes of the losses of the individual countries' financial institutions arising from investment in risky assets and to the different degrees of monetisation of the national economies. The shares of the financial and banking sectors in overall economic activity also differ from one country to another.

The temporary reduction in the effectiveness and efficiency of financial intermediation due to the crisis will therefore hit the economies of individual countries with uneven intensities. Simultaneously, the responses of the economic and political authorities may not fully eliminate this asymmetry. Specifically, the rate cuts by the European Central Bank may be insufficient for some euro area countries, whereas for other countries (those hit less hard) they may be too aggressive and lead to an inappropriate easing of the monetary conditions. Similarly, the measures adopted by national fiscal policies, differing across individual countries in terms of their nature, extent and impact on the financial, real and public sectors, may further exacerbate the problem of the asymmetric effect of the financial crisis on the EU economies, especially if they lead to longer-term erosion of fiscal discipline in the European Union. At present, there is widespread uncertainty regarding the future application of the Stability and Growth Pact rules.

In this respect, it can be said that the Czech financial sector is not exposed to significant losses that would endanger its stability, credibility and functioning. This is due above all to the different business model of most Czech financial institutions and banks, which have so far engaged chiefly in lending to Czech corporations and households using standard financial instruments and conservative investment strategies.

It can thus be expected that – unlike in the euro area – the first-round effects of the global financial crisis in the Czech financial sector and the Czech economy as a whole will be negligible. The transmission of problems from the euro area interbank market to the Czech Republic has not been too intensive so far either, thanks to the existence of an independent currency and persisting excess liquidity in the Czech banking sector. Nonetheless, the economic slowdown in euro area countries generated by the financial crisis and the appreciation of the koruna in the first three quarters of 2008 will affect Czech exports and economic output. It is obvious that, in this specific situation, the existence of an independent monetary policy has both costs and benefits for the Czech economy; overall, however, it is likely that having one's own currency is more of a benefit in the present situation.

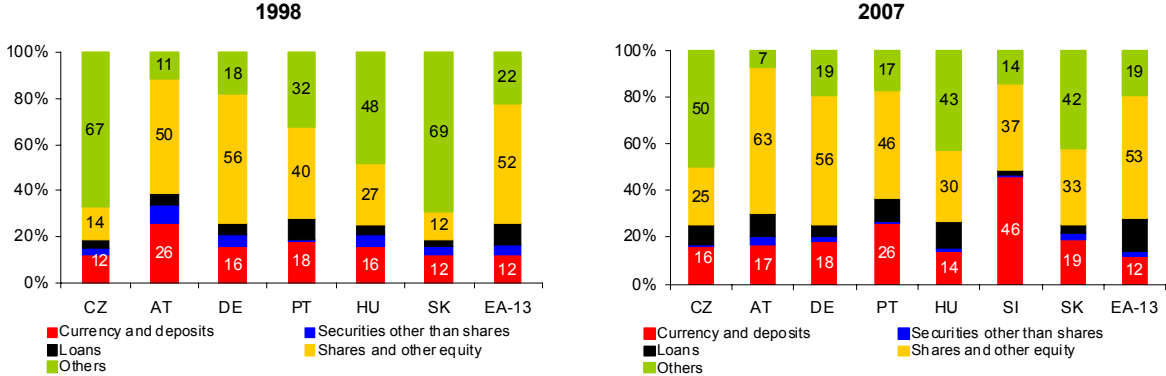
1.3.2 The structure of financial assets and liabilities of corporations and households

The financial assets and liabilities of corporations and households play an important role in the functioning of the monetary policy transmission mechanism. Some degree of structural similarity is necessary for the single monetary policy to have a symmetric effect.

In the Czech Republic, other assets (including trade receivables associated with the time mismatch between transactions and payments, and other accounts receivable) account for 50% of the **financial assets of non-financial corporations** (see Chart 16). This is much more

than in the euro area countries under review and than the euro area average. The share of currency and deposits in the financial assets of Czech corporations is also somewhat higher than in the euro area. By contrast, Czech corporations have a lower share of holdings in the equity of other corporations. Slovakia and Hungary have a similar structure of corporate financial assets. The shares of the above items in the euro area countries are more balanced. Between 1998 and 2007, the financial asset structure of Czech corporations converged towards that observed in the euro area, although some differences still persist.

Chart 16: Financial assets of non-financial corporations

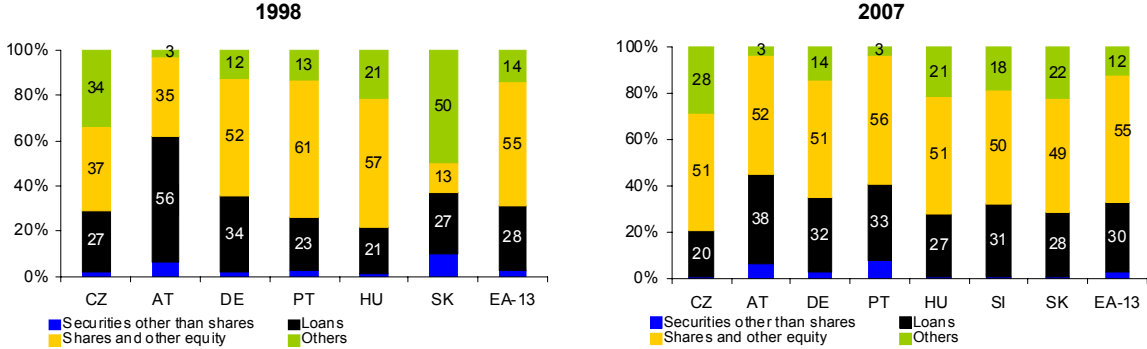


Notes: Data are not available for Slovenia for 1998; the data for Slovakia are as of 2008 Q1.

Sources: National central banks, ECB, Eurostat, CNB calculations.

In the Czech Republic, as in the euro area and in the other countries under review, ownership interests, i.e. shares issued by corporations and used to finance corporations from their own funds, account for about 50% of the **financial liabilities of non-financial corporations** (see Chart 17). As regards external resources, trade credits and other accounts payable within other liabilities account for a larger share of total liabilities in the Czech Republic than in the countries monitored. Corporations in euro area countries and the other countries under review make more use of loans and debt securities. In the long run, however, the share of trade credits and other accounts payable in the Czech Republic is decreasing and the structure of corporate financial liabilities is thus gradually converging to that in the euro area, although some differences persist.

Chart 17: Financial liabilities of non-financial corporations



Notes: Data are not available for Slovenia for 1998; the data for Slovakia are as of 2008 Q1.

Sources: National central banks, ECB, Eurostat, CNB calculations.

According to data on corporations with more than 250 employees, **the share of liabilities of foreign-controlled corporations** in the total liabilities of the corporate sector is increasing.⁵⁶ Foreign-controlled corporations record the highest debt relative to their internal funds, with foreign loans accounting for the majority of their debt. These are mostly exporting firms, which are sensitive to unexpected exchange rate variability and, in addition, have income in euros and are more inclined to use the euro for payments for domestic inputs.

The **debt of non-financial corporations**, as measured by the ratio of loans and debt securities issued to GDP, decreased between 1998 and 2007, reaching about 44% in 2007 (see Table 18). Up to 2003 this decline reflected banks' lower willingness to lend and subsequently relatively rapid GDP growth. The corporate debt ratio thus showed the opposite trend to the euro area average. In 2007, however, the corporate debt indicator in the Czech Republic increased compared to the previous year, as in most of the countries under review. However, it was still half the euro area average. It is also much lower than in Portugal, Austria, Germany and some other countries of the Central Europe region.

Table 18: Debt of non-financial corporations (loans and debt securities as a percentage of GDP in %) ^a

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	64.4	60.8	57.0	47.8	46.2	41.2	48.1	42.0	40.8	43.9
AT	68.7	72.5	78.7	80.5	79.3	81.0	78.0	78.5	78.4	79.5
DE	54.7	55.8	64.0	66.8	67.3	66.4	61.6	60.9	61.9	63.2
PT	75.0	82.4	90.5	101.1	102.7	106.0	102.9	107.1	109.9	118.1
HU	39.0	45.1	55.5	57.1	55.7	57.3	59.2	66.1	74.5	65.5
PL	26.2	31.2	33.9	35.2	34.8	32.7	33.9	28.5	31.7	.
SI	.	.	.	49.5	51.1	55.0	59.7	67.2	70.4	82.8
SK	53.6	57.5	39.9	39.5	37.3	39.1	36.0	33.8	35.8	.
EA-13	60.2	63.9	72.0	77.5	78.1	78.9	78.4	80.9	84.7	88.2

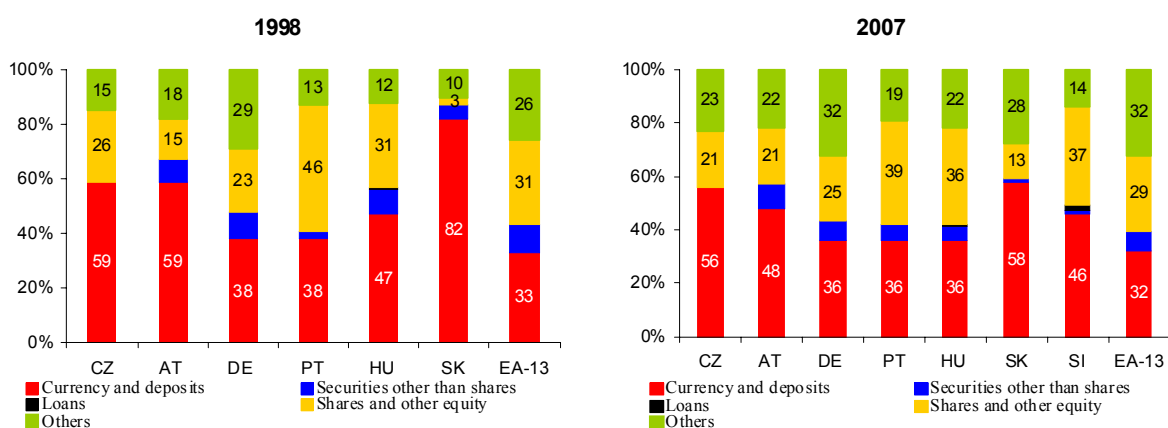
Note: a) Loans include loans granted to corporations by banks, financial intermediaries and other corporations, and loans obtained from abroad. The ratio of loans provided to corporations only by banks to GDP is about 21%.

Sources: Eurostat, national central banks, CNB calculations.

The structure of the **financial assets of households** in the Czech Republic also shows some differences compared to the euro area average (see Chart 18). The share of currency and deposits in the Czech Republic is, together with Slovakia, the highest. By contrast, the proportion of household investment in insurance and pension funds (under other accounts receivable) is relatively low compared with the euro area average, although it increased between 1998 and 2007. Austria has a similar household financial asset structure.

⁵⁶ According to CZSO data on the economic performance of non-financial corporations, this share reached 52% in 2008 Q2.

Chart 18: Financial assets of households

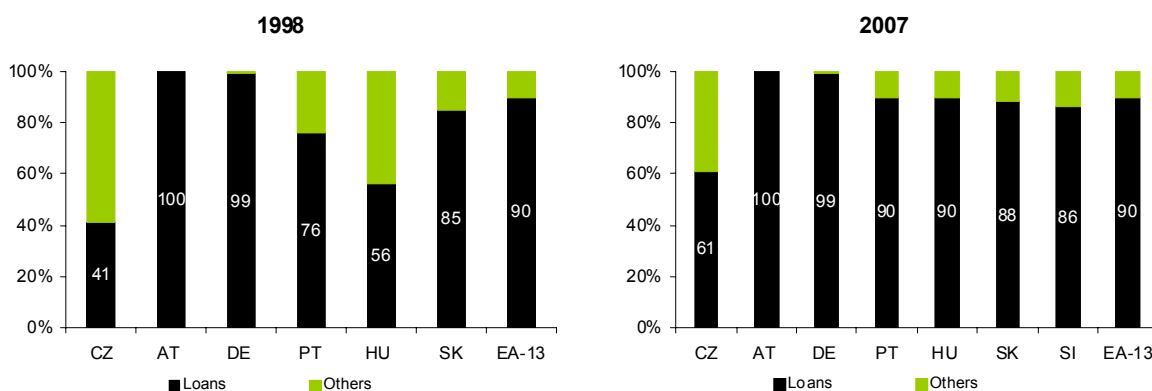


Note: Data are not available for Slovenia for 1998; the data for Slovakia are as of 2008 Q1.

Sources: National central banks, ECB, Eurostat, CNB calculations.

The **structure of financial liabilities of households** is characterised by a dominant position of loans in all countries under review (see Chart 19). In the Czech Republic, however, their share is relatively much lower than in the euro area, although it has been rising towards the euro area average since 1998. The proportion of other liabilities, for example trade credits to small businesses or outstanding members' shares in housing cooperatives, is thus substantially higher in the Czech Republic.⁵⁷

Chart 19: Financial liabilities of households



Note: Data are not available for Slovenia for 1998; the data for Slovakia are as of 2008 Q1.

Sources: National central banks, ECB, Eurostat, CNB calculations.

Household debt, as measured by the ratio of loans from both banks and non-banks to GDP (see Table 19), has been increasing in recent years and reached about 25% in 2007. Nonetheless, it is still lower than in the euro area countries under review and comparable to countries of the Central European region. The overleveraging of some groups of less creditworthy households, which, owing to their lower saving ratios, may be negatively affected by an unexpected rise in interest rates and other shocks, poses a risk of household debt growth. In addition, the ratio of household savings to gross disposable income is lower in the Czech Republic than in the euro area countries under review (see Table 20).

⁵⁷ With regard to the compilation of the financial accounts, however, this is a “recalculation” item, which may, to some extent, distort the comparison with the other countries under review.

Table 19: Household debt (bank and non-bank as a percentage of GDP, in %)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	6.6	7.3	7.6	8.9	9.6	11.5	14.6	18.6	20.6	24.8
AT	44.2	46.2	47.1	47.8	48.6	49.0	51.2	54.3	53.5	53.4
DE	69.4	72.2	72.8	72.0	71.8	71.8	70.5	69.4	67.0	57.9
PT	44.9	54.0	60.3	64.0	68.3	73.4	77.8	83.0	87.7	91.0
HU	3.8	4.5	5.6	8.1	11.6	15.9	20.0	22.5	26.9	29.2
PL	6.1	6.4	7.4	9.4	12.4	12.8	15.8	17.1	20.2	.
SI	.	.	.	15.8	15.6	16.1	16.8	19.4	22.3	25.7
SK	5.2	6.0	5.8	6.9	9.1	10.4	11.0	16.3	21.7	.
EA-13	45.6	47.9	48.6	49.9	51.1	52.9	54.7	57.6	59.7	59.9

Sources: Eurostat, national central banks, CNB calculations.

Table 20: Gross saving ratio of households (savings to gross disposable income in %)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	9.2	8.6	8.5	7.4	8.1	7.4	5.7	8.1	9.1	8.1
AT	12.6	13.1	12.8	12.0	12.1	13.2	13.3	13.7	14.1	.
DE	15.9	15.3	15.1	15.2	15.7	16.0	16.1	16.3	16.2	.
PT	10.5	9.8	10.2	10.9	10.6	10.6	9.7	9.2	.	.
HU	.	.	13.9	13.7	11.4	9.2	11.6	11.5	12.0	.
PL	14.4	12.9	10.7	12.1	8.4	7.8	7.2	7.2	6.6	.
SI	.	.	14.5	16.1	16.9	14.8	15.9	16.8	16.1	.
SK	12.3	11.2	11.1	9.1	8.9	7.1	6.3	7.2	6.6	.
EA-15	.	14.2	13.4	14.2	14.8	14.5	14.4	13.9	13.6	13.9

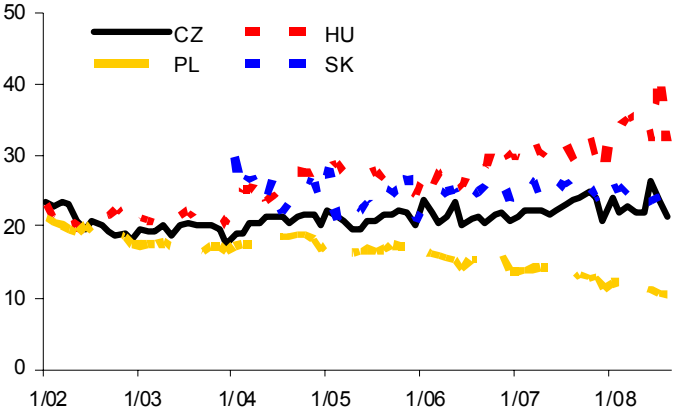
Sources: Eurostat, CZSO.

The effectiveness of independent monetary policy would be reduced if a large part of the financial balances of non-financial corporations was held in some other currency. Rising foreign currency demand is usually signalled by an increase in the share of foreign currency loans and deposits in the balance sheets of economic agents and by higher use of foreign currency in financial transactions. In the European context, it is important to monitor the degree of **spontaneous euroisation**. Although the euro is represented most in the foreign currency assets and liabilities of Czech households and non-financial corporations, euroisation as such is quite low in the Czech Republic owing to the high confidence of economic agents in the domestic currency, the stable macroeconomic environment and low inflation, which are reflected in low domestic interest rates. In this situation, the lower euroisation is also due to the floating exchange rate regime, which is usually characterised by exchange rate fluctuations and thus does not motivate economic agents (except for exporters) to substitute the domestic currency with foreign currency to any great extent. Foreign currency is thus held in the Czech economy above all for transaction reasons (euro payments in foreign and domestic trade in the case of corporations, or cash held for tourism purposes by households).

The share of foreign currency loans drawn in the Czech Republic by non-financial corporations has long been low, at about 17% of total loans, whereas the share of foreign currency loans drawn by Czech corporations abroad is about 70%. Non-financial corporations accept payments in foreign currency, usually the euro, which encourages corporations to hedge against exchange rate risk, given the expected trend appreciation, by paying domestic suppliers in euro as well. This can result in a shift in exchange rate risk from large corporations to smaller ones. Foreign currency payments for goods and services within the domestic payment system has increased modestly during the past five years, to about 16%. The share of foreign currency receipts for goods and services in the domestic payment system is about 9%. The proportion of overnight foreign currency deposits in total overnight deposits, which indicates the degree of use of foreign currency in corporate transactions, has been

gradually increasing since 2004 and is currently around 22% (this ratio has risen for euro deposits and declined for other currency deposits). This figure for the Czech Republic is similar to that in Slovakia, higher than in Poland, and lower than in Hungary (see Chart 20).

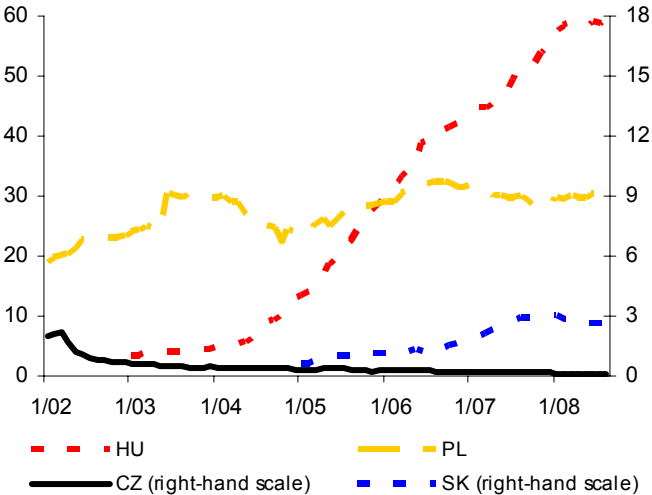
Chart 20: Overnight foreign currency deposits of non-financial corporations (shares in total overnight deposits of non-financial corporations, in %)



Sources: National central banks, CNB calculations.

Households use foreign currency, or the euro, to a much lesser extent than corporations. The share of foreign currency is about 3% for overnight deposits and almost zero for loans (see Chart 21), largely due to a similar nominal interest rate on loans for house purchase to that in the euro area. Nominal interest rates on loans for house purchase in some Central European countries (Hungary in particular) are higher in domestic currency than in foreign currency. This is reflected in significantly higher foreign currency borrowing in these countries than in the Czech Republic.⁵⁸

Chart 21: Foreign currency loans to households (shares in total loans to households, in %)



Sources: National central banks, CNB calculations.

⁵⁸ A major part of the household debt in these countries is used to finance investment in housing.

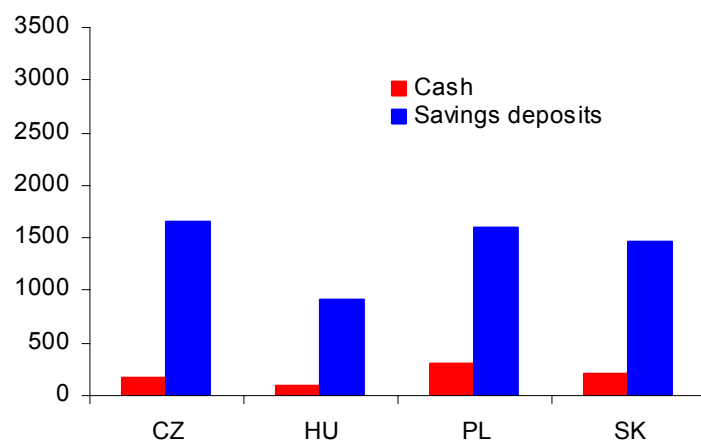
To make a further comparison of the level of euroisation in the Czech Republic and selected Central European countries, we used the results of an Oesterreichische Nationalbank survey on households' holdings of cash and savings deposits in foreign currency in 2007. The survey reveals that a relatively large percentage of households in the Czech Republic and in the selected Central European countries hold foreign currency in some form. The proportion of households holding cash and savings deposits in foreign currency in the Czech Republic is similar to that in Slovakia and higher than that in Poland and Hungary (see Table 21). The median of euro cash holdings and savings deposits is similar in the Czech Republic, Slovakia and Poland, but lower in Hungary (see Chart 22). In all the above countries, foreign currency is used primarily for transactions abroad.⁵⁹

Table 21: Cash and savings deposits in foreign currency (shares of households in the total, in %)

	Cash in foreign currency (% of total households)	Cash in euro (% of total households)	Savings deposits (% of total households)	Savings deposits in foreign currency (% of households with savings deposits)	Savings deposits in euro (% of households with savings deposits)
CZ	41	27	35	9	9
HU	9	8	21	8	8
PL	24	12	11	18	14
SK	42	22	37	13	11

Source: Oesterreichische Nationalbank.

Chart 22: Medians of cash and savings deposits (EUR)



Source: Oesterreichische Nationalbank.

To sum up, the structure of financial assets and liabilities of domestic non-financial corporations and households still differs somewhat from the euro area, particularly as regards corporate assets and household liabilities. However, we can see gradual convergence of the domestic structure towards that in the euro area. The indebtedness of Czech corporations and households is still much lower than in the euro area countries under review. The transmission

⁵⁹ The primary reason, therefore, is not the holding of euro assets as reserves, as is the case in South-Eastern European countries, where the shares of households with foreign currency cash and savings deposits and the average values of these euro assets are much higher.

of shocks to the balance sheets of overleveraged and less creditworthy households poses a risk, especially given the lower gross savings ratio of households in the Czech Republic compared to the euro area countries. The use of the euro in the financial transactions of non-financial corporations is gradually growing. This is a long-term trend for the corporate sector, associated with the rising openness of the Czech economy and its integration into foreign trade. However, the degree of euroisation is still relatively low, although there are differences between corporations and households. The distribution of households' cash holdings and deposits in foreign currency in the Czech Republic is roughly comparable to the selected Central European countries. Economic agents in the Czech Republic held foreign currency mainly for transaction purposes and do not primarily use it as a store of value or for speculative reasons. Foreign currency borrowing by the household sector is very low.

1.3.3 Financial market integration

Financial market integration has been achieved when financial assets having similar risk factors and yields are priced identically by the markets no matter where they are traded. This follows from the law of one price.⁶⁰ The more the individual segments of the financial markets of countries planning to adopt the euro become integrated with the European market, the more financial asset prices will be affected by global (European) factors associated with symmetric shocks rather than by local (national) effects associated with asymmetric shocks. Such shocks may be due to any factors capable of affecting asset prices. It can be assumed that with increasing integration the individual financial market segments will become a less likely source of asymmetric shocks. These reasons make it desirable for monetary policy makers to know the degree of, and trends in, integration of financial market segments. This analysis focuses on the integration of the money, foreign exchange, bond and stock markets.

Adam et al. (2002) used the concepts of beta-convergence and sigma-convergence to measure the process of financial market integration in the euro area countries.⁶¹ The concept of beta-convergence enables identification of the speed at which differences in yields are eliminated on individual financial markets. A negative beta coefficient signals the existence of convergence, and the magnitude of the beta coefficient expresses the speed of convergence, i.e. the speed of elimination of shocks to the yield differential vis-à-vis the euro area. The closer the absolute value of the beta coefficient is to unity, the higher is the speed of convergence. The concept of sigma-convergence captures the differences between the yields on identical assets in different countries at a given moment in time and thus identifies the degree of integration vis-à-vis the euro area achieved at that moment in the individual financial market segments in the countries under review. Sigma-convergence arises if and when the sigma coefficient falls to zero. The existence of some degree of beta-convergence may be accompanied by sigma-divergence, so both concepts must be tracked concurrently in order to assess financial integration. The text below describes the results of beta- and sigma-convergence in the period between January 1995 and August 2008; given the substantial financial market volatility resulting from the turbulence in the second half of 2007 and in 2008, the periods January 1995 – July 2007 and August 2007 – August 2008 are discussed separately.

⁶⁰ If the law of one price did not apply, there would be room for arbitrage. If we assume a fully integrated market with no barriers (economic, legal, cultural, etc.), then any investor will be able to use this arbitration opportunity, causing the law of one price to apply again.

⁶¹ The terms beta-convergence and sigma-convergence originate from the literature on economic growth and its dynamics; see, for example, Barro and Sala-i-Martin (1992, 1995).

January 1995 – July 2007

The results of the beta-convergence analysis, as applied to the individual segments of the financial market, are given in Table 22. The results show that yields on the Czech stock and bond markets converged towards those on corresponding euro area financial instruments relatively quickly in this period, at a faster pace than in Portugal and Austria. On the foreign exchange market, the speed of convergence of the Czech Republic was comparable to other new EU Member States, but on the money market it was lower (as in Slovakia).⁶² Yield convergence towards the euro area (towards Germany in the case of bond markets) occurred in all the countries under review. In this period, the absolute values of the beta coefficient were close to one for all the countries and markets except the money market, which means that the levelling of newly arising differences in yield differentials between the relevant national economy and the euro area can be labelled as fast. A comparison of the periods 1995–2002 and 2003–2007 reveals that the pace of beta-convergence of the stock markets of the new EU Member States under review (except Slovakia) increased over time. The speed of convergence of the money market increased in the Czech Republic and Hungary; the pace of convergence of the foreign exchange market was faster particularly in the countries heading towards the euro area – Slovakia and Slovenia. Nonetheless, the new EU Member States are generally achieving high levels of beta-convergence of their financial markets towards the euro area.

The results of the sigma-convergence analysis for the individual segments of the financial market and the countries under review vis-à-vis the euro area (Germany⁶³ for the bond markets) are shown in Chart 23. The results of sigma-convergence across the individual markets of the new EU Member States show that the highest degree of integration was achieved on the money and foreign exchange markets. The Czech financial market seemed to be the most integrated (especially in the case of the foreign exchange and stock markets) compared to the markets in the other new Member States. Only the Slovenian money and foreign exchange markets achieved a higher degree of integration; this is linked with its completed euro adoption process.⁶⁴ However, significant differences in the yields on the Slovenian stock market persisted. The foreign exchange markets may have seemed more volatile until August 2007, but the sigma values were very low there, reflecting the already relatively strong integration of these markets. As regards stock markets, the degree of integration achieved in the Czech Republic was comparable to that observed in Portugal, Austria and Germany. The same could not yet be said in the case of the bond markets. Overall, it can be seen that gradual trend sigma-convergence of stock, bond and money markets was taking place in all the observed countries since 2001–2002.⁶⁵

August 2007 – August 2008

The relevant columns of Table 22 (08/2007–08/2008) and the relevant part of Chart 23 describe the developments on the individual markets in the period affected by the financial

⁶² Yields on money market assets are affected to some extent by the monetary policy decisions of the state in question, so the validity of the law of one price is somewhat limited. Therefore, the speed of beta convergence is lower on the money market than on the other markets.

⁶³ As in section 1.1.2, for example, any interpretation of the values for Germany should also take into account the fact that the data for Germany have a significant weight in the calculation of the data for the euro area (see the *Methodological Part* for details).

⁶⁴ The latest developments in Slovakia probably also reflect the adoption of the single currency in 2009 (see below).

⁶⁵ This may have been due to the announcement that these countries would join the European Union (12–13 December 2002). This period is illustrated by a vertical line in Chart 21.

crisis. The calculations show that most countries recorded a slowdown in convergence of yields towards those in the euro area. Since 2007, integration of money and foreign exchange markets has accelerated only in Slovakia; this is connected with its preparations for euro adoption. From the point of view of the degree of integration of the individual markets with the euro area, it is clear that the present financial crisis has contributed with mixed intensity to divergent developments in the given period on all markets except the money market. However, with the exception of the foreign exchange market, where the indicator for the Czech Republic was affected by strong koruna appreciation in the period under review, the impact on the Czech economy was rather lower compared to the other economies of the Central European region, Hungary in particular. This can be put into context with the ownership structure of banks and other financial institutions in the Czech Republic, the solid economic performance of the Czech economy, and the confidence in the Czech currency.

Table 22: Beta coefficients

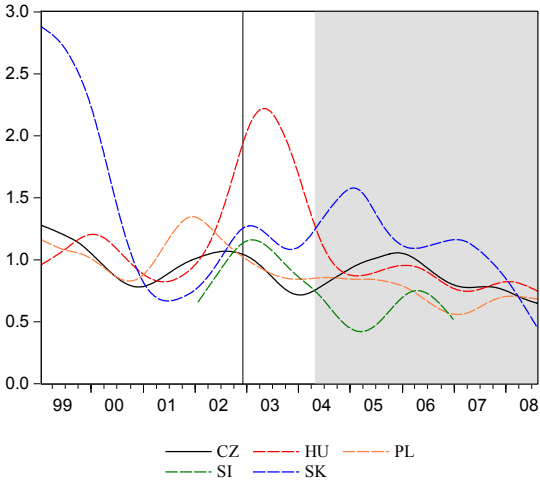
	Money market			Foreign exchange market			Bond market		Stock market		
	1999-2002	2003-07/2007	08/2007-08/2008	1995-2002	2003-07/2007	08/2007-08/2008	2001-07/2007	08/2007-08/2008	1995-2002	2003-07/2007	08/2007-08/2008
CZ	-0.57	-0.65	-0.58	-0.94	-1.11	-0.82	-0.73	-0.82	-0.76	-0.94	-0.92
AT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-0.98	-0.69	-0.9	-0.88	-0.81
DE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	B	B	-0.79	-0.79	-0.7
PT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-0.81	-0.69	-0.89	-1.04	-0.84
HU	-0.61	-0.84	-0.67	-1.01	-0.95	-0.77	-0.87	-0.85	-0.8	-0.85	-0.91
PL	-0.77	-0.62	-0.82	-0.91	-0.78	-0.95	-0.82	-0.83	-0.8	-0.91	-0.81
SI	-0.58 ^a	-0.55 ^b	n.a.	-0.85	-1.03 ^b	n.a.	n.a.	n.a.	-0.77	-0.83	-0.89
SK	-0.77	-0.55	-0.51	-1.09	-0.98	-0.6	-0.99	-0.86	-0.74	-0.69	-0.93

Note: B – benchmark; n.a. – data not available All the estimates were statistically significant at the 1% level;
 a) data since January 2002.
 b) data until end-2006.

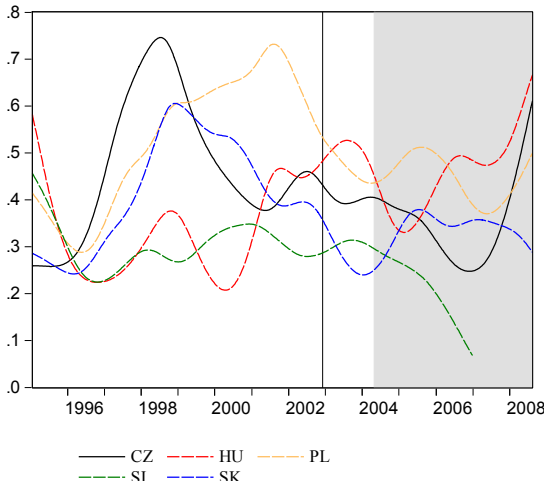
Source: CNB calculations.

Chart 23: Sigma coefficients^a

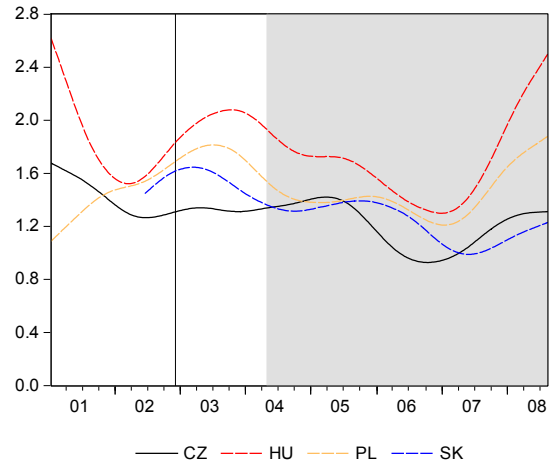
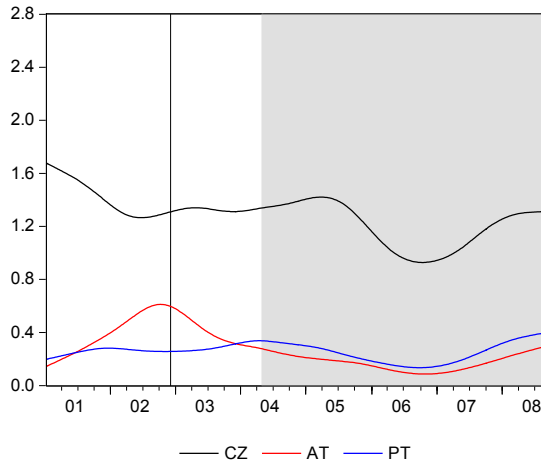
a) money market



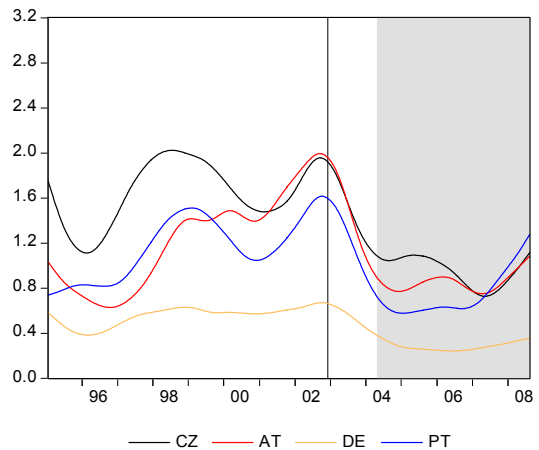
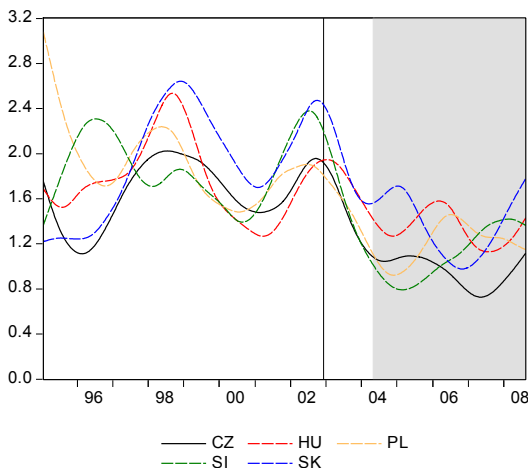
b) foreign exchange market



c) bond market



d) stock market



Note: a) Lower standard deviation values (vertical axis) correspond to a higher convergence level. For illustration, the grey area represents the period after EU enlargement on 1 May 2004 and the vertical line represents the announcement thereof on 12–13 December 2002.

Source: CNB calculations.

1.4 Potential sources of asymmetric shocks

1.4.1 The nature of shocks hitting the euro area countries and the effect of euro adoption

The empirical literature analysing the nature of economic shocks hitting the euro area countries is not uniform. Giannone and Reichlin (2006) and Eickmeier (2006) believe that although there is no clear evidence for an increase in economic growth correlation among the euro area countries after introduction of the euro, common shocks – which lead to relatively high synchronisation of booms and recessions – are of critical importance in explaining the variability of economic output. The differences in GDP growth among euro area countries are mostly due to idiosyncratic shocks. The effect of different transmission of common shocks is

found to be small. Similarly, when analysing differences in growth rates and inflation among euro area countries, Stavrev (2008) argues that they are declining, whereas the significance of common shocks is increasing. He attributes this to the effect of the single monetary policy on the synchronisation of cycles and finds the remaining differences to be relatively small but persistent, corresponding above all to idiosyncratic shocks affecting the individual countries. In addition, he sees a rising importance of convergence in the economic level and a declining significance of convergence in the price level for explaining the differences. By contrast, Artis et al. (2007) argue that the euro area cannot be considered homogeneous from the point of view of response to external shocks.

Eickmeier and Breitung (2006) find that common factors explain most of the variability in GDP, inflation and short-term interest rates in 1993–2005 (almost 90% for GDP and more than 70% for prices and rates) and distribute the remaining variability into supply, demand and monetary policy shocks. The impact of demand and monetary policy shocks on output and inflation and the impact of demand shocks on interest rates are found to be persistent. Global shocks are thus of great significance for explaining output variability in the euro area countries. Giannone and Reichlin (2006) identify the primary effect of shocks hitting the USA on subsequent developments in the euro area.

Most studies are limited to shock identification and do not describe their potential sources for individual countries. European Commission (2006) is an exception; it also emphasises the significance of idiosyncratic shocks and defines them: a fall in the risk premium after euro adoption, an easing of the monetary conditions, and productivity in the tradable and non-tradable sectors.

European Commission (2006) describes in detail the shocks observed in the individual countries on euro adoption. European Commission (2008b) classifies these shocks as follows:

- **Disappearance of the risk premium** (Spain, Portugal and Ireland) and the associated fall in interest rates.⁶⁶ According to simulations, this shock produces a boom in housing investment, which overshoots and then falls back, along with GDP. This results in permanently increased consumption, which induces a persistent current account deficit. The related easing of the monetary conditions for households boosts the demand for owner-occupied housing.
- **Exchange rate overvaluation** (Germany) and the associated decline in competitiveness and higher real interest rates compared to the other countries of the monetary union. In the short run, this has an adverse effect on housing investment and GDP growth and produces disinflation.
- **A favourable shock to productivity in the tradables sector**⁶⁷ (Ireland) – a rise in inflation owing to the Balassa-Samuelson effect, a decline in real interest rates and a pick-up in housing demand. Demand grows mainly for non-tradable goods and the current account is little affected.
- **An adverse shock to productivity in the non-tradables sector** (Italy, Spain and Portugal). The rise in prices of non-tradable goods leads to a decline in the real interest rate and a rise in housing demand.
- **An immigration shock** (Spain and Ireland) – increased demand for non-tradables and housing investment – impact on housing prices. The current account deteriorates.

⁶⁶ Sections 1.1.1 and 1.1.6 deal with this type of shock.

⁶⁷ Section 1.1.1 deals with real appreciation.

According to the simulations, secondary effects on other countries are also possible. The monetary policy response to an adverse productivity shock will produce an increase in interest rates, which will lead to a decline in economic activity. A positive productivity shock in the non-tradables sector also leads to interest rate growth, but this is offset by the income effect. An increase in housing demand and an associated shift of demand from tradables to non-tradables can have a negative effect on import demand.

A differing impact of common shocks may be another source of asymmetric developments. In this regard, European Commission (2008b) finds risks mainly in the effect and spillover of global imbalances, demand for and prices of commodities, which may generate a strong need for economic adjustment and redistribution of wealth, and in the implications of population ageing.

1.4.2 Macroeconomic effects of financial flows from EU funds

Upon joining the European Union, the Czech Republic gained the opportunity to draw on substantial sums from European funds under common policies, particularly the economic and social cohesion policy and the common agricultural policy. The Czech Republic had some experience with drawing on EU funds under the pre-accession instruments prior to joining the EU.⁶⁸ Fund allocation for EU Member States is many times higher, however. A potentially significant economic stimulus can thus be expected in this connection, probably in the area of investment activity above all.⁶⁹ The actual effect of the inflow of EU funds on the macroeconomic development of each country depends on the amount of funds used; any sudden increase in drawings on these funds can also have a substantial effect in the short run.

The financial flows between the Czech Republic and the EU have so far been relatively slow. The **net balance**⁷⁰ of the Czech Republic vis-à-vis the EU in 2007 was CZK 15.1 billion, which is the highest amount since it joined the EU (see Table 24), but this was mostly due to the receipt of advance payments for structural operations, including economic and social cohesion projects financed from the Structural Funds (SF) and the Cohesion Fund (CF), and for rural development in the new programming period 2007–2013 (a total of around CZK 13 billion). However, the actual drawdown of funds for structural operations did not pick up significantly in 2007 after a respectable increase in 2006. The volume of realised expenditure⁷¹ from the Structural Funds increased by only CZK 2 billion in 2007 compared to 2006 (see Table 23).

The **Structural Fund drawdown** situation did not improve either in 2008 H1. The actual situation lagged behind the planned schedule of realised expenditure for June 2008. According to data of the Ministry for Regional Development (MRD), approximately 31% of the total allocations for SF projects from the previous programming period (2004–2006) had

⁶⁸ The ISPA, PHARE and SAPARD financial instruments.

⁶⁹ The analysis does not expect private investment to be crowded out by public sector investment. The investment activity connected with the implementation of EU projects is financed largely from EU funds, i.e. it does not directly imply any demand for additional government bond issues and the associated upward pressure on interest rates with a negative impact on private investment. The share of national cofinancing of EU projects should be ensured as much as possible by re-directing funds from national economic and social cohesion projects to EU projects. This will reduce the crowding out of private investment and also decrease demand for general government expenditure. Cofinancing of EU projects from public sources is classified as national expenditure, which simultaneously aids compliance with the additionality principle.

⁷⁰ The net balance is defined as the difference between the country's total income from EU funds and its contributions to the EU.

⁷¹ Realised expenditure includes funds applied for in the payment requests submitted by final beneficiaries to the intermediate body.

yet to be drawn as of 30 June 2008.⁷² Drawdown of funds from the new allocation for the programming period 2007–2013 commenced during 2008, albeit to a very limited extent. This was mostly due to delays in the preparation and adoption of strategic documents for economic and social cohesion projects for the current programming period.⁷³

Table 23: Drawdown of financing from EU Structural Funds in the Czech Republic (realised expenditure in CZK millions)^a

	2005			2006			2007			2008
	H1	H2	Total	H1	H2	Total	H1	H2	Total	H1
Objective 1	692	1387	2079	4340	7891	12232	5721	8153	13874	4933
Objectives 2 + 3	0	7	7	112.9	818	930	409	775	1184	520
Total	692	1394	2086	4453	8709	13162	6130	8928	15058	5453

Note: a) Realised expenditure within operational programmes (Objective 1) and single programme documents (Objectives 2+3). Cofinancing by the Czech Republic excluded. Objective 1 = Supporting development in the less prosperous regions (with GDP below 75% of the EU average); Objective 2 = Revitalising areas facing structural difficulties; Objective 3 = Supporting education, training and employment policies. Objectives 2 and 3 cover regions not eligible under Target 1.

Source: Ministry for Regional Development.

Thanks mainly to a planned increase in funds for structural operations, the net balance of the Czech Republic vis-à-vis the EU is expected to increase to about CZK 39 billion (or 1% of GDP) in 2008. It had already reached about CZK 26 billion in 2008 H1. However, this favourable trend was again due above all to advance payments received from SF and CF funds amounting to around CZK 24.6 billion.

According to the Czech Ministry of Finance's preliminary estimates, the net balance should continue to increase gradually in the years ahead and reach approximately 1.8% of GDP in 2013. The revenue side should again be dominated by funds for structural operations, which should account for as much as 1.9% of GDP. The current estimates of the net balances for 2008–2013 have been reduced by 0.1–0.3 percentage points compared to last year's estimates, mainly because of the expected stronger exchange rate of the koruna against the euro, which will result in a lower koruna value of the allocations, which are expressed primarily in euro. However, the biggest year-on-year change in financial inflows from EU funds is still expected this year, when the Czech Republic's net balance vis-à-vis the EU should increase by 0.6 percentage point.

The financial flows between the Czech Republic and the EU have **effects on the government sector balance** on both the revenue and expenditure side. The revenue side of the public budgets is positively affected by any use of SF and CF funds to finance expenditure previously funded from national resources, most notably government sector investment projects and agricultural policy. In addition, government sector revenues were boosted in the previous programming period (2004–2006) by budgetary compensations. By contrast, the expenditure side will reflect transfers of own resources to the European budget, other payments to the European institutions (e.g. the EIB) and claims for cofinancing of projects from the SF and CF. Financial flows from the EU whose final recipient is the private sector have no impact on the public finance balance, since they will appear in the same amount on both the revenue and expenditure sides of the budget.

Owing to relatively low revenues within the common agricultural policy and comparatively low drawdown of SF and CF funds, the overall effect of financial flows between the Czech

⁷² The “n+2 rule” ensures that the SF and CF allocation for 2006 can still be drawn in 2008.

⁷³ The Czech Republic's national strategic reference framework was not approved by the European Commission until the end of July 2007. Most operational programmes for 2007–2013 were approved only in December 2007.

Republic and the EU on the government sector balance was negative in the past, at 0.1–0.3% of GDP. This year we can expect an almost neutral effect. Starting from 2009, the effect of financial flows between the Czech Republic and the EU on the government sector's performance will probably be slightly positive, since the positive impact of inflows of funds into agriculture and structural operations will slightly exceed the very slowly rising transfers of own resources. However, if the projects are not cofinanced from the SF and CF funds by re-directing part of the funds from national projects, additional upward pressure on public expenditure can be expected due to cofinancing (0.3 percentage point of GDP at most at the end of the horizon). The overall effect on the government sector's balance would thus be neutral to slightly negative.

Table 24: Expected financial flows resulting from the Czech Republic's EU membership (in CZK billions) and estimated impacts of drawdown of EU funds by the private sector on the economy^a

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Pre-accession instruments	2.1	2.6	0.5	-0.1	-	-	-	-	-
Agriculture	11.8	14.3	19.3	20.0	25.3	25.1	27.0	28.5	32.5
Structural operations	6.3	13.3	27.6	55.4	56.7	61.5	69.9	85.0	100.7
Internal policies	1.8	1.6	1.6	1.3	1.3	1.2	1.2	1.2	1.1
Compensation	8.9	5.7	-	-	-	-	-	-	-
EEA / Norway financial instrument	-	0.1	0.1	0.4	1.1	0.7	0.3	0.2	0.4
Total income from EU	31.0	37.5	49.0	77.1	84.3	88.5	98.3	114.9	134.7
Own resources	28.6	30.3	32.1	36.0	39.5	38.6	38.0	39.0	38.5
Payments to EIB, RFCS, etc.	0.8	1.0	1.8	1.7	1.0	0.0	0.4	0.5	0.5
Total payments to EU	29.4	31.3	33.9	37.7	40.5	38.6	38.4	39.5	38.9
Net balance	1.6	6.2	15.1	39.4	43.8	49.9	59.9	75.5	95.8
Net balance in % of GDP	0.05	0.19	0.43	1.03	1.06	1.14	1.27	1.49	1.77
Impulse in pp of GDP	0.09	0.15	0.04	0.01	0.15	0.05	0.02	0.05	0.07

Note: a) 2005-2007 = actual data “-“ means that the instrument was not used in the given period or will not be available.

Source: Czech Ministry of Finance (preliminary estimates in EUR) and CNB calculations.

Any sizeable increase in financial inflows from EU funds will imply an **additional stimulus for economic activity**. However, this additional stimulus will not depend on the financial flows recorded between the Czech Republic and the EU, but on the actual use of these funds by final recipients. The positive net balance and a high inflow of funds from the EU to the Czech Republic does not necessarily mean an increase in net demand, since the financial flows associated with EU membership also include advance payments, which have not necessarily been paid to the final beneficiaries. For the purposes of this analysis, the derivation of the additional economic impulse from the inflow of money from the EU is thus based on an expert estimate of the real drawdown of funds from the EU by the private sector. Its numerical expression in the contribution to GDP growth is based on the method of fiscal impulse calculation within the CNB's macroeconomic model (see the *Methodological Part* for details).

According to revised estimates, the effect of drawdown of funds from the EU on GDP growth in the Czech Republic will be roughly neutral this year and slightly positive starting from 2009 (see Table 24). The highest value of the expected impulse from the inflow of money from the EU is expected in 2009. Compared to last year's estimates, the expected more pronounced increase in drawdown of EU funds has again been delayed by one year, i.e. to 2009, particularly owing to a different distribution of drawing money from the SF and CF. However, the value of the impulse from the inflow of money from EU funds is not high either in 2009. Hence no significant asymmetric shock arising from the drawing of financial assistance from the EU is expected in the future.

The simulation of the macroeconomic effects takes account in particular of the short-term and medium-term demand impacts of the additional impulse arising from the inflow of funds from the EU; the potential impacts on the supply side of the economy are expected more in the long term and are not modelled. It is also assumed that the drawdown of EU funding is generally expected and will not affect the exchange rate in terms of conversion of EUR into CZK.⁷⁴ Table 27 shows the simulation results, which are presented in the form of deviations of the inflation path, output gap, CZK/EUR exchange rate and interest rates from the macroeconomic scenario that does not take into account the drawdown of money from EU funds.

Table 25: Impact of the additional impulse due to the inflow of funds from the EU (deviations from the scenario that does not take account of EU fund drawdown)

	2007	2008	2009	2010	2011	2012	2013
Inflation (pp)	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
3M PRIBOR (pp)	0.00	-0.01	0.02	0.02	-0.01	-0.01	0.02
Output gap (pp)	0.00	0.00	0.08	0.04	-0.04	-0.02	0.01
CZK/EUR (CZK)	0.00	-0.01	-0.06	-0.06	-0.04	-0.03	-0.03

Source: CNB calculations.

The simulation shows that the impact of the inflow of funds from the EU on the variables under review will be insignificant in 2008–2013. Inflation will hardly deviate from the baseline scenario (i.e. the scenario excluding EU fund drawdown). A similarly marginal effect can be expected for the interest rate path as well as for the output gap and the exchange rate. The estimated effects are little changed compared to last year and have merely shifted by one year. Like last year, it can be concluded that the impact on the CZK's participation in the ERM II system and the fulfilment of the convergence criteria is insignificant. The results of the simulation should, however, be taken as tentative and conditional on the methodology used.

1.4.3 Product specialisation

Higher specialisation of production helps to exploit economies of scale. From the viewpoint of operating within a monetary union, however, increasing specialisation can lead to susceptibility of the economy to asymmetric shocks (Krugman, 1993). Krugman's sector specialisation hypothesis predicts that individual countries will specialise in specific sectors, represented by a final relatively generally defined product with no clear substitute, and produce and export in most of the product categories of these sectors. However, greater specialisation can also occur within individual sectors where components of the final product are produced in different countries. The biggest risks from an asymmetric shock to the euro area remain in sectors where the products of a given economy represent a large part of the European market and this commodity simultaneously accounts for a large proportion of exports of a given country.

The industries that account for a larger share of total production and value added in the Czech Republic compared to the euro area and the EU as a whole include the manufacture of

⁷⁴ This assumption is derived from the fact that financial transactions in relation to the EU are mostly carried out via CNB accounts and converted directly into foreign exchange reserves (see the document *Joint Agreement between the Czech Government and the Czech National Bank and Updated Strategy for Dealing with the Exchange Rate Effects of Foreign Exchange Revenues of the State* available on the CNB website).

transport equipment, the manufacture of metal products and energy generation. The shares of each of these three industries in total value added are roughly 2 percentage points higher in the Czech Republic than the European average. This means that a shock that generates, for example, a 10% global decline in demand for production in a given industry will cause a GDP growth slowdown in the Czech economy that is about 0.2 percentage point higher than on average for the euro area. Nonetheless, these three industries account for a relatively small proportion of total European production in these industries, so it can be assumed that such a shock will also hit other economies.

Box 2: The Czech car industry

The above considerations relate among other things to the car industry, whose large share in Czech industrial production⁷⁵ and Czech exports is often cited as a possible source of asymmetric shocks for the Czech economy. The Czech Republic specialises in a certain subset of products within the car industry (e.g. manufacture of several types of engines, gearboxes, safety glass for automobiles, parts and components of bodies, ignition systems, steering wheels, exhaust pipes and shock absorbers), which form an important part of Czech exports and have an disproportionately high share of the European market. As regards the European car industry, however, Czech producers are present in only a fragment of all the categories of products that can be included in the industry. According to the PRODCOM⁷⁶ database, the Czech car industry is most exposed in two categories, parts and accessories for motor vehicles and parts and components of bodies for motor vehicles not elsewhere classified. Since these commodities account for only a small part of the whole car industry, we interpret this situation as corresponding to intra-industry specialisation and thus as being against Krugman's hypothesis.

Data on economic results of the largest Czech exporter Škoda Auto can be used in a similar way. Škoda Auto's Annual Report reveals that about 60% of production purchases⁷⁷ came from the domestic economy, 22% from Germany, 11% from the rest of Western Europe and 6% from the rest of Europe. Turning to the number of suppliers (totalling 1,322), almost half came from Germany (another almost 23% from Western Europe excluding Germany) and about one-fifth from the Czech Republic. The Annual Report also reveals a high share of intra-industry trade, mostly within the Volkswagen group. In 2006, for example, 61% of the 1.2 litre engines and 46% of the gearboxes produced were supplied to customers of the group.

The risk of excessive specialisation in the car industry is further multiplied by the industry's high cyclicality (see Chart 29). Unfortunately, the contributions of the car industry to the course of the business cycle in the Czech Republic cannot be well analysed due to a lack of data and to ongoing capacity changes that are masking the cyclical developments. Although a possible shock to the car industry would affect numerous countries, the disproportionately high share of the car industry in the Czech economic output compared to the euro area

⁷⁵ The share of the car industry in the total production and value added of the national economy is comparable in the Czech Republic to that in Germany. However, the German automobile industry accounts for about 30% of passenger car production in Europe, whereas the share of the Czech Republic is naturally much smaller.

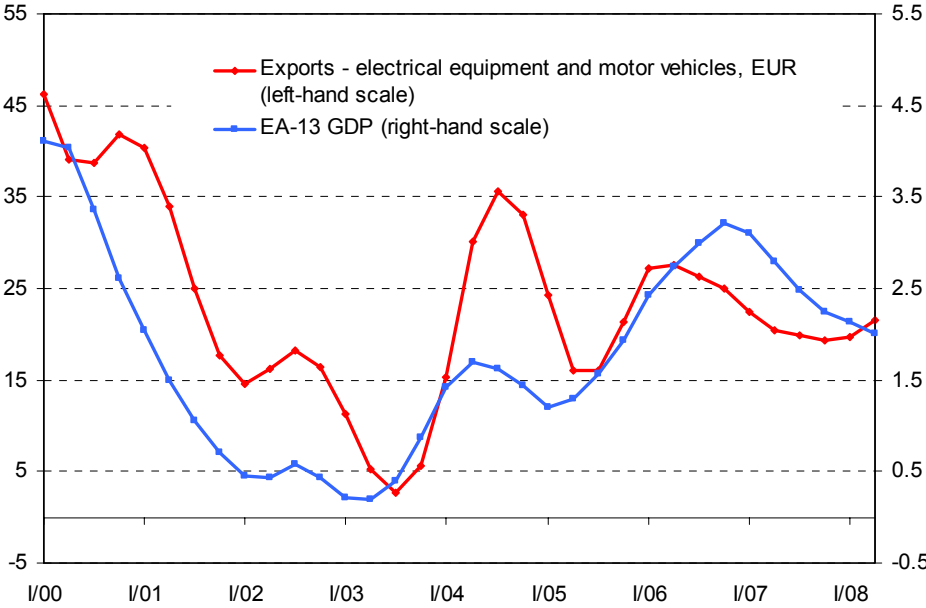
⁷⁶ Statistics on the production of manufactured goods (PRODCOM) make it possible to estimate the degree of specialisation of individual states in specific sectors. The interpretation should take into account, however, that the database is not complete. Data for a large proportion of products and states are missing or confidential, which may distort the results. Specifically, the Czech Republic reports rather more data than other countries. The latest data are for 2006.

http://epp.eurostat.ec.europa.eu/portal/page?_pageid=2594.58778937&_dad=portal&_schema=PORTAL

⁷⁷ The purchase of means of production for production itself does not include, for example, the construction of new production facilities etc.

average is a source of risk that the settings of the single monetary policy would not be optimal – in terms of the intensity of its response – for the macroeconomic environment in the Czech economy if such a shock were to occur. The large share of Germany (where the car industry accounts for the same high share of production) in Czech exports could then further intensify the cyclical fluctuation in the Czech economy.

Chart 24: Cyclical export industries in the Czech Republic and economic growth in the euro area (annual percentage growth)



Note: The time series have been seasonally adjusted and filtered using the Hodrick-Prescott filter.

Sources: Eurostat, CZSO, CNB calculations.

Other industries accounting for a large part of Czech exports include engineering (which is closely connected with the car industry), construction materials and food products. Czech exports account for more than one-fifth of the European market in the following areas: components and fixtures and fittings for trains and trams and railway signalling equipment (35% of the total market, but only 0.2% of the value of all Czech exports), aluminium wire netting (31% of the market, 0.1% of exports), parts for air conditioning machines (24% and 1.3% respectively), tempered safety glass for motor vehicles (21% and 0.5%) and iron or steel pallets for handling goods (21% and 0.3%).

The above facts show that specialisation takes place at a level lower than individual industries (or specific final products). This reduces the risk of significant asymmetric shocks, since sectoral shocks thus affect relatively small part of total Czech production and impact on more than one country.

Industries accounting for a lower share of value added in the Czech economy compared to the euro area may equally be an asymmetric shock source. The impacts of the 2008 financial crisis on the Czech economy are dealt with in Box 1 in section 1.3.

1.4.4 The effects of an oil price shock

The nature of the shocks affecting the economy will probably change after euro adoption (European Commission, 2008). While demand shocks, whose sources can include exchange rate fluctuations vis-à-vis trading partners or fiscal policies, will probably be less frequent, the

significance of common shocks will increase, but their impacts on individual countries may differ. Sizeable changes in energy prices are one such shock.

The energy intensity of the Czech economy is relatively high by international comparison. As regards oil consumption, the Czech Republic depends almost entirely on imports. However, owing to a large share of coal in total energy consumption in the domestic economy, imports of oil are less significant than in other countries (Dybczak et al., 2008). Imported oil is mostly used in the transport and chemical industries. Dybczak et al. argue that the effects of an oil price shock comparable with the oil price movements in 2007–2008 on the Czech economy are not too dramatic. This is due, they say, to the relatively low energy dependence of the Czech economy, to the exchange rate dampening the impact of dollar price fluctuations on koruna oil prices, to the small effects of world oil prices on Czech producer and consumer prices in the past, and to the probability of a gradual reduction in the energy intensity of the Czech economy in the future. The authors use a CGE (computable general equilibrium) model to simulate the impact of an oil price shock on the Czech economy. The oil price shock is defined as a rise in the Czech koruna price of oil and oil products of 5% a year over the next four years, i.e. of 20% overall, and related four-year growth in prices of imported chemical products of 0.8% a year. They show a significant, although not dramatic, impact of such a shock on nominal and real variables (see Table 26); however, the actual negative effect of a potential oil price shock on nominal and real variables of course will depend on the size of the changes in oil prices and their impacts on global demand and demand for Czech exports.

Table 26: Effects of global oil price growth (% of the deviation from the baseline scenario)

	1	3	5	∞
GDP	-0.5	-1.2	-1.5	-0.8
CPI	0.4	1.5	2.1	-0.5

Note: The figures show percentage deviations from the baseline scenario in the first (1) and third (3) year of the shock, one year after the shock (5) and the long-term effect (∞).

Source: Dybczak et al., 2008.

Table 26 shows the size of the impact of the oil price shock defined above on the price level and GDP. The price level will be 0.4% higher in the first year and 2.1% higher in the fifth year, which represents an average impact of the oil price shock on consumer price inflation of 0.4 percentage point in the first five years. Owing to the response of wages to the related GDP decline, however, the ultimate effect of the shock on the price level is slightly negative. Economic output as measured by GDP will be 1.5% lower in the fifth year of the shock, owing to lower competitiveness and domestic demand. This implies a short-term decrease in GDP growth of 0.3 percentage point.⁷⁸ In the long run, the oil price shock implies a GDP decline of 0.8%.

ECB (2004) presents empirical estimates of the impact of oil price shock on the CPI and GDP in the euro area.⁷⁹ The effect of a permanent 50% rise in oil prices adds 0.3–0.6 percentage point to euro area inflation. The impact then diminishes to just 0.0–0.1 percentage point in the third year. The oil price shock has a negative effect on GDP growth of 0.1–0.8 percentage point in the first year and an impact of between -0.1 and +0.4 percentage point in the third

⁷⁸ The CNB simulation presented in Inflation Report IV/2008 models the impact of an oil price increase of USD 25 a barrel for two years. This oil price scenario implies a somewhat lower impact on inflation and economic growth in the years following the oil price shock than Dybczak et al. (2008).

⁷⁹ The study presents the impacts calculated using the ECB AWM, EC QUEST, NiGEM and IMF Multimod models.

year. Dybczak et al. (2008) conduct a simulation for the Czech Republic using the same oil price shock. This results in qualitatively similar, but more pronounced negative effects on the CPI and GDP than presented in the baseline simulation in Table 26 (an impact on inflation of 0.8 and 0.9 percentage point in the first and third years, and an impact on GDP growth of -1.0 percentage point in both years). In addition to the higher energy intensity of the Czech economy, this is due, however, to the fact that the absolute impact of a 50% increase in oil prices is at present much higher than when the estimates presented by the ECB were drawn up.

2. ADJUSTMENT MECHANISMS

The adoption of the single currency and the loss of an independent monetary policy will mean that the adjustment of the economy to shocks will place higher demands on other adjustment mechanisms. The theory of optimum currency areas indicates the importance of the stabilising function of public budgets, labour market flexibility and the ability of the financial system to absorb shocks.

2.1 Fiscal policy

After the loss of independent monetary policy, automatic fiscal stabilisers or discretionary fiscal policy measures may to some extent substitute for missing adjustment mechanisms in the event of asymmetric shocks and thus contribute where necessary to stabilisation of the economy. The current condition of, and in particular the outlook for, public finances is therefore an important factor that must be taken into account when considering the preparedness of the Czech economy to join the euro area.

2.1.1 The stabilisation function of public budgets

From the perspective of the stabilising role of fiscal policy, a desirable public finance policy is one that does not cause large changes in market agents' expectations and creates a stable economic environment. The need for the stabilising function of fiscal policy will increase after euro adoption.

Fiscal policy can affect the economy either directly, via discretionary measures on the revenue or expenditure side of the public budgets, or indirectly, by creating conditions for optimal functioning of automatic (built-in) fiscal stabilisers. However, the negative experience with activist fiscal policy in the advanced countries in the 1970s is an argument against the wider application of discretionary fiscal measures, since such policy failed to produce the desired, or provable, results or was counterproductive.⁸⁰ This was also reflected in a paradigm shift in theoretical economics, with belief in the effectiveness of activist fiscal policy being replaced by a hypothesis that adherence to pre-defined rules is more effective. In the fiscal area, such rules consist primarily in a simple, stable and predictable system of tax and expenditure regulations operating within a consolidated and sustainable public finance system, supported, of course, by fiscal discipline on the part of the government. By contrast, discretionary, or activist, fiscal policy can destabilise the economic environment.

The EU fiscal rules therefore consider the optimal situation to be a balanced government budget policy within the business cycle and the free operation of automatic fiscal stabilisers, which can moderate shocks without the need for ad hoc discretionary fiscal measures.⁸¹ In a

⁸⁰ In general, the main causes are the long and unpredictable lags that arise between the identification of shocks, the implementation of fiscal measures and the effects of those measures, the existence of institutional constraints and the inertia of fiscal decisions. A typical example of this problem is the risk of "pro-cyclical fiscal policy", i.e. fiscal policy that tries to smooth the business cycle (which can be viewed as one specific type of economic shock) but in reality – owing to the aforementioned lags – amplifies the cycle.

⁸¹ The Stability and Growth Pact exerts pressure on public finances so that they are able to have a stabilising effect particularly at times of recession, i.e. so that sufficient room is created for such an effect (for the functioning of built-in stabilisers and, in extreme cases, for fiscal discretion). In connection with the 2008 financial crisis and the related public support provided to financial institutions by the governments of some EU Member States, the question arises of to what extent will fiscal discipline be violated or the Stability and Growth Pact relaxed for this reason. It would be premature to draw any conclusions in this respect, however, since the

period of recession, public finances thus stimulate aggregate demand by means of deficits. By contrast, in a period of expansion they should subdue demand by creating fiscal surpluses. In order for the automatic function of public budgets to work, while avoiding breaches of the maximum agreed deficits, public finances must be balanced or in surplus during a growth phase of the business cycle. This reasoning serves as the basis for the convergence criterion for the general government deficit as a percentage of GDP, where a 3% limit is considered sufficient to allow free functioning of automatic stabilisers in the event of a minor, i.e. normal economic downswing. If the recession is deeper, discretionary fiscal policy intervention is assumed necessary, with a greater likely impact on the deficit, and so an exemption from fulfilling this criterion is applied.

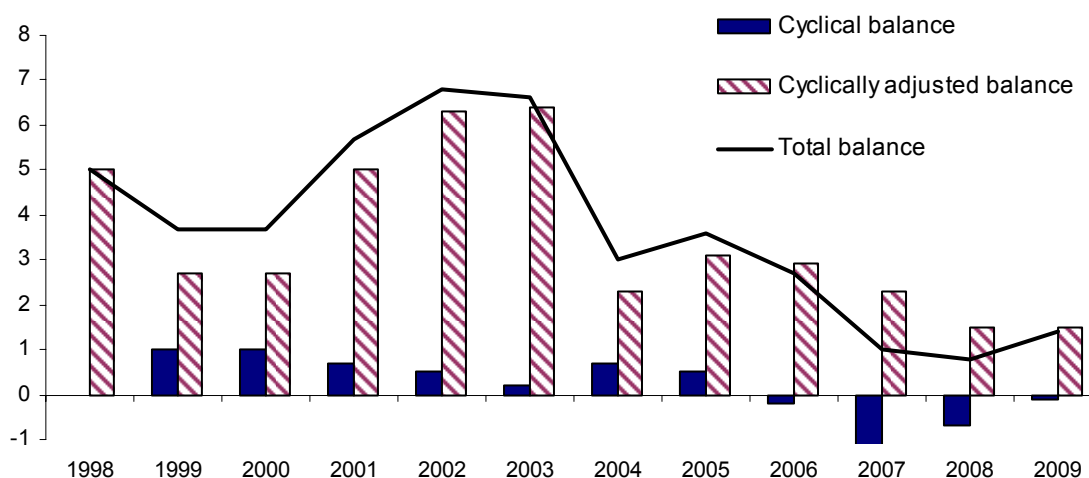
The influences of the macroeconomic environment and of interventions by the government on public budgets can be differentiated by decomposing the fiscal balance into the part that results from the business cycle, and the cyclically adjusted balance (or structural balance, i.e. the balance taking into account the effects of temporary or one-off fiscal measures in addition to economic fluctuations). The cyclically adjusted balance yields information on how the fiscal performance would look if the economy were at its potential. Chart 25 illustrates the CNB's current estimate of **the Czech Republic's general government balance broken down into its cyclical and cyclically adjusted components**.⁸² The cyclical component played a negligible role in 1998–2006 and the total fiscal deficit was practically identical to the cyclically adjusted component. The effect of automatic stabilisers, which respond to the business cycle and smooth its fluctuations, was thus very limited in the Czech Republic.⁸³ The total deficit was worsened mainly by pro-cyclical government expenditure policy, since additional tax receipts were not consistently employed to reduce the fiscal deficit, but rather to generate new public expenditures. Similarly, tax cuts were not accompanied by corresponding measures on the public expenditure side even during years of solid economic growth. The deficit nature of the Czech government sector was thus due mainly to non-cyclical effects, and the business cycle did not start to have a pronounced effect until 2007 and 2008. Ensuring medium-term balance or sustainability of the Czech public budgets is an important precondition for the ability to fulfil the Stability and Growth Pact in the long term and to make use of the stabilising function of public budgets. The adoption of fiscal stabilisation measures in August 2007 and their implementation in 2008, along with some other reform steps, suggest a gradual improvement in this situation. The public budgets balance recorded a relatively significant improvement as early as 2007. The excessive deficit procedure against the Czech Republic was terminated in 2008, since, according to the European Commission, the deficit had been corrected in a credible and sustainable manner. This procedure against the Czech Republic was terminated one year sooner than initially assumed. According to CNB estimates, the structural deficit could fall to 1.5% of GDP in 2008 and remain at this level in 2009.

impact of such operations on government performance under ESA95 methodology is not clear so far. At the same time, any deterioration of the indicators as a consequence of the financial support would not necessarily mean a relaxation of the Stability and Growth Pact, since the rules currently in force themselves permit a deterioration in the fiscal position resulting from particular measures to be classified as extraordinary without the remedial mechanisms contained in the preventive or corrective parts of the Pact being activated.

⁸² The CNB's estimates were prepared in accordance with the ESCB method on data according to the ESA95 methodology, whereas Table 20 contains the prediction of the European Commission and the cyclical adjustments are carried out using the European Commission's method.

⁸³ Automatic stabilisers act in the direction of a deterioration in the fiscal balance at a time of economic recession and in the direction of an improvement in years of economic growth.

Chart 25: Decomposition of the fiscal balance into its cyclical and cyclically adjusted components, based on CNB analyses (% of GDP)



Note: Positive values represent a public budgets deficit and negative values a public budgets surplus.

Source: CNB calculations.

2.1.2 Government deficit and debt and the scope for stabilising fiscal policy

Given the requirements of the Stability and Growth Pact, the ability of fiscal policy to react discretionarily or automatically to unforeseen shocks is determined primarily by the gap between the general government structural deficit and the reference value of 3% of GDP and by the gap between the government debt and the reference value of 60% of GDP. The fiscal policy objective in the run-up to euro area accession should be to take the public budgets close to a zero balance (or close to the Medium Term Objective – MTO)⁸⁴ so that sufficient room is left for stabilising fiscal policy in less favourable times. Table 27 sums up the spring 2008 figures and forecasts of the European Commission regarding the **fiscal balance** for a selected sample of countries. The left-hand side of the table provides information on the unadjusted government sector balance, while the right-hand side contains the structural balance, i.e. the fiscal balance adjusted for cyclical, one-off and temporary effects.

⁸⁴ The originally uniform requirement of balanced finances has been replaced under the amended European fiscal rules by country-specific medium-term objectives (MTOs), which differ from economy to economy depending on the existing level of public government debt and the prospects for economic growth. Fast growing economies with a low general government public debt level may, instead of maintaining balanced public sector accounts, reach a deficit of up to 1% of GDP. This is also the medium-term objective for the Czech Republic, which it again undertook to comply with by 2012 in the November 2007 update of the convergence programme.

**Table 27: General government deficit (ESA95), European Commission estimate
(% of GDP)**

	2006	2007	2008	2009	2006	2007	2008	2009
	not adjusted				cyclically adjusted			
CZ	-2.7	-1.6	-1.4	-1.1	-2.9	-2.3	-1.9	-1.5
AT	-1.5	-0.5	-0.7	-0.6	-1.4	-1.0	-1.2	-0.9
DE	-1.6	0.0	-0.5	-0.2	-1.4	-0.3	-0.8	-0.8
PT	-3.9	-2.6	-2.2	-2.6	-3.2	-2.2	-1.9	-2.2
HU	-9.2	-5.5	-4.0	-3.6	-9.7	-4.7	-3.7	-3.3
PL	-3.8	-2.0	-2.5	-2.6	-4.0	-2.5	-2.7	-2.3
SI	-1.2	-0.1	-0.6	-0.6	-1.3	-0.7	-1.1	-0.7
SK	-3.6	-2.2	-2.0	-2.3	-3.1	-2.6	-2.8	-3.1
CZ ^b	-2.7	-1.0	-0.8	-1.4	-2.7	-2.0	-1.5	-1.5

Note: a) Cyclical adjustment using the European Commission method.
b) Unadjusted balance: preliminary data according to the CZSO's notifications (October 2008) for 2006 and 2007, and the CNB's current estimate for 2008 and 2009. The cyclically adjusted balance is calculated under ESCB methodology. The difference in the cyclically adjusted balance for the Czech Republic results from a different method of cyclical adjustment, the level of the unadjusted balance used, the level of GDP trend growth and one-off and other temporary measures deducted from the unadjusted balance prior to its cyclical adjustment.

Sources: European Commission (2008a), CNB.

Table 27 shows that the fiscal situation – as expressed by the total (unadjusted) general government balance – recorded a significant improvement in all the countries under review. This positive trend was based mainly on unexpectedly favourable economic developments and the ensuing extraordinary revenues, and only partly on reform measures. This is also reflected by the less convincing results for the cyclically adjusted balance, characterising the governments' reform efforts. The general government deficit in the Czech Republic was around 1% of GDP in 2007, due mainly to cyclical factors, especially higher tax revenues. A continuing slight improvement in the overall balance (with the exception of Poland, Portugal and Slovakia) is also expected in 2008 and 2009. The fact that the general government deficit has not disappeared even in the peak phase of the economic cycle is a warning for the Czech Republic. The expected downswing in economic growth thus increases the risk of a deterioration in deficits compared to the forecasted values of around 1% of GDP. However, it is not likely that the general government deficit in the Czech Republic will exceed the Maastricht criterion of 3% of GDP within the given time period.

In addition to other effects, the government's room for manoeuvre is determined by the **nature of fiscal expenditure**. While a change to a government resolution or statutory instrument is sufficient to allow a change in some expenditures, changes to other expenditures require time-consuming amendments to laws or international treaties. From the economic perspective, the classification into mandatory, quasi-mandatory and non-mandatory expenditures is just a classification of the speed at which the government is able to alter such expenditures if the need arises.⁸⁵ Mandatory expenditures are the least flexible; nevertheless, most of them can be modified by means of suitable legislative amendments in the shorter or longer term.

Table 28 summarises the evolution of mandatory state budget expenditures in relation to total state budget revenue and expenditure and total general government revenue and expenditure.

⁸⁵ The definition of mandatory expenditures applied in this analysis is given in the *Methodological Part*.

Table 28: Shares of mandatory state budget expenditure (%)^a

	2005	2006	2007	2008	2009
- in state budget revenue	54	57	54	56	56
- in state budget expenditure	51	53	51	53	54
- in general government revenue (ESA95)	39	41	39	39	40
- in general government expenditure (ESA95)	36	38	36	36	37

Note: a) Data for 2005–2007 are actual results and figures for 2008 and 2009 are based on the government’s September 2008 draft state budget. Estimated developments in general government revenues and expenditure have been taken from the European Commission document.

Sources: European Commission (2008a), CNB calculations.

According to the government’s draft state budget, mandatory expenditures in 2008 will account for 56% of total state budget cash revenues, or 39% of the revenues of the general government sector as a whole (ESA methodology). The share of mandatory expenditures will increase in 2008, and the outlook for 2009 is for a continuing moderate rise. It thus seems clear that the government’s policy statement commitment to reduce the share of mandatory expenditures in total state budget expenditure below 50% by 2010 will not be fulfilled.

The individual countries under review do not monitor their mandatory expenditures in a directly comparable form, as there is no harmonised definition of the term. However, some inter-country comparison of the structure of general government revenue and expenditure is possible. Such a comparison is given in Table 29; “mandatory expenditures” consist mainly of social payments and interest expenditure. The Czech Republic ranked among the countries with the lowest figures in the selected sample for both indicators. By contrast, in 2007, as in previous years, the Czech Republic was among the group of countries with the highest ratio to GDP as regards government expenditure on investment (gross fixed capital formation).

Table 29: Ratios of public revenue and expenditure to GDP in 2007 (%)

	CZ	AT	DE	PT	HU	PL	SI	SK
Total revenue	40.8	47.5	43.9	43.1	44.6	40.4	43.2	34.7
- taxes	19.9	27.4	23.7	24.9	25.8	22.8	24.0	17.4
- social contributions	16.2	15.7	16.5	12.7	13.6	12.1	14.3	11.9
Total expenditure	42.4	48.0	43.9	45.7	50.1	42.4	43.3	36.9
- compensation of employees	7.5	6.9	6.9	12.9	11.4	9.6	10.9	6.8
- intermediate consumption	6.1	8.8	4.2	4.1	6.4	5.9	6.1	4.5
- social payments	12.8	17.6	17.3	15.2	15.2	14.4	14.7	11.6
- gross fixed capital formation	4.8	1.0	1.5	2.4	3.6	4.1	3.7	1.9
- interest expenditure	1.2	2.7	2.8	2.8	4.1	2.6	1.3	1.4

Source: European Commission (2008a).

The current stock of, and prospects for, **government debt** through its effect on debt service spending may also become factors limiting the stabilising ability of fiscal policy. Table 30 provides a comparison of the ratio of gross consolidated debt to GDP. For the sake of comparability, the data are again taken from the European Commission’s spring prediction.

Table 30: Government debt (ESA95), European Commission estimate (% of GDP)

	2006	2007	2008	2009
CZ	29.4	28.7	28.1	27.2
AT	61.8	59.1	57.7	56.8
DE	67.6	65.0	63.1	61.6
PT	64.7	63.6	64.1	64.3
HU	65.6	66.0	66.5	65.7
PL	47.6	45.2	44.5	44.1
SI	27.2	24.1	23.4	22.5
SK	30.4	29.4	29.2	29.7
CZ ^a	30.1	30.4	30.3	30.2

Note: a) Preliminary data according to the CZSO's notifications (October 2008) for 2006 and 2007, and the CNB's current estimate for 2008 and 2009.

Sources: European Commission (2008a), CNB.

Thanks to the favourable macroeconomic developments, the gross consolidated debt of the Czech government sector declined to 28.9% of GDP in 2007. A further slight decrease is expected this year. The Czech Republic is one of the least indebted countries among the countries under comparison, ranking second immediately behind Slovenia. The outlook for 2009 is for a slight decline in government debt for the Czech Republic. Thanks to the low government debt and low interest rates, the debt service costs as a percentage of GDP estimated for the Czech Republic are relatively favourable (see Table 31). However, in the longer term, this depends on consolidation and the enforcement of structural changes connected with the pension and health insurance reform, which would reduce the otherwise inevitable increase in debt and thus also the mandatory expenditures connected with debt service.

Table 31: Interest expenditure, European Commission estimate (% of GDP)

	2006	2007	2008	2009
CZ	1.1	1.2	1.1	1.1
AT	2.7	2.7	2.6	2.6
DE	2.8	2.8	2.6	2.6
PT	2.8	2.8	2.8	2.7
HU	3.9	4.1	4.2	4.1
PL	2.7	2.6	2.7	2.7
SI	1.4	1.3	1.2	1.1
SK	1.5	1.4	1.4	1.4

Source: European Commission (2008a).

Despite the unexpectedly low deficit in 2007 (and a similarly expected relatively favourable outcome in 2008), the very existence of public budget deficits in the context of a peaking economic cycle testifies to continuing problems with public finances in the Czech Republic. Given the still rather high share of mandatory expenditures, the deficits thus leave only narrow room for the functioning of automatic stabilisers or active fiscal policy in economically less favourable times.

2.1.3 Sustainability of public finances

Sustainability of public finances is a key prerequisite for those finances to have a stabilising effect on the economy. Virtually all EU countries are exposed to the problem of population ageing and the related rise in pension, social and health expenditure, which may generate instability in the future. The long-term outlook for government debt, taking into account the

reforms outlined in the national updates of the convergence or stability programmes, is shown in Table 32.

Table 32 Gross government debt (% of GDP)

	2007	2010	2030	2050
CZ	30.4	30.0	76.0	282.0
AT	59.9	55.0	24.0	25.0
DE	64.9	60.0	22.0	38.0
PT	64.4	60.0	33.0	74.0
HU	65.4	63.0	70.0	205.0
PL	44.9	42.0	-20.0	-117.0
SI	25.6	23.0	45.0	227.0
SK	30.6	30.0	32.0	116.0

Source: European Commission (2008a).

In the cases of the Czech Republic, Slovenia, Hungary and Slovakia, this model simulation indicates a serious rise in fiscal problems during 2030–2050, related mainly to demographic changes. By contrast, Poland may achieve a significant pension system surplus, as well as a positive net government sector position, by 2050. The current trajectory of ageing-related expenditure in the Czech Republic appears unsustainable in the long term. If essential pension and health system reforms are not carried out, it is likely to lead to a substantial rise in the debt level. For this reason, the Czech Republic, Slovenia, Hungary and Slovakia are classified as the countries with the highest risk to public finance sustainability in the European Union. At the same time, it is likely that the Czech Republic and some other countries will see a tightening of their medium-term objectives so that they better reflect the public budgets' implicit obligations to cover the aforementioned high costs of population ageing in these countries.

2.2 Wage elasticity and inflation persistence

Adjustment of real wages and prices is another mechanism, in addition to stabilising fiscal policy, that should aid in efficient absorption of shocks. Changes in real wages act as an impulse for economic agents to change their behaviour in a direction corresponding to a given shock.

2.2.1 The degree of adjustment of real wage growth to the unemployment rate – the Phillips curve

The response of wages to changes in demand for labour is one of the methods of economic adjustment and a means of preserving a high employment rate. The following analysis assesses the ability of the Czech economy to dampen the impacts of shocks by means of real wage adjustment. The degree of real adjustment of wages to changes in unemployment, i.e. real wage elasticity, is measured using a simple Phillips curve.

Real wage elasticity may be either positive or negative. Negative values suggest that wages are flexible (growth in wage costs is suppressed by growth in unemployment). By contrast, positive or insignificant values of wage elasticity point to the absence of wage flexibility. The Phillips curve estimates were made using the least squares method (OLS) on quarterly data for the periods 1996 Q1–2001 Q4 and 2002 Q1–2008 Q2. Table 33 sums up the results.

Table 33: Elasticity of wages to the unemployment rate

	1996–2001	2002–2008
CZ	-0.018 *	-0.030
AT	-0.090 **	0.040
PT	-0.012	-0.045
HU	-0.041 **	0.030
PL	-0.027 *	0.014
SI	0.001	0.025
SK	-0.032 **	-0.060

Note: ***, ** and * denote significance levels of 1%, 5% and 10% respectively.

Source: CNB calculations.

Although the estimated wage elasticity increased for the Czech Republic between the periods under review, it also became statistically insignificant.⁸⁶ Wages thus seem not to have an important stabilising function. The statistical significance of estimates also disappeared for Austria, Hungary, Poland and Slovakia. Recently, wage elasticity has thus been insignificant in all the aforementioned countries. In the cases of Portugal and Slovenia, wages probably failed to play an adjusting role throughout the period under review.⁸⁷

2.2.2 Downward flexibility of nominal and real wages – business survey evidence

A supplementary view of wage elasticity is provided by evidence from a business survey that directly asks how often businesses change wages.

The indicator of downward inflexibility of nominal wages can take values in the range of [0, 1] and is constructed as the proportion of businesses that have frozen nominal wages over the past five years.⁸⁸ Higher values of this indicator thus correspond to a higher degree of wage inflexibility.

A supplementary indicator is that of downward real wage inflexibility. It also takes values in the range of [0, 1] and indicates the proportion of businesses in which there is an *automatic* relationship between nominal wages and past or expected inflation.

Table 34 shows that the Czech Republic recorded the highest degree of a nominal wage freezing of all the selected countries in 2002–2006 (more than one-quarter of the businesses surveyed), while the lowest degree was recorded by Slovenia (3.3%). Real wage inflexibility in the Czech Republic (11.3%) is broadly in line with the average of the selected current euro

⁸⁶ An increase in the absolute value of the coefficient coupled with a decline in the statistical significance implies higher volatility in the data.

⁸⁷ A supplementary view of wage elasticity is provided by wage curve estimates measuring real wage elasticity in terms of the rate of adjustment of regional wage levels to the level of regional unemployment (Nickell, 1997). An estimate of the wage curve for the Czech Republic (based on the methodology in Galuščák and Münich, 2005a) in 1994–2001 was published in last year's Alignment Analyses. The analysis found that wages in the Czech economy are dependent on regional, and especially short-term, unemployment, and the elasticity coefficient is similar to that found by Blanchflower and Oswald (1994) for a number of advanced and transition countries. Recently, however, wage flexibility seems to have decreased somewhat, probably due to increasing long-term unemployment.

⁸⁸ The response of businesses in the form of a wage freeze rather than a wage decline is assessed as a sign of downward inflexibility of wages. However, a wage freeze can be both destabilising and stabilising. If the economic conditions result in a need to reduce nominal wages, a nominal wage freeze can imply the need to adjust through employment. In a different situation, though, a nominal wage freeze amid non-zero (and changing over time) inflation can lead to a decline in real wages and thus to a desirable adjustment to productivity and other macroeconomic variables.

area countries.⁸⁹ The highest real wage inflexibility was recorded by Slovenia (21.5%), while the lowest was recorded by Poland (6.7%).

**Table 34: Downward inflexibility of nominal and real wages:
Proportion of businesses recording inflexibility in 2002–2006**

	nominal wages	real wages
CZ	0.259	0.113
AT	0.089	0.119
PT	0.151	0.083
HU	0.064	0.117
PL	0.096	0.067
SI	0.033	0.215

Source: Babecký et al. (2008).

2.2.3 Inflation persistence

The ability of the economy to absorb shocks also depends on price flexibility. One of the ways of examining price flexibility is to analyse inflation persistence (inertia), i.e. the speed at which inflation returns to equilibrium after a shock. It can be said that high inflation persistence signals price inflexibility (Coricelli and Horváth, 2009). Substantial local differences in inflation persistence in the countries of a monetary union may also imply different impacts of the single monetary policy. According to Angeloni and Ehrmann (2004), the differences in inflation observed among individual euro area countries can be largely explained by different inflation persistence.

Inflation persistence is measured by three different methods. The first, non-parametric, method (Method 1) uses a procedure proposed by Marques (2004), according to which the longer it takes actual inflation to return to its mean value, the more rigid is the inflation. This indicator takes values between 0 and 1. The closer the values are to one, the more persistent is inflation.

The second and third methods are based on a model of inflation as an autoregressive process, monitoring the sum of the coefficients of the autoregressive terms. Method 2 assumes a constant mean value of inflation. Marques (2004) and Cecchetti and Debelle (2006) showed that the results of modelling inflation persistence are largely dependent on the assumption regarding the mean to which inflation converges. If the inflation time series contains structural breaks, which the model process does not allow for, the inflation persistence estimate is typically biased upwards. Because of the transformation process, accompanied by price convergence, gradual price deregulation and changes in monetary policy, it is the time series of transition countries that are mainly affected by breaks in the mean values of inflation. Method 3 therefore models the autoregressive process with the assumption that the mean value of inflation changes over time. The values of persistence indicators in Methods 2 and 3 increase with inflation persistence.

⁸⁹ According to CNB analyses, real wages deflated by headline inflation are generally counter-cyclical in the Czech Republic, i.e. real wages grow more slowly/quickly at times of fast/low economic growth. This relationship is disturbed at some times by the impacts of administrative changes on inflation. However, the counter-cyclical nature of real wages seems to be largely due to fluctuations of the exchange rate, to which economic growth and inflation respond faster than nominal wages. When real wages are deflated by domestic production prices only, they are generally pro-cyclical (i.e. real wages grow faster at the peak of the business cycle and *vice versa*), which suggests some degree of real wage flexibility.

Table 35 shows the inflation persistence indicators for 1997 Q1–2008 Q2. Under Method 1, inflation exhibits one of the lowest levels of persistence in the Czech Republic in comparison with the other countries surveyed. Although a decline in persistence was recorded relative to the assessment carried out in 2007, last year's calculation was based on monthly, not quarterly, data and so the results are not fully comparable. Estimates under Method 2 indicate a relatively low level of inflation persistence in the Czech Republic, comparable to that in Slovakia, Portugal or the EA-13. Method 3 assesses inflation persistence in the Czech Republic as the lowest among the group of countries tested. As this method takes into account the transition nature of the Czech economy in the most appropriate way, it can be given the greatest weight when interpreting the results in the Table.

Table 35: Inflation persistence estimates^a

	Method 1	Method 2	Method 3
CZ	0.79	0.83	0.32
AT	0.74	0.92	0.71
DE	0.77	0.98	0.97
PT	0.82	0.78	0.43
HU	0.79	0.91	0.84
PL	0.85	0.97	0.52
SI	0.90	0.95	0.66
SK	0.85	0.80	0.42
EA-13 ^b	0.77	0.86	0.84

Notes: a) Method 1 – non-parametric technique. Method 2 – sum of autoregression coefficients, constant mean assumed. Method 3 – sum of autoregression coefficients, time-varying mean assumed.
b) The estimates for the EA are not directly comparable with the estimates for individual countries owing to the aggregation bias described in Cecchetti and Debelle (2006).

Sources: Eurostat, CNB calculations.

2.3 Labour market flexibility

Labour market adjustment is a significant equilibrating process which, like wage and price adjustment, will increase in importance after euro area entry. Changes in employment, as well as wage adjustment, may dampen the negative impacts of asymmetric shocks. Labour market flexibility is defined by labour force flexibility and institutional factors.

2.3.1 Unemployment and internal labour market flexibility

An insufficiently flexible labour market is generally associated with higher long-term unemployment and significant regional differences in the unemployment rate. While long-term unemployment suggests a high structural component of unemployment, regional differences in unemployment may be due to low regional mobility of labour.

Table 36 illustrates the evolution of the **long-term unemployment** rate in the countries under review. In the late 1990s, this indicator increased substantially in the Czech Republic. By contrast, the long-term unemployment rate declined in 2006 and 2007, to 2.8% in 2007. This indicator is still higher than in Austria (the lowest level) and Slovenia. The long-term unemployment rate is higher in the other countries under comparison than in the Czech Republic. In particular, it is very high in Slovakia. The long-term unemployment rate is declining in all the countries under review except Hungary, Austria and Portugal. Similar conclusions can be drawn from the data on the long-term unemployed as a proportion of total unemployment (see Table 37). The long-term unemployed still accounted for more than 50% in 2007. The absence of a noticeable decline in the proportion of the long-term unemployed

up to 2007 supports the assumption that the decline in the long-term unemployment rate was due mainly to increasing demand for labour associated with high economic growth, i.e. by cyclical factors. This proportion fell slightly during 2008, probably in connection with a tightening of the conditions for entitlement to social benefits.

Table 36: Long-term unemployment rate (%)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	2.0	3.2	4.2	4.2	3.7	3.8	4.2	4.2	3.9	2.8
AT	1.3	1.2	1.0	0.9	1.1	1.1	1.3	1.3	1.3	1.2
DE	4.7	4.2	3.8	3.8	4.0	4.6	5.5	5.7	5.5	4.7
PT	2.1	1.7	1.7	1.5	1.7	2.2	2.9	3.7	3.8	3.8
HU	4.2	3.3	3.1	2.6	2.5	2.4	2.7	3.2	3.4	3.4
PL	4.7	5.8	7.4	9.2	10.9	11.0	10.3	10.3	7.8	4.9
SI	3.3	3.3	4.1	3.7	3.5	3.5	3.3	3.1	2.9	2.2
SK	6.5	7.8	10.3	11.3	12.2	11.4	11.8	11.7	10.2	8.3

Note: Shares of persons unemployed for 12 months or more under ILO methodology in the labour force.

Source: Eurostat.

Table 37: Shares of the long-term unemployed (%)

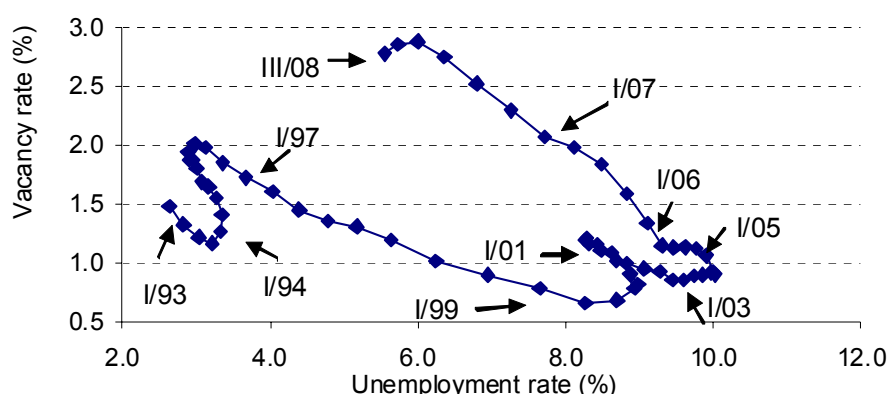
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	31	37	49	52	50	49	51	53	54	52
AT	30	30	28	24	27	26	28	25	27	27
DE	51	51	51	50	48	50	56	53	56	57
PT	43	39	42	38	35	35	44	48	50	47
HU	50	48	48	45	43	41	44	45	45	47
PL	47	43	46	50	55	56	54	58	56	51
SI	45	45	61	60	56	53	52	47	49	46
SK	52	48	55	59	65	65	65	72	76	74

Note: Shares of long-term unemployed (12 months or more) in all the unemployed under ILO methodology.

Source: Eurostat.

The differences between cyclical and **structural unemployment** can be observed by means of the Beveridge curve, which expresses the dependence between vacancies and unemployment. Decreasing (increasing) unemployment amid a rising (falling) number of vacancies is associated with changes in the cyclical component of unemployment, whereas simultaneous movements of unemployment and vacancies in the same direction signal changes in structural unemployment. The Beveridge curve for the Czech Republic (see Chart 26) shows that cyclical unemployment has been decreasing since around mid-2004, with the rate of decline of cyclical unemployment increasing since 2006. This reflects demand for labour. It is also clear that the labour market in the Czech Republic suffers from the phenomenon of hysteresis, where a period of economic recession is accompanied by a rise in structural unemployment, manifesting itself in an increase in long-term unemployment. This occurred, for example, in 1999–2000 and 2003–2004. The increase in long-term unemployment in these periods is apparent in the data given in Tables 36 and 37. The developments in 2008 Q2 and Q3 suggest a change in the Beveridge curve and a shift towards the origin. The simultaneous decreases in the number of vacancies and unemployment indicate a decrease in structural unemployment.

Chart 26: Beveridge curve



Note: Seasonally adjusted quarterly data.

Sources: Ministry of Labour and Social Affairs, CNB calculations.

Regional differences in unemployment can be quantified using a coefficient of variation for areas (NUTS 2) and regions (NUTS 3). Table 38 shows that the regional differences in the unemployment rate in the Czech Republic compared to the other countries were the highest in 2006, and remained broadly unchanged from a year earlier.⁹⁰ The regional differences in unemployment in the Czech Republic declined slightly in 2007.^{91, 92}

Table 38: Coefficient of variation of the unemployment rate (%)

	NUTS 2 regions										NUTS 3 regions							
	1999	2000	2001	2002	2003	2004	2005	2006	2007	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	33	39	39	44	42	42	46	45	42	42	47	48	52	47	47	50	50	47
AT	29	33	36	43	42	41	40	44	.	31	36	39	44	43	42	41	45	.
DE	49	59	65	57	48	47	41	40	.	.	.	67	60	51	50	45	45	.
PT	31	31	29	31	30	25	22	21	.	37	36	35	36	35	33	30	29	.
HU	35	32	30	32	33	28	27	32	.	37	36	34	36	37	32	30	36	.
PL	23	19	18	17	16	16	15	12	.	38	40	37	29	28	26	25	24	.
SK	27	27	24	23	27	31	37	38	.	31	29	28	31	36	37	42	43	.

Note: Ratios of the standard deviation weighted by region size to the average unemployment rate (%). Labour Force Survey data. The coefficients of variation depend on the degree of disaggregation.

Sources: Eurostat, CNB calculations (CZ, 2007).

⁹⁰ The increase in regional differences in 2005 seems to have been related to renewed demand for labour, manifesting itself in a marked decline in unemployment particularly in regions with lower unemployment. Unemployment in districts with prevailing lower unemployment varies significantly over the business cycle as compared to regions with prevailing high unemployment. The coefficient of variation is therefore cyclical in nature.

⁹¹ The generally empirically observed cyclicity of the coefficient of variation would suggest that its recent decline amid buoyant economic growth may imply a positive effect of the measures taken on the structural component of unemployment. However, the definitive conclusion of a structural improvement is contradicted by the trend between 2007 Q4 and 2008 Q2, when the coefficient increased again. According to the Ministry of Labour and Social Affairs' monthly data on registered unemployment, the coefficient of variation has been declining since the start of 2008.

⁹² Much of the regional differences in unemployment are explained by differences in the education of the workforce (OECD, 2000; Jurajda and Terrell, 2006). According to OECD (2005), in addition to demographic factors, regional differences in unemployment are affected by demand for labour, initial sector specialisation and housing policy (rent regulation, support for private ownership; see also OECD, 2006). Regions with higher unemployment also have a lower participation rate. According to OECD (2008a), this suggests potential labour force reserves, especially of women on maternity and parental leave and younger and older persons.

The large regional differences in unemployment in the Czech Republic may be due to low regional mobility. Although **internal mobility** (see Table 39) is greater in the Czech Republic than in Slovakia, Poland and Slovenia, it is lower than in Austria and Germany. This indicator increased slightly for the Czech Republic in 2006 and 2007.⁹³

Table 39: Internal migration (per 1,000 inhabitants)

	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	19.6	19.4	19.9	21.8	20.7	21.2	20.9	22.0	24.9
AT	33.1	32.3	34.9	43.1	44.1	35.0	35.6	36.1	.
DE	48.4	.	47.1	46.7	46.1	45.3	44.3	43.2	.
HU	20.8	22.4	21.2	22.8	23.9	21.6	22.0	25.1	.
PL	11.2	10.2	9.6	10.6	11.3	11.3	11.1	12.4	.
SI	15.4	15.0	15.6	17.5	14.0	15.1	16.1	19.2	.
SK	14.6	14.3	14.8	16.7	15.7	15.8	16.2	17.0	.

Note: Changes in permanent residence; SI – Slovenian nationals only.

Source: Statistical yearbooks, Eurostat, CNB calculations.

2.3.2 International labour mobility

According to the theory of optimum currency areas, international labour mobility can be an important channel for the economy's ability to absorb asymmetric shocks, in particular those of a long-term nature, through changes in labour supply.

2.3.2.1. Migration abroad

The degree of international mobility can be assessed by means of the number of immigrants and emigrants (see Table 40). The data on recorded mobility show that the **number of immigrants** coming to the Czech Republic was significantly higher in 2007 than in 2006 and higher than in Germany, Portugal, Hungary, Poland and Slovakia. International mobility as expressed by the number of immigrants is higher only in Austria and Slovenia. The increase in the number of immigrants to the Czech Republic since 2005 seems to be due mainly to demand for labour, as the **number of emigrants** from the Czech Republic declined sharply in 2007, unlike the number of immigrants. Compared to the Czech Republic, the numbers of emigrants are higher in Austria, Germany, Portugal and Slovenia.

International mobility is also evidenced by the data on the **proportion of foreigners in the population** (see Table 41). The share of foreigners in the population in the Czech Republic is similar to that in Slovenia and higher than that in Hungary, Poland and Slovakia. Austria and Germany have considerably higher shares of foreigners in their populations. Compared to previous years, there was an increase in the share of foreigners in the population and in the labour force in the Czech Republic in 2006 and 2007, owing to significant increases in the number of employed foreigners.

⁹³ Fidrmuc (2004) examines the level to which migration responds to idiosyncratic shocks. It is clear from the results for the Czech Republic, Hungary, Poland and Slovakia that the impact of migration in terms of reducing regional differences in unemployment is limited in these countries. While prosperous regions have relatively high numbers of emigrants and immigrants, less advanced regions have a comparatively immobile population. According to a World Bank report (World Bank 2006), young people and people with higher education move more frequently. This may widen the regional gaps. Important reasons for moving include family reasons, housing, standard of living and traditions, while economic motives, according to the report, have only a limited effect on moving (see also Erbenová, 1997, and Fidrmuc, 2005). Commuting to work is more significant in terms of smoothing regional differences in the above countries, and has been increasing in recent years.

Table 40: Immigration and emigration (number of persons per 10,000 inhabitants)

	Immigration				Emigration			
	2001	2005	2006	2007	2001	2005	2006	2007
CZ	12.6	58.9	66.4	101.1	21.0	23.5	32.6	19.8
AT	111.8	143.1	121.9	128.6	90.3	83.4	88.7	89.2
DE	106.8	85.8	80.3	.	73.6	76.2	77.6	77.2
PT	18.5	46.6	26.2	43.6	.	10.2	12.0	25.3
HU	20.8	.	21.4	.	2.5	.	3.6	.
PL	1.7	2.5	2.8	3.9	6.1	5.8	12.3	9.3
SI	39.2	75.2	99.7	149.7	24.2	43.0	68.5	79.7
SK	3.8	17.5	23.4	16.0	1.9	5.2	5.7	3.4

Source: Eurostat, CZSO, statistical yearbooks, CNB calculations.

Table 41: Shares of foreign nationals in the population (%)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CZ	2.0	2.1	2.2	1.8	1.6	1.8	1.9	1.9	2.5	2.9
AT	9.3	9.4	9.5	9.5	9.1	9.3	9.4	9.6	9.8	9.9
DE	9.0	8.9	8.9	8.9	8.9	8.9	8.9	8.8	8.8	8.8
PT	1.7	1.8	1.9	2.0	2.2	2.3	.	.	2.6	4.1
HU	1.4	1.5	1.5	1.1	1.1	1.1	1.3	1.4	1.6	1.7
PL	.	.	.	.	1.8	.	.	.	1.8	0.1
SI	2.1	1.7	2.1	2.1	.	2.2	2.3	2.2	2.4	2.7
SK	.	.	.	.	.	0.6	0.6	0.4	0.5	0.6

Source: Eurostat, CNB calculations.

At the end of April 2008, 262,700 foreign workers were registered in the Czech Republic.⁹⁴ Most of these were Slovaks (39%), followed by Ukrainians (26%) and Poles (9%).⁹⁵ The number of foreign workers has been increasing very rapidly since the beginning of 2005, with 43,800, 33,300 and 55,200 newcomers recorded in 2005, 2006 and 2007 respectively. The main factor of foreign employment in the Czech Republic is so far probably growing demand for labour. Accession to the EU in 2004 and the related relaxation of conditions for foreign employees had only a limited effect.⁹⁶

Foreign workers are employed in the Czech Republic mainly in manufacturing, construction, real estate and renting, and wholesale and retail trade (see Chart 27). These industries are reporting the highest growth in the number of foreign workers. Foreign workers find employment in jobs requiring lower skills (see Chart 28), the largest increases being recorded

⁹⁴ Data from labour offices on the numbers of workers subject to the recording obligation and on the numbers of workers who require a work permit.

⁹⁵ The share of Slovaks in foreign employment in the Czech Republic is declining, while the share of nationals of other states is increasing. In addition to Slovaks, Ukrainians and Poles, the other large groups of employees include Vietnamese, Mongolians, Bulgarians and Romanians (data as of April 2008).

⁹⁶ Since May 2004, EU nationals have been able to work in the Czech Republic without restrictions (Slovak nationals did not require a work permit even prior to EU accession). However, the numbers of foreign workers began to increase more significantly only in 2005. The numbers of foreign workers in the Czech Republic since 1996, when data on foreign employment began to be available, correlate very closely with economic activity as measured by GDP growth. The extraordinary increase in foreign workers in 2005–2007 is probably related primarily to the high GDP growth and a related increase in demand for labour.

for plant and machine operators, workers in elementary occupations and craft and related trades workers.⁹⁷

Chart 27: Foreign employees in the Czech Republic by industry (thousands of persons)

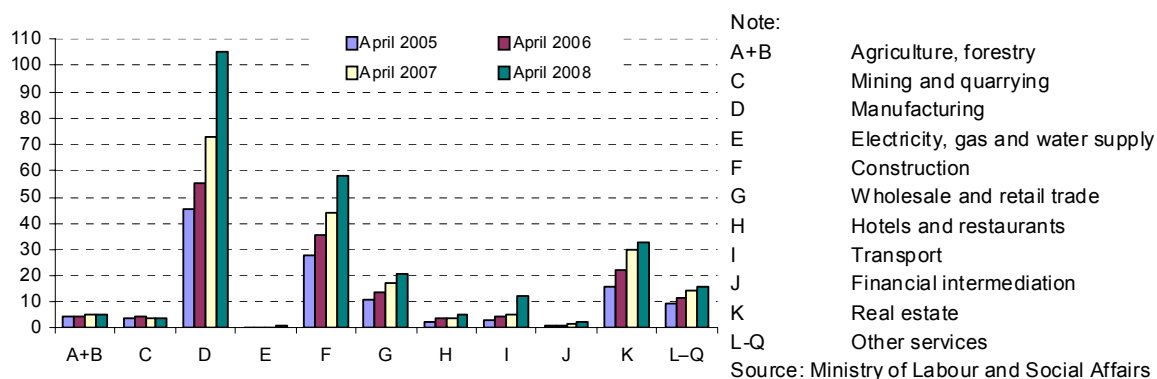
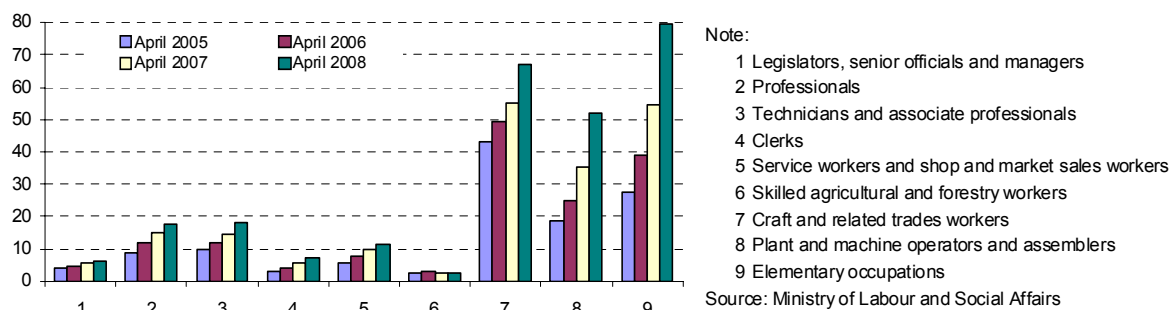


Chart 28: Foreign employees in the Czech Republic by profession (thousands of persons)



A supplementary view of **employment of foreigners** is provided by an analysis of anonymised individual data from the Average Earnings Information System.⁹⁸ The data in Table 42 show that the proportion of foreign employees is particularly high among employees with primary education and in the age category of under 25 years, which in 2006 exceeded 10% for both males and females. The share of foreigners in employment is also high for persons with primary education aged 26 to 45 and for persons with tertiary education aged under 25. The same demographic groups also recorded the highest increases compared to 2002.⁹⁹ The inflow of foreign employees is concentrated mainly in younger age groups. In addition to persons with primary education, there is a significant increase in the employment of foreigners with university education.¹⁰⁰

⁹⁷ This is particularly apparent for Ukrainian nationals. Slovaks, in addition to these jobs, find employment in skilled jobs, presumably due to the lack of a language barrier.

⁹⁸ See the *Methodological Part*.

⁹⁹ An alternative procedure based on the set of the same businesses in 2002 and 2006 leads to similar results as in Table 42.

¹⁰⁰ Foreign employees with university education can to some extent include foreigners who complete their studies and find jobs in the Czech Republic.

Table 42: Shares of foreigners and changes in the employment structure 2002–2006

	Males			Females			Total
	≤ 25 years	26–45 years	≥ 46 years	≤ 25 years	26–45 years	≥ 46 years	
Primary education							
2006 share (%)	10.4	7.6	3.4	10.1	6.3	3.2	5.7
2006 share - 2002 share (p.p.)	7.2	5.5	2.4	6.1	4.0	2.1	4.0
Secondary education							
2006 share (%)	4.2	2.4	1.4	5.1	1.4	1.1	2.4
2006 share - 2002 share (p.p.)	3.0	1.3	0.9	3.8	0.7	0.5	1.6
Tertiary education							
2006 share (%)	8.0	3.6	1.4	5.9	3.0	1.6	3.9
2006 share - 2002 share (p.p.)	5.6	2.6	0.5	3.4	1.8	0.9	2.6

Note: Shares of foreigners in employees in 2006 (%) and changes in share compared to 2002 (p.p.). Weighted data.

Source: Dybczak and Galuščák (2008).

Earnings of foreign employees were significantly lower in 2006 than those of domestic workers (see Chart 29, red line) along the entire wage distribution, except for the best paid males, where wages of foreigners are slightly higher, probably because of the shortage of high-skilled workers on the labour market (for example, higher salaries of foreign senior managers). Chart 29 breaks down the wage differences between foreign and domestic workers (red line) in deciles into the contribution of observed characteristics (to what extent the wage difference is due to differences in age, education, tenure, occupation and sector) and the contribution of returns to characteristics (to what extent the wage difference is due to differences in rewards for the given characteristics). The decomposition of the wage differences shows that the differences in rewards between foreign and domestic workers in 2006 were due mainly to different observed characteristics. A negative contribution of returns, indicating possible discrimination compared to domestic workers, can be seen in the first two deciles of the wage distribution for males and females. By contrast, in the case of the best paid males, part of the positive wage difference is explained by a positive contribution of different returns, signalling positive discrimination linked probably with the shortage of high-skilled workers on the labour market.¹⁰¹

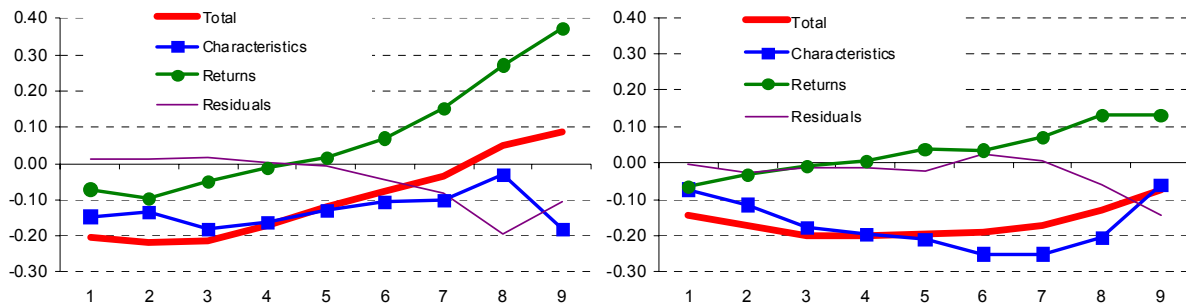
The inflow of foreign employees has so far had a negligible impact on wage growth as measured by changes in the wage distribution in 2002–2006. Chart 30 shows the difference in wages in the individual deciles of the wage distribution between 2002 and 2006 (red line).¹⁰² It is clear from the decomposition of wage differences into the contributions of characteristics and returns of domestic and foreign workers that the increase in the real wage in 2002–2006 was due to growing returns to the observed characteristics of domestic workers. The increase in wages in higher deciles of the wage distribution is partly due to the observed characteristics of domestic workers, probably mainly those with higher education. The contributions of the characteristics and coefficients of foreigners to wage growth in 2002–2006 were negligible, mainly because of their still low share in total employees.¹⁰³

¹⁰¹ The decomposition of wage differences into the contributions of characteristics and returns is not residual-free. The two highest deciles show a significant negative residual, which may suggest bias in the estimated returns and, therefore, greater uncertainty in the given decomposition. Given the shortage of skilled workers on the labour market, the planned introduction of a “green card” scheme is a useful measure.

¹⁰² Chart 30 shows differences in real wages, as the data on wages in 2002 were reweighted to the 2006 price level.

¹⁰³ The contributions of the characteristics and returns of foreigners are expressed in Chart 30 as differences in relation to the characteristics and returns of domestic workers.

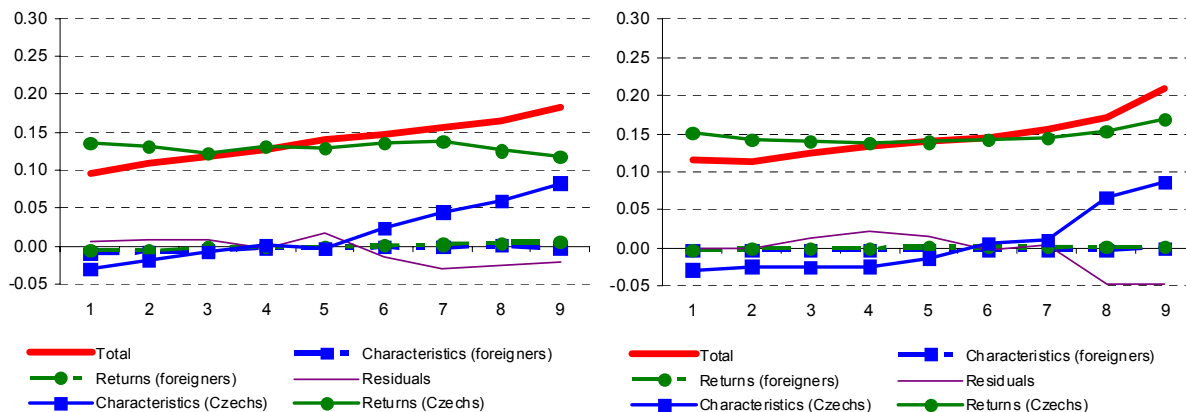
Chart 29: Breakdown of the wage difference between foreign and domestic workers for males (left-hand side) and females (right-hand side) in 2006



Note: Differences in the logarithm of wages of foreigners (vertical axis) in deciles of the wage distribution (horizontal axis). Deciles denote wage distribution points; for example, the fifth decile is the median. Decomposition of the overall wage difference into the contributions of characteristics (age, education, tenure, profession, sector) and returns to characteristics (differences in rewards for the given characteristics).

Source: Dybczak and Galuščák (2008).

Chart 30: Breakdown of the wage difference between foreign and domestic workers for males (left-hand side) and females (right-hand side) between 2002 and 2006



Note: Differences in the logarithm of wages between 2002 and 2006 (vertical axis) in deciles of the wage distribution (horizontal axis). Deciles denote wage distribution points; for example, the fifth decile is the median. Decomposition of the overall wage difference into the contributions of characteristics (age, education, tenure, profession, sector) and returns to characteristics (differences in rewards for the given characteristics) for foreign and domestic workers. The contributions of the characteristics and returns of foreigners are expressed as differences in relation to the characteristics and coefficients of domestic workers.

Source: Dybczak and Galuščák (2008).

To sum up, then, according to the data on recorded mobility, international mobility in the Czech Republic is lower than in Austria and Slovenia. It is also lower than in Germany and Portugal in terms of the number of emigrants.¹⁰⁴ An inflow of foreign employees is observed in younger age groups. In addition to persons with primary education, there is a significant increase in employed foreigners with university education. Earnings of foreign employees are lower than those of domestic workers, mainly because of different characteristics such as age,

¹⁰⁴ According to MLSA (2008), however, the number of Czech nationals working in EU/EEA countries and Switzerland more than doubled in 2005–2007. According to the available data, 76,400 Czech nationals were working in 20 European countries last year.

education, tenure, profession and sector.¹⁰⁵ The high growth in foreign employment in the Czech Republic since 2005 is due to increasing demand for labour and can be viewed as evidence of an ability to adjust. However, this trend is probably linked with the other rigidities on the Czech labour market, causing demand for labour of workers with lower skills not to be met from domestic sources (see section 2.3.1). Moreover, the mobility of the foreign labour force may itself pose some risk to the supply of labour in the country, as movements of foreign workers are affected by other factors in addition to demand (potential earnings, language barriers, geographical distance, etc.). Unexpected changes in foreign employment flows may thus occur despite unchanged domestic conditions.

2.3.2.2 Administrative restrictions on international labour mobility

The free movement of persons, including workers, is one of the four fundamental economic freedoms enshrined in the EU Treaty (Articles 39 to 42). However, during the negotiations on EU enlargement, on 1 May 2004 most of the “old” Member States adopted **transitional restrictions on the free movement of workers from the new countries**. These transitional restrictions are stipulated in Annex V to the Act of Accession. Their adoption gives the new Member States the right to apply reciprocal measures. This right has not yet been exercised by the Czech Republic.¹⁰⁶

Of the twelve old euro area countries, only Ireland opened its labour market to workers from the new Member States as of 1 May 2004 (when ten new Member States joined the EU).¹⁰⁷ Other euro area countries applied a two-year transition period to workers from the new Member States, during which a work permit was necessary to employ them. During 2006, the above transition period was cancelled in Finland, Italy, Portugal, Greece and Spain, and the labour markets in Belgium, France and the Netherlands were partially liberalised in 2006. On 1 May 2007, the Netherlands lifted all restrictions. Luxembourg has not applied the transition period since 1 November 2007, while France cancelled its transition period on 1 July 2008 (although the restrictions still apply to Bulgaria and Romania). Specific circumstances relating to individual countries that have extended their transition periods and in the new member countries under review are provided in more detail in Table 43. If serious labour market disturbances occur, these specific measures may be applied until the end of a seven-year period after accession. As of 1 May 2011, all EU Member States must introduce free movement of labour for all citizens of the countries which acceded to the EU on 1 May 2004. Given that the Czech Republic cannot realistically adopt the euro until after 2011, the relevance of these administrative restrictions to labour mobility for the period after euro adoption essentially disappears.

Table 43: Persisting administrative barriers for the new EU members

Country	Current situation	Outlook
Austria	A transition period applies until 30 April 2009 to workers from the new Member States under review. A quota known as the “Bundeshöchstzahl” is set in Austria, stipulating that the percentage of foreigners employed	Austria has notified the European Commission of its intent to keep the transition period until 30 April 2009.

¹⁰⁵ A sign of negative discrimination is observed in the lowest two deciles of the wage distribution, where, in addition to the observed characteristics, the lower returns to characteristics may be due to a negative wage difference.

¹⁰⁶ The position of the Czech government is included in its resolution No. 13 of 7 January 2004.

¹⁰⁷ However, job applicants from the new Member States are not entitled to draw any social benefits.

may not exceed 8% of the entire Austrian labour force. The individual federal states then set quotas known as “Landeshöchstzahlen” A list of professions for which access to the labour market has been simplified was issued on 1 January 2008.

Belgium	A transition period applies until 30 April 2009 to workers from the new Member States under review. Workers from the new Member States surveyed may receive a one-year work permit. The work permit is applied for by the employer. As from 30 April 2006, issuance of permits was simplified for professions in demand.	If certain conditions are fulfilled, all restrictions might be lifted before 30 April 2009.
Germany	A transition period applies until 30 April 2009 to workers from the new Member States under review. The situation of job applicants from the Czech Republic and Slovakia is facilitated somewhat by the bilateral agreements which have been concluded. These include an agreement on procedures relating to employment in Germany for a period of up to three months during one year, an agreement on mutual employment of Czech, Slovak and German citizens for the purpose of extending their professional and language skills, and an agreement on the secondment of Czech and Slovak workers from companies with registered offices in the Czech and Slovak Republics on the basis of work performance contracts. As from 1 November 2007, issuance of permits was simplified for some professions.	Germany has notified the European Commission of its intent to keep the transition period until 30 April 2009. However, it has been partially liberalised.
Czech Republic	No restrictions apply to workers from the countries under review or from other euro area countries.	
Hungary	A transition period applies to those euro area countries which do likewise.	
Poland	No restrictions apply to workers from the countries under review or from other euro area countries.	
Slovakia	No restrictions apply to workers from the countries under review or from other euro area countries.	
Slovenia	No restrictions apply to workers from the countries under review or from other euro area countries.	

2.3.3 Institutional environment

The institutional environment has a fundamental influence on the labour market. Economic adjustment may be limited by the relationship between wages and labour productivity, strict employment protection measures, or a social system which fails to sufficiently motivate unemployed people to seek jobs.

Trade unions and collective bargaining

In the economy, wages represent price signals which influence the allocation of production resources. Wage-setting at the company level with regard to corporate labour productivity is an important prerequisite for wage flexibility. If industry-level (generally higher-level) collective bargaining plays a significant role, it may weaken the link to labour productivity

and lead to a higher wage level and higher unemployment (Calmfors and Driffill, 1988).¹⁰⁸ If industry-level bargaining predominates, it may result in lower wage flexibility. The negative impact of industry-level bargaining can be intensified by regulations extending the binding effect of collective pay agreements beyond the contractual parties (Brandt, Burniaux and Duval, 2005).

Collective bargaining coverage amounts to 51% in the Czech Republic. It is slightly higher in manufacturing (56%), while standing at 39% in trade (see Table 44). Collective bargaining coverage in the Czech Republic is higher than in Hungary and Poland, and is around 10 percentage points lower than in Germany. Full, or almost full, coverage of employees by collective agreements is recorded in Austria and Slovenia.¹⁰⁹

Table 44: Coverage of employees by collective agreements in 2006 (%)

	CZ	AT	DE	PT	HU	PL	SI
Total	51	98	62	61	19	27	100
Manufacturing	56	99	63	65	21	28	100
Construction	49	98		67	15	24	100
Trade	39	100		57	14	16	100
Market services	49	94	61	57	20	33	100

Note: Coverage by corporate or higher-level collective agreements in businesses with 20 employees or more. Weighted estimates for manufacturing, construction, trade and market services excluding financial intermediation. The total figures are for the sectors listed in the table (DE: only manufacturing and market services excluding financial intermediation).

Source: CNB calculations from the ECB's harmonised survey.

The practice of extending the binding effect of higher-level collective agreements is not applied very widely in the Czech Republic. An analysis of Labour Force Survey data reveals that extended higher-level collective agreements do not cover significantly more than 10% of employees (August 2008). Compared to 2007, the applicability was also extended administratively in agriculture.¹¹⁰

Wage flexibility in the Czech Republic is not fundamentally limited by wage setting except in the non-business sector, where wages are set at the central level with a weak link to labour productivity.

¹⁰⁸ While some studies confirm this hypothesis, Flanagan (1999) argues that in the case of an open economy, a high degree of economic integration or a large non-trade union organised sector, the given macroeconomic variables can be more or less independent of the collective bargaining structure.

¹⁰⁹ Although these survey data suffer from a sampling error, independent estimates of the degree of coverage provide very similar figures. According to an estimate by Trexima, the collective agreement coverage in businesses of the whole business sector with ten employees or more amounted to 53% in 2007 (data from the Average Earnings Information System). Similarly, using a similar sample of businesses, Jurajda (2005) estimated that the coverage of employees in the business sector by collective agreements was more than 50% in the Czech Republic at the start of 2004. The same source states that the coverage was more than 70% taking into account the extension of the binding effect of higher-level collective agreements, and that more than 80% of corporations with 250 employees or more were highly likely to have a collective agreement. Comparing firms in the same industry and size categories, Jurajda finds no major differences in wage levels, except for highly skilled personnel, whose wages seem to be lower in firms with a collective agreement.

¹¹⁰ Provisions regarding the extension of the binding effect of higher-level collective agreements are included in the Collective Bargaining Act. The legislation in force since July 2005 defines all employers in the given sector to which the binding effect of collective agreements should be extended. The extension of the binding effect of higher-level agreements does not apply to businesses employing less than 20 people, businesses employing more than 50% disabled people or businesses subject to another higher-level collective agreement.

Minimum wage

The administrative setting of the minimum wage reduces wage differentiation and wage flexibility at the low end of the wage scale. If the minimum wage is relatively high, it may reduce demand for less-skilled labour and for graduates and thereby increase the total and long-term unemployment of people with low skills and unemployment among graduates and school-leavers (OECD, 1998, Gregg, 2000).

In the Czech Republic, the **minimum wage** as a percentage of the average wage was relatively low in the 1990s. This indicator rose continuously between 1999 and 2006, reaching 38.1% in 2007 (see Table 45). The minimum wage as a percentage of the average wage in the Czech Republic is higher than in Hungary and Poland, but lower than in Portugal, Slovenia and Slovakia.¹¹¹ As in Hungary, this indicator declined somewhat in the Czech Republic compared to 2006.¹¹² By contrast, the minimum wage ratio rose significantly in Slovakia compared to 2006. In Hungary and Poland, the minimum wage is paid to about the same proportion of employees as in the Czech Republic (see Table 46). Portugal and Slovenia have a greater share of employees on the minimum wage compared to the Czech Republic. The effect of the minimum wage on the flexibility of low wages and creation of low-skilled jobs is thus probably lower in the Czech Republic than in the two countries above.

Table 45: Minimum wage (%)

	2002	2003	2004	2005	2006	2007
CZ	36.9	38.1	38.4	39.1	39.7	38.1
PT	43.0	40.7	40.0	40.5	40.7	41.6
HU	42.1	38.6	40.7	38.2	39.6	35.4
PL	33.0	33.9	35.1	33.7	36.1	.
SI	45.3	46.3	44.1	45.6	46.6	44.2
SK	32.4	34.0	34.1	34.4	34.8	46.6

Note: Monthly minimum wage as a percentage of the average wage in industry and services (excluding public administration).

Source: Eurostat.

Table 46: Shares of employees earning the minimum wage (%)

	2000	2001	2002	2003	2004	2005	2006	2007
CZ	1.6	1.7	2.0	2.0	2.0	2.0	2.3	2.2
PT	6.2	4.0	4.0	5.7	5.3	4.7	4.2	5.5
HU	3.9	8.4	11.4	8.1	8.0	8.0	7.8	2.2
PL	.	2.9	4.0	.	4.5	2.9	2.3	.
SI	2.0	2.6	2.6	2.7	2.0	2.8	2.5	3.4
SK	.	0.2	0.1	0.4	1.9	1.7	1.9	1.6

Note: Percentage of full-time employees earning the minimum wage.

Source: Eurostat.

The minimum wage's negative impact on wage flexibility can be more pronounced in some sectors and professions. The minimum wage as a percentage of the wage in the first decile of the wage distribution is high in low-skilled professions (see Table 47). This relation indicates that for 10% of persons employed in the service and shop workers profession and in elementary occupations, the minimum wage made up almost 90% of their earnings in 2007.

¹¹¹ No minimum wage has been defined at the national level in Austria and Germany.

¹¹² This ratio is likely to decline further in 2008, since the minimum wage remains the same as in 2007 (CZK 8,000).

Compared to the previous year, a decline in the minimum wage ratio can be observed here as well, although this is negligible for workers in elementary occupations.

Table 47: Minimum wage and gross monthly wage in selected professions (%)

Main employment class	Minimum wage / 1st decile				
	2003	2004	2005	2006	2007
Total for the Czech Republic – business sector	63.9	66.1	68.0	69.6	66.6
Services and shop workers	87.6	89.2	90.1	89.8	86.8
Skilled agricultural and fishery workers	74.4	74.3	76.3	75.0	69.6
Elementary occupations	84.3	86.3	89.1	90.1	89.5

Note: The table only lists the three professions with the highest figures in 2007.

Source: Average Earnings Information System (Ministry of Labour and Social Affairs), CNB calculations.

Employment protection

Strict **conditions for the recruitment and dismissal of employees** reduce flows on the labour market and increase long-term unemployment (OECD, 2004).¹¹³ The high costs of dismissing individual employees (in particular during the period shortly after conclusion of the employment contract, once the probationary period has expired) result in lower job creation, especially for graduates and young people. The combination of the high costs of dismissing permanent employees and low regulation of temporary work strengthens the position of permanent employees relative to temporary workers, whose chance of gaining permanent employment is thus lower.

According to OECD data, the conditions for the dismissal of individual employees were stricter in the Czech Republic in 2006 than in the countries under comparison except for Portugal (see Table 48).¹¹⁴ In the Czech Republic, the cost of dismissing employees is relatively high, especially with regard to short-term contracts (see Chart 31).¹¹⁵ This institutional setup may adversely affect job creation and long-term unemployment in the Czech Republic.

¹¹³ Bassanini and Duval (2006) confirm the conclusions of other papers that employment protection, as measured by the EPL index (see Table 48), has no clear impact on the overall employment rate. Higher EPL values, however, adversely affect the entry of young people onto the labour market. A higher EPL index, according to these authors, is also associated with substitution of part-time contracts with full-time contracts for women.

¹¹⁴ The comparison uses the currently available data for 2006. The CNB's analysis shows that protection of permanent employment changed only very little in connection with the new Labour Code in 2007. See more in the text.

¹¹⁵ For the Czech Republic, the costs of dismissing employees represent an equivalent of 124 days of the wage for all the three periods of employment shown in the chart. It is an average of 150 days (i.e. two months of notice and three months of the severance pay) for redundancy dismissals and 60 days of the wage for the other cases (two months of notice), to which 19 days are added, covering the necessary period for serving the notice to the employee and the start of the running of the period of notice.

Table 48: Employment protection legislation (EPL) index^a

	Permanent employment ^b		Temporary employment ^c		Collective dismissals ^d		Overall index ^e	
	2003	2006	2003	2006	2003	2006	2003	2006
CZ	3.3	3.3	0.5	1.1	2.1	2.1	1.9	2.2
AT	2.4	2.4	1.5	1.5	3.3	3.3	2.2	2.2
DE	2.7	2.7	1.8	1.8	3.8	3.8	2.5	2.5
PT	4.2	4.2	2.8	2.8	3.6	2.9	3.5	3.4
HU	1.9	1.9	1.1	1.1	2.9	2.9	1.7	1.7
PL	2.2	2.2	1.3	1.8	4.1	4.1	2.1	2.3
SK	2.8	2.8	0.4	0.4	2.5	2.5	1.7	1.7

Notes: a) The indices take values ranging from 1 to 6, a higher value meaning greater employment protection.

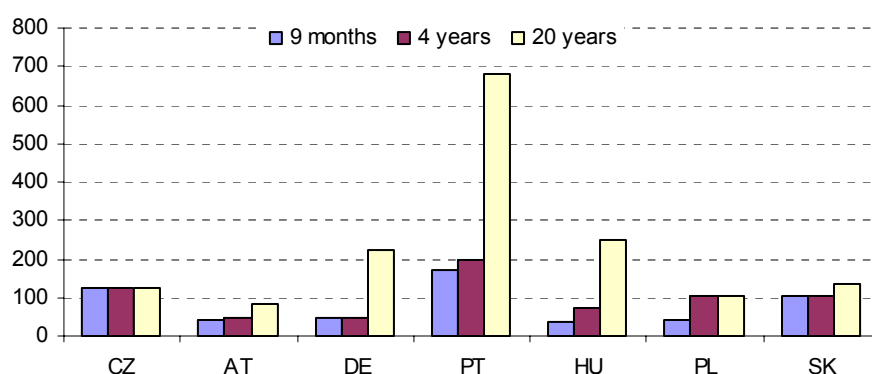
b) protection against individual dismissal

c) fixed-term contracts, temporary work agencies

d) over and above individual dismissals

e) weighted average of indicators of permanent employment, temporary employment and collective dismissals.

Sources: OECD, CNB calculations for CZ and SK (for SK permanent employment only).

Chart 31: Costs of individual termination of an open-ended contract by employment contract duration in 2006 (number of days for which wage is paid)

Note: Sum of data for days of notice, severance pay and delay to start of notice. CZ, SK: average for notice due to redundancy and other cases; AT: average for higher and lower skilled persons.

Sources: OECD, CNB calculations.

A very low index for the protection of temporary employment combined with high protection of permanent employment in the Czech Republic (see Table 48) suggests the risk of labour market duality, where temporary workers have only a small chance of gaining permanent employment. With respect to collective dismissals of employees (above the level of individual dismissals), the Czech Republic applies the lowest restrictions by comparison with the countries under review. In terms of the aggregate index of employment protection, which is a weighted average of the three foregoing components, the Czech Republic ranked among the countries with average labour market regulation in 2006 as compared to the sampled countries.¹¹⁶ However, one should take into account that there is a disparate intensity of

¹¹⁶ European labour markets are generally rather inflexible, so the benchmark offers a rather low standard in this case.

protection of permanent and temporary jobs behind the average figure, which may result in the above issue of labour market duality.

Under the new Labour Code, effective from January 2007, conditions for the dismissal of employees remained practically unchanged. The notice period for redundancy is reduced from three to two months, while severance payment is increased from two to three monthly salaries. The draft does not even grade these conditions according to the duration of employment. The analysis of this and other factors in the new legislation shows that the permanent employment protection index declined only slightly, from 3.3 in 2006 to 3.2.¹¹⁷ The temporary employment index and the index of conditions for collective dismissals are the same as in 2006. These figures hold for 2008, too, since no other measures have been taken that affect the employment protection index.¹¹⁸ Thus, the adverse impact of permanent employment protection on job creation and long-term unemployment is still higher than in the countries under comparison except for Portugal.

Labour taxation

Labour taxation directly affects labour costs and job creation, in particular those for people with low skills and for specific groups, such as women, school-leavers and older people. Moreover, high labour taxation increases the proportion of entrepreneurs in the labour force and the size of the grey economy (Brandt et al., 2005). Higher taxation of labour may have more pronounced effects on unemployment growth in the case of a high minimum wage (Bassanini and Duval, 2006).¹¹⁹ The taxation of people with high incomes is important in conditions of international competition, as people with high skills and high incomes have a greater propensity to migrate.

Overall labour taxation¹²⁰ in the Czech Republic in 2007 was similar to that in Poland and lower than in Austria, Germany and Hungary (see Table 49). Taxation of labour at the average wage level in the Czech Republic was higher than in Portugal and Slovakia. Taxation of low-income earners in the Czech Republic in 2007 was comparable to that in Poland and lower than in Austria, Germany and Hungary. Lower labour taxation than in the Czech Republic is applied in Portugal and Slovakia.

¹¹⁷ The difficulty in dismissing employees has decreased slightly since January 2007, as employers, in the case of redundancy dismissals, are no longer required to consider the option of transferring employees to another job or retraining them.

¹¹⁸ Minor revisions to the Labour Code were passed in the second half of 2007, but these do not affect the employment protection index.

¹¹⁹ Higher taxation cannot be shifted onto employees in this case.

¹²⁰ Overall labour taxation (the “tax wedge”) is defined as social security contributions paid by employees and employers and income taxes relative to overall labour costs. The data on labour taxation in Table 49 are calculated in line with the applicable tax legislation for a model household.

Table 49: Overall labour taxation

	100% of average wage				67% of average wage			
	2000	2006	2007	Change*	2000	2006	2007	Change*
CZ	42.7	42.6	42.9	0.2	41.4	40.1	40.5	-0.9
AT	47.3	48.3	48.5	1.2	43.2	43.7	44.1	0.9
DE	54.0	53.3	52.2	-1.8	48.6	48.4	47.4	-1.2
PT	37.3	37.4	37.4	0.1	33.2	32.6	32.6	-0.6
HU	54.6	51.9	54.4	-0.2	51.4	43.3	45.9	-5.5
PL	43.1	43.7	42.8	-0.3	42.0	42.5	41.6	-0.4
SK	41.7	38.5	38.5	-3.2	40.5	35.5	35.6	-4.9

Note: Income tax and social security contributions paid by employees and employers as a percentage of total labour costs. Data for employees (individuals without children) earning 100% (left-hand part of the table) and 67% (right-hand part of the table) of the average wage.* Differences in percentage points for 2000–2007.

Sources: OECD (2008b), CNB calculations.

The real tax burden in terms of aggregate tax revenues as a percentage of a potential tax base is described by **implicit tax rates** (see Table 50). In 2006, this indicator was the highest in the Czech Republic and Austria of all the selected countries. A slightly lower implicit tax rate was recorded by Germany and Hungary, while a significantly lower implicit tax rate was recorded in Portugal, Poland, Slovenia and Slovakia. Between 1998 and 2006, this indicator showed a decline in Germany, Hungary and Poland and a slight fall in Slovenia, while remaining broadly flat in the Czech Republic and increasing in Austria and Portugal. The data in Chart 32 show that in all the selected countries health and social insurance affects the implicit tax rate to a greater extent than income tax. Of all the selected countries, the highest insurance from labour income is paid in the Czech Republic.

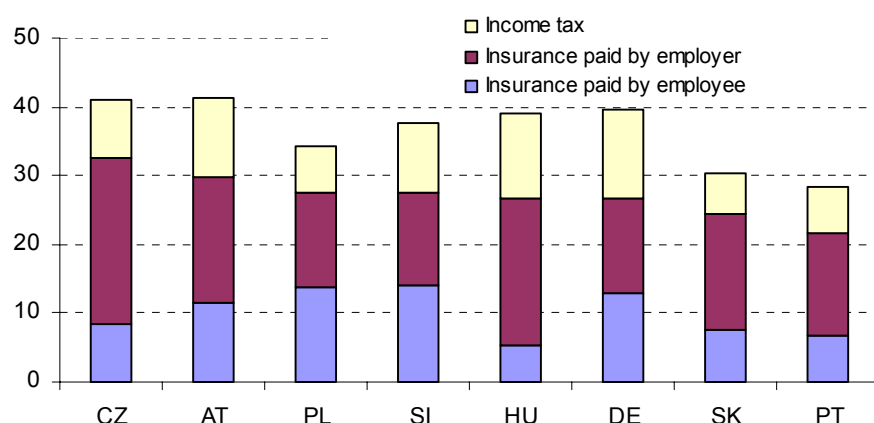
Table 50: The implicit labour taxation rate (%)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Change (p.p.)
CZ	40.7	40.5	40.7	40.3	41.2	41.4	41.8	41.7	41.0	0.3
AT	40.5	40.6	40.2	40.7	40.8	40.9	41.1	41.0	41.2	0.8
DE	40.6	40.4	40.7	40.5	40.4	40.3	39.1	38.6	39.6	-1.0
PT	26.2	26.5	27.0	27.4	27.6	27.8	27.9	28.4	28.5	2.3
HU	42.9	42.7	41.8	41.0	40.6	38.8	37.7	37.8	39.0	-3.8
PL	35.6	35.8	33.6	33.2	32.4	32.7	32.7	33.1	34.4	-1.3
SI	37.7	38.4	37.7	37.5	37.7	37.8	37.5	37.5	37.6	-0.2
SK	38.0	37.4	36.3	37.1	37.0	36.3	34.3	32.9	30.3	-7.7

Note: The implicit taxation rate describes aggregate tax revenues as a percentage of a potential tax base. Changes in p.p. for the period shown in the table.

Source: Eurostat (2008).

Chart 32: Components of the implicit labour taxation rate in 2006 (%)



Note: Decomposition of implicit taxation rate into income tax and contributions paid by employee and employer. The countries are listed in diminishing order of total insurance.

Source: Eurostat (2008).

Given the above data, it can be assumed that the impact of labour taxation on job creation and long-term unemployment is broadly the same as in Austria, Germany and Hungary, but higher than in Portugal, Poland, Slovenia and Slovakia. Labour taxation remained broadly unchanged in 2000–2006, with the exception of 2006, when it declined slightly in low-income categories. Labour taxation is broadly flat in the Czech Republic and has recorded more significant declines in Hungary (until 2005) and Slovakia. Of the countries under comparison, the Czech Republic has the highest insurance from labour income.

Work-incentive indicators

Net replacement rates measure the extent to which the combination of taxes and benefits affects the financial gain from work and thereby the motivation of unemployed or inactive persons to enter employment. The indicator is defined as the ratio of net household income when the person under consideration is jobless to that when the same person has a job. Table 51 compares the net replacement rates for short-term and long-term unemployment and for two types of households.

Table 51: Net replacement rates^a

	Initial stages of unemployment ^b						Long-term unemployment ^c					
	Individuals without children			Family (2 children) ^d			Individuals without children			Family (2 children) ^d		
	2001	2005	2006	2001	2005	2006	2001	2005	2006	2001	2005	2006
CZ	59	56	59	65	57	59	53	45	42	92	76	74
AT	55	55	55	73	72	75	55	51	51	88	79	80
DE	60	60	63	81	78	82	57	48	48	81	79	79
PT	78	77	77	76	85	89	24	26	27	72	78	79
HU	58	52	71	61	66	77	28	25	31	54	60	77
PL	72	74	98	67	69	81	43	42	41	62	62	61
SK	67	61	59	76	57	56	75	26	28	122	52	53

Note: a) The ratio of the net household income when the breadwinner is unemployed and employed (data in %). Income from employment of the breadwinner at 67% of the average wage.

b) Unemployed persons entitled to unemployment benefits, excluding social assistance benefits.

c) Unemployed persons after five years.

d) The other adult is economically inactive, children of 4 and 6 years of age.

Source: OECD tax benefit models.

Data on short-term unemployment show that the incentive to accept employment in the Czech Republic is higher than, or similar to, the levels in the other countries under review. In particular, short-term unemployed people in Portugal and Poland and, in the case of families with children, also in the other countries except Slovakia are less motivated to seek employment than those in the Czech Republic. The financial reasons for seeking a job are less strong in the Czech Republic than in Slovakia and Poland among the long-term unemployed. Long-term unemployed people, however, have a greater incentive to seek work than in Austria and Germany. The reduction of the tax burden on low-income persons in the Czech Republic introduced in January 2006 had a negligible impact on net replacement rates. The net replacement rates for long-term unemployed people from households with an economically inactive partner and children declined slightly from 76% in 2005 to 74% in 2006. The tax and benefit system probably contributes to pushing these persons into inactivity and the grey economy.¹²¹

The changes in the social benefit system introduced in January 2007 further deepened these structural problems on the labour market. Although the new social benefit structure financially disadvantages households with no employment income, the newly defined housing benefit causes distortions (Galuščák and Pavel, 2007; OECD, 2008a). The simulation in Galuščák and Pavel (2007) shows that, compared to 2006, the financial incentive to seek a job has declined in households with children compared to 2006, but has changed less significantly for other types of households. The sharp rise in parental allowance may weaken the incentive of non-working parents to seek work, thereby further exacerbating the loss of their job skills.¹²²

Although the reform of taxes and benefits introduced in January 2008 halted the adverse trends in incentives to seek a job, it did not generate any significant reduction of the structural problems on the labour market (Chart 33).¹²³ The removal of the link between the level of some benefits and the subsistence level and the removal of automatic indexation of the subsistence level reduce the risk of increasing mandatory state budget expenditures. On the other hand, it is clear that the minor changes to the parameters of some benefits do not remove the distortions in the incentives to seek a job. In particular, housing benefit remains problematic. It is even higher than in 2007 owing to an increase in normative housing expenses. Net household income is lower than last year for households that draw the reduced family allowance of CZK 3,800. The income of such households is partly made up by higher housing benefit, especially in the case of low-income households and households of the unemployed.¹²⁴

The lower tax burden in 2008 compared to a year earlier increases the net income of those households which can apply tax discounts for a non-working wife or for children. The

¹²¹ The data in Table 51 do not fully capture the potential partial improvement in the incentive to seek employment connected with the coming into force of the Employment Act in October 2004 and other follow-up measures, which lay down stricter eligibility conditions for unemployment benefit and registering with labour offices.

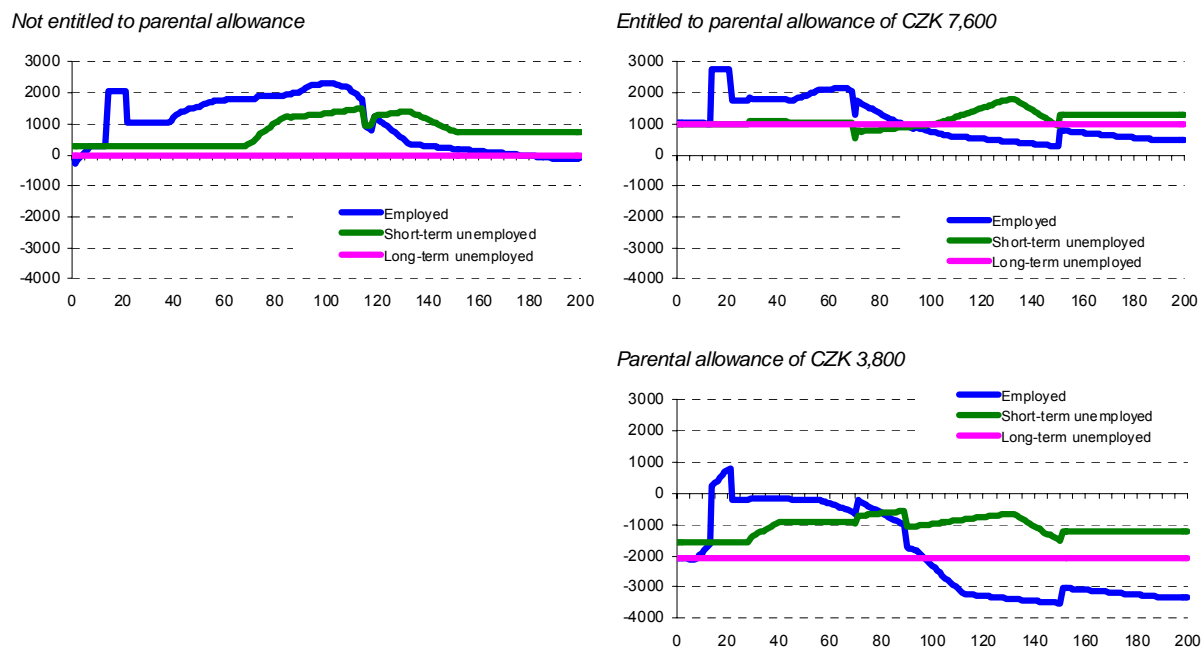
¹²² Independently conducted simulations in IMF (2008) show that the marginal effective tax rates increased for low-income households.

¹²³ Although income tax was reduced, the net replacement rates are mainly affected by insurance and social benefit entitlements (Carone and Salomäki, 2005; see also *Labour taxation*).

¹²⁴ Stricter conditions for entitlement to benefits, which are attached to a lower subsistence level in the case of the long-term unemployed who show insufficient job-seeking activity, have had a positive impact on the incentive to seek a job since January 2008.

increase in net income due to lower income tax is less apparent in the case of households with children which applied joint taxation in previous years.¹²⁵

Chart 33: Change in the net income of households with a non-working partner in 2008 compared to 2007 (CZK)



Note: Changes in the net income of households in relation to the wages of the employed or the potential wages of the unemployed (in % of the average wage, horizontal axis). Short-term unemployed entitled to unemployment benefits. Households with a non-working partner and two children aged 6 and 4 (left-hand side) and 4 and 2 (right-hand side).

Sources: CNB calculations, methodology taken from Galuščák and Pavel (2007).

2.4 Product market flexibility

2.4.1 Administrative barriers to entrepreneurship

High costs and barriers as regards business start-ups and complicated administrative regulations governing entrepreneurship reduce competitive pressures, productivity and thus flexibility on product markets. In the long run, this also has a negative impact on job creation and employment (Nicoletti and Scarpetta, 2004). According to Bassanini and Duval (2006), regulation on product markets increases overall unemployment.

An OECD index is used for international comparison of the above-mentioned administrative barriers to entrepreneurship (Conway, Janod and Nicoletti, 2005). Although the latest available data for this index relate to 2003, they are a useful base for comparison. In 2003, the administrative barriers to entrepreneurship were higher in the Czech Republic than in all the countries under comparison except Poland (Table 52, last column). The overall index in the

¹²⁵ Bičáková et al. (2008) estimate the response of the labour supply to a change in income using individual data from Mikrocensus 2002. The wage elasticity of the labour supply is low by international comparison, and is even lower if the changes in income are adjusted for taxes and include social benefits. According to the authors, this indicates work disincentives in the welfare system. The sensitivity of the labour supply is higher for women and those with lower incomes.

Czech Republic was almost unchanged from 1998, but fell significantly in Germany, Portugal and Poland. By international comparison, the regulatory and administrative opacity in the Czech Republic was relatively high in 2003, especially in the area of licences and permits.

Table 52: Index of administrative barriers to entrepreneurship^a

	Administrative burdens on startups ^b		Regulatory and administrative opacity ^c		Barriers to competition ^d		Barriers to entrepreneurship, total	
	1998	2003	1998	2003	1998	2003	1998	2003
CZ	2.2	2.3	2.7	2.3	0.6	0.5	2.0	1.9
AT	2.6	2.8	0.6	0.4	1.0	0.8	1.7	1.6
DE	2.4	1.6	2.6	2.2	0.4	0.5	2.0	1.6
PT	2.1	1.7	1.8	1.2	1.0	0.5	1.8	1.3
HU	2.4	2.3	0.4	0.4	1.5	1.1	1.6	1.4
PL	3.8	3.7	2.0	1.5	1.6	0.3	2.8	2.3
SK	.	1.9	.	0.7	.	0.3	.	1.2

Note: a) Indices ranging between 1 and 6, a higher value indicating higher barriers. The aggregate index is a weighted sum of indicators in seven basic areas, which are grouped into the three areas shown in the table.

b) Administrative burdens for corporations, administrative burdens for sole proprietors (natural persons), sector specific administrative burdens.

c) Licences and permits system, government communication strategy and simplification of rules and procedures.

d) Legal barriers to entry into the industry, antitrust exemptions for public enterprises.

Source: Conway et al. (2005).

An amended Commercial Code took effect in July 2005, simplifying and accelerating corporate registration. This makes it easier to establish businesses and is likely to decrease the index in the area of regulatory and administrative opacity, where the Czech Republic recorded the highest value of all the countries under comparison in 2003. A further relaxation, which should be reflected in a decrease in the index for the above area, resulted from the amendment of the Trades Licensing Act in August 2006, thanks to the introduction of central registration points to facilitate incorporation of businesses.¹²⁶ The amendment also decreased business start-up costs by cutting the number of required documents. The digitisation of the Commercial Register as of January 2007 was another step towards lowering the administrative barriers.

An amended Trades Licensing Act took effect in July 2008, reducing the costs of starting up and carrying on trades. Trade certificates and licences have been replaced by an extract from the Register of Trades and the extract issuance period has been shortened. In addition, the charges for issuing certificates have been reduced and the local competence of trade licensing offices has been cancelled. The system of trades has been made more transparent and simplified. The administrative environment in the Czech Republic has thus partially improved, and this, in turn, has reduced its potential adverse impact on labour market flexibility in the job creation area.

World Bank data on business conditions confirm that Czech Republic's world ranking as regards the conditions for starting a business improved in 2008 (see Table 53). Relative to the other countries included in the Doing Business database, the Czech Republic is in 86th place in 2008. Of the countries under review, Portugal, Hungary, Slovenia and Slovakia have better conditions for starting a business than the Czech Republic, while Austria, Germany and

¹²⁶ Communication with authorities and institutions has been also streamlined by the introduction and expansion of "assisted points for the execution of public administration" (Czech POINT – the Czech national terminal for submissions, verifications and information).

Poland have worse conditions. As regards closing a business, the Czech Republic has the worst ranking among the countries under comparison, down by two places from 2007.¹²⁷

Table 53: Conditions for starting and closing a business

	Starting a business		Closing a business	
	2007	2008	2007	2008
CZ	93	86	111	113
AT	83	104	21	20
DE	75	102	31	33
PT	40	34	20	21
HU	72	27	56	55
PL	134	145	91	82
SI	124	41	37	38
SK	76	48	39	37

Note: Country rankings as the conditions for starting and closing a business. Starting a business: number of procedures, time (days), cost and minimum capital requirements in % of income per capita. Closing a business: time (years), cost in % of total assets and recovery rate in cents on the dollar.

Source: World Bank (2008).

2.4.2 Tax burden on businesses

The tax burden on businesses significantly affects product market flexibility. Given the high international mobility of capital, the taxation rate can be one of the deciding factors for investment allocation. The corporate tax rate is assessed by means of the statutory corporate income tax rate and the implicit tax rate.

The Czech Republic applies a **corporate income tax rate** of 21% in 2008 (see Table 54). Higher tax rates are recorded in Austria, Germany, Portugal, Hungary and Slovenia. Businesses in Poland and Slovakia are exposed to lower tax burdens in terms of statutory tax rates. Corporate income tax rates are declining sharply in the countries under comparison, except for Hungary and Slovenia, which had the lowest tax burdens on average throughout the period under review.

Table 54: Highest statutory corporate income tax rates (%)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Change (p.p.)
CZ	35.0	35.0	31.0	31.0	31.0	31.0	28.0	26.0	24.0	24.0	21.0	-14.0
AT	34.0	34.0	34.0	34.0	34.0	34.0	34.0	25.0	25.0	25.0	25.0	-9.0
DE	56.0	51.6	51.6	38.3	38.3	39.6	38.3	38.7	38.7	38.7	29.8	-26.2
PT	37.4	37.4	35.2	35.2	33.0	33.0	27.5	27.5	27.5	26.5	26.5	-10.9
HU	19.6	19.6	19.6	19.6	19.6	19.6	17.6	17.5	17.5	21.3	21.3	1.7
PL	36.0	34.0	30.0	28.0	28.0	27.0	19.0	19.0	19.0	19.0	19.0	-17.0
SI	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	23.0	22.0	-3.0
SK	40.0	40.0	29.0	29.0	25.0	25.0	19.0	19.0	19.0	19.0	19.0	-21.0

Note: Changes in p.p. for the period shown in the table.

Source: Eurostat (2008).

The tax rates are simple indicators of the taxation rate. However, the tax burden is also determined by the tax base, which is affected by depreciation, amortisation and tax exemptions. The **implicit tax rates**, defined as aggregate corporate income tax revenues as percentage of the potential tax base, are thus a complementary indicator of the tax rate (see

¹²⁷ The data on the country rankings in 2007 were recalculated owing to changes in methodology and the selection of countries. Rankings for previous years are not available. Only partial data from which the country rankings were derived are published.

Table 55). The implicit tax rate in the Czech Republic was somewhat lower than the statutory one. It declined between 2004 and 2006 in line with the statutory rate. In 2006, the implicit taxation rate was higher in the Czech Republic than in Austria, Portugal, Poland and Slovakia.¹²⁸

Table 55: Implicit corporate income taxation rates (%)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Change (p.p.)
CZ	28.0	30.1	26.2	28.3	30.3	32.0	29.8	25.1	23.4	-4.7
AT	26.8	25.2	24.7	33.5	26.1	23.3	23.4	21.8	21.6	-5.2
PT	20.1	21.5	25.5	22.7	22.4	19.2	19.2	18.9	.	-1.2
PL	42.7	42.7	37.7	37.9	39.2	22.6	18.7	22.4	.	-20.3
SK	41.5	37.3	30.3	25.2	27.0	28.6	22.2	21.6	18.4	-23.1

Note: The implicit taxation rate expresses aggregate tax revenues as a percentage of the potential tax base. Changes in p.p. for the period shown in the table.

Source: Eurostat (2008).

2.4.3 Costs associated with exit from the sector

The conditions for closing loss-making entrepreneurial projects significantly affect the existence of competition and the effective allocation of economic resources and thus have an important impact on product market flexibility. Insolvency law is a standard part of the legal systems of all standard economies. The Czech Republic passed Act No. 328/1991 coll., on Bankruptcy and Composition, in 1991. This Act was subsequently frequently amended and on 1 January 2008 was replaced by Act No 182/2006 Coll., on Insolvency and the Methods of its Resolution (Insolvency Act). The new Act should foster faster, more transparent, more effective and more legally certain relationships between debtors and creditors. Moreover, it introduced the possibility of personal bankruptcy for private individuals.

The number of bankruptcies in the corporate sector has been rising continuously since 2004. 2007 saw an extraordinary 19% annual increase in the number of bankruptcy petitions (see Table 56). The new Insolvency Act, which entered into force on 1 January 2008, may lead to even greater incentives to file bankruptcy petitions on the part of both debtors and creditors. The Czech Republic thus showed an opposite trend than Western European countries, which recorded a significant, albeit slowing decline in corporate insolvency (a fall of 5% in 2007 compared to a decline of 12.3% in 2006).¹²⁹ Preliminary figures for 2008 suggest a stagnation in corporate bankruptcies in Western Europe.

Table 56: Number of insolvencies in the Czech Republic

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of bankruptcy petitions	4306	4339	4650	4036	4002	3918	3643	3882	4227	5015
Bankruptcy petitions settled	2418	2964	4087	4539	4429	4639	4778	4870	5106	5386
Insolvency proceedings opened	2022	2000	2491	2473	2155	1728	1441	1236	1245	1115
Insolvency proceedings in progress	8087	9706	10560	10537	10217	9744	8876	8135	7456	7256

Source: Ministry of Justice of the Czech Republic

The new Insolvency Act in force since 2008 also introduces the possibility of bankruptcy for Czech households. The experience to date shows a gradual increase in the number of bankruptcies as people obtain information and are able to prove all the necessary aspects required by law for approval of the discharge process. The newly introduced insolvency

¹²⁸ Data on the implicit taxation of corporate income are not available for Germany, Hungary and Slovenia.

¹²⁹ Due to data availability, the sample of countries under comparison in this analysis differs from that in the other parts of the document (see the *Methodological Part*).

register, administered together with the database of bankrupts by the Ministry of Justice of the Czech Republic, should positively affect risk assessment by creditors. Based on data from the register, the courts approved 135 bankruptcies in the first three months after the amendment took effect. An idea of the future trend can be obtained from the data on the annual numbers of personal bankruptcies per 10,000 people in Germany (15) and Austria (9), where the numbers are much higher.¹³⁰

The introduction of the new Insolvency Act signifies an improvement in the position of both creditors and debtors and fosters greater transparency and efficiency, which should, in turn, bolster the stability of the financial system in the Czech Republic.

2.5 Flexibility and shock-absorbing capacity of the banking sector

The capacity of the financial sector to absorb shocks depends, among other things, on its performance and stability. While a profitable and sound financial sector may be effective in helping to eliminate the impact of economic shocks, unsound financial institutions may increase the unfavourable effects of negative shocks.¹³¹ The following analyses will concentrate on the banking sector, which has the greatest weight in the financial sector in the countries surveyed.

Recent years have seen qualitative improvements in banking credit portfolios in the Czech Republic. In addition to better loan repayment, however, the dilution of bad loans by greater new lending may have been a hidden factor underlying the improvement in portfolio quality. As of the end of 2007, the Czech banking sector recorded its best ever **loan portfolio quality**, better in quality than the Polish and German banking sectors (see Table 57).

Table 27: Non-performing loans/total loans in the banking sector (%)

	2000	2001	2002	2003	2004	2005	2006	2007 ^a
CZ ^b	19.9	13.7	8.9	4.8	4.0	3.9	3.7	2.8
AT	2.9	3.1	3.9	3.7	3.3	2.6	2.1	2.4
DE	4.7	4.6	5.0	5.3	5.1	4.8	4.0	.
PT	2.2	2.1	2.3	2.4	2.0	1.6	1.2	1.3
HU	2.5	2.7	3.1	2.7	2.7	2.5	2.5	2.4
PL	14.9	17.8	21.1	21.2	14.9	11.0	7.2	5.2
SI	5.2	7.0	7.0	6.5	5.5	4.8	4.1	1.8
SK	21.7	22.0	11.2	9.2	7.2	5.6	3.3	2.8
EA-13 ^c	3.3	4.1	3.3	3.4	3.1	3.0	2.1	.

Notes: a) Preliminary data.

b) Data for the Czech Republic exclude Konsolidační banka and banks under conservatorship.

c) Simple average. Weighted average for EA-12 up to 2005.

Sources: CNB, national central banks. Unconsolidated data.

The capital adequacy ratio of the Czech banking sector, at an average of 11.5%,¹³² is above the required threshold of 8% and is at levels similar to those in the other countries under review (see Table 45).¹³³ This indicator thus testifies to sufficient coverage of potential risks as well as to the relatively less risky business activities of domestic banks, which include

¹³⁰ By contrast to corporate insolvency, personal bankruptcy has risen relatively fast in Western Europe in past years. A particularly large annual increase was recorded in 2006 (31.9%), whereas 2007 saw a slowdown (8.3%).

¹³¹ An unstable sector may also be a source of asymmetric shocks.

¹³² The ratio reached 12.4% in 2008 H1.

¹³³ The decreases in capital adequacy between 2004 and 2006 were mostly related to the use of retained profits for the payment of dividends and bonuses or to the repatriation of profits to the foreign owners of the banks.

trading in treasury bills and also, according to the banks' records, in mortgage loans to households. The ratio of non-performing loans to total household loans was low at 2.6%. However, their worse quality in the consumer credit segment may indicate a certain risk. The deterioration in conditions for exporters is also leading to growth in the share of non-performing loans.¹³⁴

Table 28: Capital adequacy of the banking sector (%)

	2000	2001	2002	2003	2004	2005	2006	2007 ^a
CZ ^b	14.9	15.4	14.2	14.5	12.6	11.9	11.4	11.5
AT ^c	10.6	11.5	11.3	12.1	11.9	11.5	11.6	12.1
DE ^c	11.7	12.0	12.7	13.4	13.2	12.2	11.9	11.7
PT ^c	9.2	9.5	9.8	10.0	10.4	11.3	11.8	11.0
HU ^b	13.7	13.9	13.0	11.8	12.4	11.6	11.0	10.8
PL ^b	12.9	15.0	14.2	13.8	15.5	14.5	13.1	11.9
SI ^b	13.5	11.9	11.9	11.5	11.8	10.5	10.8	10.6
SK ^b	2.4	13.4	21.3	21.6	18.7	14.8	13.0	12.8
EA-13 ^{c,d}	11.6	12.1	11.9	11.9	11.8	11.8	12.1	11.6

Notes: a) Preliminary data.
b) Unconsolidated data.
c) Consolidated data.
d) Simple average. Weighted average for EA-12 up to 2005.

Sources: CNB, national central banks.

The stability of the banking sector stems from the **prosperity of the banking business**. In recent years, it has been possible to attain a relatively stable net interest margin of around 2.4% in the Czech banking environment. This figure increased to 2.6% in 2007 (see Table 59). In an environment of increasing competition and modest growth in key rates since the end of 2005, interest rates on loans and deposits have risen gradually. However, they remained relatively low until the end of 2007. The availability of loans to households and prospering businesses was preserved. Stable or slightly increasing net interest margins were provided by higher interest rate spreads and profits on developed retail transactions with households. Compared to some of the selected new EU members, banks in the Czech Republic operate under tighter economic conditions – this is reflected in lower margins as well as lower operating expenses. The comparatively low margins also reflect the relatively low level of interest rates. A comparison of net non-interest income per unit of assets is shown in Table 60. This indicator shows values for the Czech banking sector in the last two years at higher levels than those for the euro area countries under comparison and, except for Slovakia, at lower levels than in the new member countries surveyed.

¹³⁴ In August 2008, 1.5% of housing loans and 6.5% of consumer credit were at risk of default. The share of non-performing loans in loans to non-financial corporations was 3.7%.

Table 29: Net interest margin (NIM, %)

	2000	2001	2002	2003	2004	2005	2006	2007 ^a
CZ ^b	2.53	2.47	2.35	2.26	2.36	2.37	2.51	2.61
AT ^{b,c}	1.20	1.21	1.23	1.17	1.09	0.98	0.90	0.87
DE ^{b,c}	1.14	1.12	1.20	1.16	1.18	1.17	1.15	1.12
PT ^{b,c,d}	2.25	2.31	2.21	2.04	2.00	1.86	1.89	1.85
HU ^b	4.00	4.05	4.19	3.96	4.00	3.92	3.60	3.25
PL ^b	4.26	3.38	3.39	3.13	3.24	3.30	3.26	3.40
SI ^b	4.41	3.37	3.41	3.05	2.70	2.42	2.19	2.30
SK ^d	1.85	2.28	2.69	2.91	2.85	2.15	2.42	2.34

Notes: a) Preliminary data.
b) Unconsolidated data.
c) The share of net interest in average total balance-sheet assets, in the case of Germany since 1999.
d) Consolidated data from 2005 onwards.

Sources: CNB, national central banks.

Table 30: Net non-interest income/average assets (%)

	2000	2001	2002	2003	2004	2005	2006	2007 ^a
CZ ^b	1.22	1.37	1.46	1.43	1.69	1.61	1.48	1.44
AT ^c	1.59	0.89	0.75	0.83	0.84	0.94	0.98	0.94
DE ^b	0.42	0.36	0.34	0.35	0.35	0.37	0.39	0.39
PT ^c	1.07	0.88	0.88	1.02	1.06	1.39	1.47	1.27
HU ^b	1.06	1.34	1.50	1.70	1.67	1.66	1.77	1.53
PL ^b	2.73	3.05	2.73	2.52	2.37	2.32	2.10	2.10
SI ^b	1.41	1.47	1.84	1.63	1.72	1.60	1.67	1.60
SK ^b	1.14	1.09	1.25	0.95	1.44	1.48	1.36	1.19
EA-13 ^{c,d}	1.07	0.84	0.90	1.11	0.82	0.96	1.10	1.06

Notes: a) Preliminary data.
b) Unconsolidated data.
c) Consolidated data. Net non-interest income/assets as at year-end.
d) Simple average. Weighted average for EA-12 up to 2005.

Sources: CNB, national central banks.

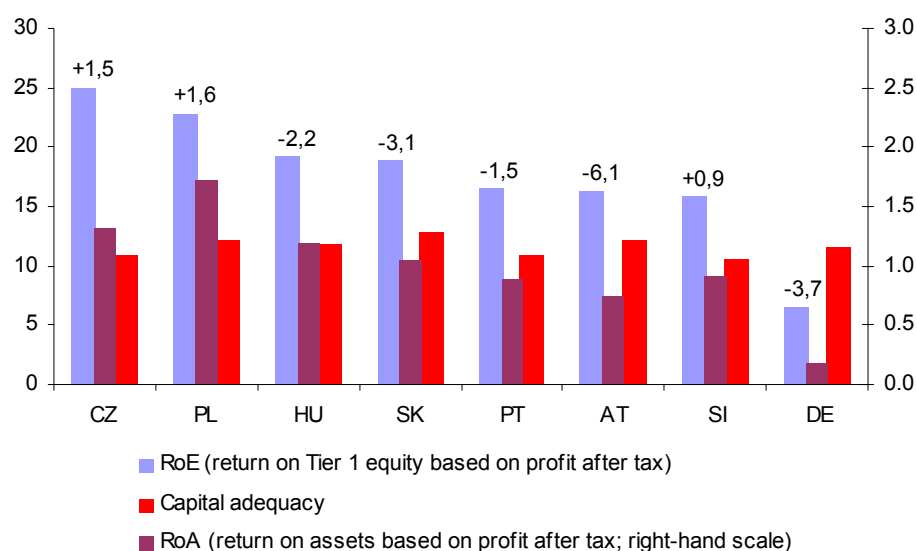
In recent years, the Czech banking sector has shown a high after-tax **return on assets**. This has been enabled chiefly by interest rate and fee policies, together with a smaller need of provisioning for risks undertaken. Except for Hungary, Poland and Slovenia, which posted higher returns on assets in 2007, the Czech banks in total showed greater returns than those in the other monitored countries, according to consolidated results. Compared to the euro area countries, they posted higher return on equity and return on assets. In 2007, the Polish banking sector came close to the Czech banking sector in terms of return on equity (see Table 61 and Chart 34).

Table 31: After-tax profit/bank assets (RoA, %)

	2000	2001	2002	2003	2004	2005	2006	2007 ^a
CZ ^b	0.56	0.93	1.59	1.64	1.76	1.76	1.23	1.31
AT ^c	1.39	1.25	0.53	0.60	0.96	0.65	0.94	0.75
DE ^b	0.29	0.20	0.15	0.03	0.14	0.44	0.29	0.18
PT ^c	1.05	0.96	0.78	0.89	0.84	1.03	1.01	0.89
HU ^b	1.31	1.58	1.68	1.86	2.34	2.40	1.43	1.20
PL ^b	1.51	1.36	0.82	0.95	1.57	1.96	1.56	1.72
SI ^b	1.14	0.45	1.11	1.00	1.06	1.00	0.89	0.91
SK ^b	0.54	1.02	1.16	1.17	1.15	1.05	1.27	1.04
EU-13 ^{c,d}	0.83	0.47	0.40	0.47	0.58	0.61	0.75	0.77

Notes: a) Preliminary data. From 2006 onwards, the RoA data for all countries are consolidated.
b) Unconsolidated data. Pre-tax profit/average bank assets up to the end of 2005.
c) Consolidated data. Pre-tax profit/assets as at year-end up to the end of 2005.
d) Simple average. Weighted average for EA-12 up to 2005.

Sources: CNB, national central banks.

Chart 26: Profitability and capital adequacy of banks in 2007 (%)

Notes: Consolidated data. The figures above RoE columns indicate year-on-year changes.

Sources: CNB, national central banks, ECB.

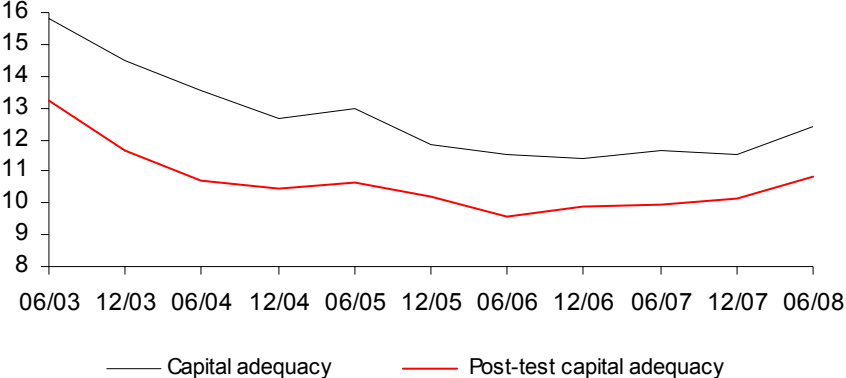
Return on equity is high in the Czech Republic. This is because banks have posted above-average earnings in recent years, reducing their ratios of operating expenses to net income on banking activities and making their operations more efficient overall. At the end of 2007, banks in the Czech Republic had the lowest ratio of operating expenses to net income in the EU-27.

Other entities in the Czech financial system, especially insurance companies, pension funds and open-end mutual funds, faced asset price declines in 2007 as a result of the financial market turbulence. Czech insurance companies and pension funds were able to cover their asset revaluation losses with provisions and capital and minimise their potential losses by holding most of their investments in debt instruments until maturity. Insurance company stability was fostered by very good solvency, and also by a high RoE of almost 22%. The value of pension fund client contributions rose by 2.7% on average in 2007.

Thanks to its high profitability in recent years, the financial sector – and especially the banking sector – has created sufficient capital to dampen potential external shocks and can be regarded as relatively resilient to adverse macroeconomic factors. **The results of standardised stress tests** indicate that the banking sector as a whole would withstand significant hypothetical shocks with a capital adequacy ratio of 10.1% with the end-2007 data and 10.8% with the end-2008 H1 data (see Chart 35).¹³⁵

The CNB’s Financial Stability Report (CNB, 2008) published in June 2008 described the results of stress tests with three adverse scenarios, drawing on projections of macroeconomic variables from the CNB forecast and models of the evolution of credit volume and credit risk. These scenarios reflected the possible development of the global credit crisis. According to these tests, the Czech banking sector showed good resilience to most shocks. However, the worst macroeconomic scenario (referred to as a “loss of confidence” in CNB, 2008), with marked adverse effects on interest rates, the exchange rate and GDP growth, would necessitate capital injections to maintain the capital adequacy of financial institutions at a sufficient level.

Chart 27: Stress test results for the Czech banking sector (capital adequacy, in %)



Source: CNB.

In the context of completed structural changes and the implementation of the Basel II principles, and following years of high profitability, the Czech banking sector has created suitable conditions for coping with potential economic shocks. During the ongoing global financial crisis, the Czech financial sector has so far shown the ability to withstand unfavourable developments. However, a further aggravation of problems abroad and a steeper decline in economic activity could have a more marked impact on the Czech financial system.

¹³⁵ This stress stemmed from the scenario of a hypothetical 2 percentage point rise in interest rates, a 20% depreciation of the exchange rate and a 3 percentage point rise in the ratio of non-performing loans to total loans.

3. SUMMARY OF RESULTS OF ANALYSES – COMPARISON WITH 2006 AND 2007 DOCUMENTS

Analysis	Method / Category	Section	Value 2006 ^o	Value 2007 ^a	Value 2008 ^b	Commentary
CYCLICAL AND STRUCTURAL ALIGNMENT						
Direct alignment indicators						
Real economic convergence	GDP per capita, PPP, EA-12=100	1.1.1	68.5	72.1	74.1 ^c	The Czech Republic continues to converge. Indicator above the levels of PT, HU, SK and PL.
	Price level of GDP, EA-12=100	1.1.1	55.0	57.8	59.8 ^c	Further convergence in 2007, but still lagging well behind AT, DE, PT and SI. Further quite sizeable upward shift in the relative price level expected in 2008.
	Real exchange rate against the euro, 1998=100	1.1.1	123	129	133	Real appreciation present (higher on average since 1998 than in all the countries compared except SK and HU).
	3M real interest rates	1.1.1	0.4	0.2	0.1	Together with HU by far the lowest level in 2007. Although low real interest rates are convenient for adoption of the euro, further real appreciation may lead to low or negative short-term money market rates in real terms.
Correlation coefficients of real economic activity (CZ and EA-12). 2006 value: 2001 Q1–2006 Q1 2007 value: 2002 Q1–2007 Q1 2007 value: 2002 Q1–2008 Q1	GDP (Method 1)	1.1.2	0.29	0.62	0.73	The correlation under Method 1 is statistically significantly different from zero and the coefficient is rising over time. However, the relationship may have been affected by the cycle in the euro area and the trend in the Czech Republic. Correlation coefficient comparable with PL and SK, higher than in HU and lower than in euro area countries compared.
	GDP (Method 2)	1.1.2	0.26	0.33	0.34	
	GDP (Method 1, dynamic correlation, average for cycle lengths considered)	1.1.2	0.33	0.7	0.8	
	IPI (Method 1)	1.1.2	0.77	0.77	0.74	The correlation is statistically significant; the value is comparable with or higher than in most countries compared except DE. Indicator describes only part of the economy.
	IPI (Method 2)	1.1.2	0.41	0.25	0.31	
	Method 1: year-on-year difference Method 2: quarter-on-quarter (or, month-on-month) difference	Total exports (Method 1)	1.1.2	0.64	0.63	0.63	Statistically significant correlation, unlike in last year's results confirmed by both methods.
Total exports (Method 2)		1.1.2	0	-0.04	0.36	
Czech exports to EA-12 vs. EA-12 GDP (Method 1)		1.1.2	0.42	0.38	0.38	Statistically significant relationship only according to Method 1.
Czech exports to EA-12 vs. EA-12 GDP (Method 2)		1.1.2	0.24	0.30	0.27	

Analysis	Method / Category	Section	Value 2006 ^o	Value 2007 ^a	Value 2008 ^b	Commentary
Synchronisation of demand shocks	Structural vector autoregression, correlation	1.1.3	asymmetry	asymmetry	asymmetry	Zero correlation of shocks, unchanged between the periods under review. Other countries compared except DE also show no statistically significant correlation.
Synchronisation of supply shocks	Structural vector autoregression, correlation	1.1.3	asymmetry	asymmetry	asymmetry	Zero correlation of shocks, unchanged between the periods under review. DE shows the strongest alignment of shocks. PT and SI have also shown statistically significant correlations since 2001.
Analysis of cyclical alignment using the Taylor rule	Sum of squares of deviations from implied rates for the euro area (2003 Q1-2008 Q1)	1.1.4	-	-	reasonable alignment	Value comparable with PL and SI, lower than in HU and SK and higher than in euro area countries. Lower values mean greater alignment.
Structural similarity of the Czech economy and the EU-12 economy	Landesmann index	1.1.5	0.15	0.15	0.16	The Czech Republic has the highest structural discrepancy among the countries compared; recently comparable with SK. However, this indicator remains quite close to zero, which would mean a similar structure.
Convergence of the interest rate differential	Difference in three-month and five-year interest rates	1.1.6	convergence	convergence	convergence	The Czech Republic has a zero to slightly negative interest rate differential.
Convergence of exchange rates to the euro	Bivariate GARCH	1.1.7	high correlation	high correlation	high correlation	The high correlation slightly decreased this year and the last owing to the volatility of exchange rates as a result of the financial crisis.
Exchange rate volatility (exchange rate to euro, annualised, in %)	historical (daily returns for a period of six months)	1.1.8	<5 (2006)	4 (2007)	5-8 (2008)	CZK has average to low volatility. Increased volatility recently owing to the uncertainty in world financial markets.
	implied (options)	1.1.8	<5.5 (2006)	4 (2007)	5-7 (2008)	
	historical (quarterly returns, 1999–2006)	1.1.8	3.8	3.6	3.6	Variability lower than HU, PL and SK.
	fundamental (OCA criteria)	1.1.8	6.0	5.9	5.8	Fundamental variability similar in all Central European countries compared.
The effect of international economic relations						
Share of foreign trade with the euro area in total foreign trade	Exports, %	1.2.1	59.3	58.4	57.1 ^c	A high level of trade links. Among the higher ones on the export side, although declining slightly. Rising on the import side.
	Imports, %	1.2.1	52.9	58.4	59.1 ^c	
Ratio of direct investment to/from the euro area to GDP	Inflow of direct investment, % (stock)	1.2.1	38 (2004)	42 (2005)	43 ^c (2006)	A high level of ownership links, particularly on the FDI inflow side.
	Outflow of direct investment, % (stock)	1.2.1	1 (2004)	1 (2005)	1 ^c (2006)	
Share of intra-industry trade	Grubel-Lloyd index	1.2.2	0.8 (2004)	0.8 (2005)	0.8 (2006)	The high share of intra-industry trade (only AT, and recently also DE, have higher shares) remains broadly unchanged.

Analysis	Method / Category	Section	Value 2006 ^o	Value 2007 ^a	Value 2008 ^b	Commentary
Financial market						
Financial sector	Financial system assets, % of GDP	1.3.1	135	133	142	
	Bank loans to non-bank clients, % of GDP	1.3.1	40.5	45.3	51.9 ^c	The ratio of financial system assets to GDP and the ratio of loans to GDP are substantially lower than in AT, DE and PT, slightly lower than in SI and higher than in SK and PL. As regards the structure of the Czech financial sector, similar to the euro area average. The ratio of loans to households is rising dynamically.
	Banking sector assets /financial system assets, %	1.3.1	73.6	73.3	74.2	
	Bank loans to households, % of total loans	1.3.1	34.7	38.2	40.9	
Structure of financial assets and liabilities of corporations and households		1.3.2	-	-	differences exist		Difference apparent primarily in a relatively high proportion of trade receivables in corporate assets and in the household liability structure. Some convergence in structure over time.
Stock market integration	Money market	1.3.3	-	-0.6	-0.6	High speed of adjustment on the stock and bonds markets until mid-2007 (higher than that in AT and PT). On the foreign exchange market comparable to the other countries under review except SI; lower on the money market. Recently, however, some decline in the speed of adjustment has occurred on all the markets analysed as a result of the financial crisis.
Speed of convergence of yields with yields in the euro area (beta-convergence coefficient, 2001–2007)	Foreign exchange market	1.3.3	-	-0.9	-0.8	
	Bond market (2002–2007)	1.3.3	-	-0.9	-0.8	
	Stock market	1.3.3	-0.9	-0.9	-0.9	
Potential sources of asymmetric shocks						
Impact of asymmetric shock due to fund inflows from the EU	Calculated by the fiscal impulse method in the CNB's macroeconomic model QPM	1.4.2.	minor impact	minor impact	minor impact	Generally slow drawing of EU funds continuing. Will not exert significant pressure on monetary policy and exchange rate.

Analysis	Method / Category	Section	Value 2006 ^o	Value 2007 ^a	Value 2008 ^b	Commentary
ADJUSTMENT MECHANISMS						
Fiscal policy						
General government deficit	CNB estimate % of GDP, ESA 95	2.1.2	-3.5 (2006)	-3.5 (2007)	-1.0 (2007) -0.8 (2008) 28.9	2007 improvement largely cyclical (higher tax revenues). A further modest reduction in the deficit is expected for 2008.
Public debt	CNB estimate % of GDP, ESA 95	2.1.2	30.6 (2006)	30.5 (2007)	27.6 (2008)	A improvement occurred in 2007 thanks to favourable macroeconomic developments.
Wage and price flexibility						
Rate of adjustment of real wage growth to the unemployment rate	Phillips curve	2.2.1	-0.008	-0.019	-0.030	No statistically significant change in wage elasticity compared to the previous analysis. Compared to last year's assessment, the coefficient has increased in absolute terms, but the statistical significance is unchanged. Low elasticity is also observed for the other countries compared.
Downward wage flexibility - business survey	Nominal wages	2.2.2	-	-	0.259	The Czech Republic has the highest downward nominal wage rigidity figure, but its downward real wage flexibility is average.
	Real wages	2.2.2	-	-	0.113	
Inflation persistence 1998–2006	Method 1 (non-parametric)	2.2.3	0.93	0.92	0.79 ^c	The methods yield different results. Method 3, which probably best takes into account the transition nature of the Czech economy, assesses inflation persistence as the lowest among the countries compared.
	Method 2 (sum of AR coeffs, constant mean)	2.2.3	-	0.74	0.83	
	Method 3 (sum of AR coeffs, time-varying mean)	2.2.3	-	0.45	0.32	
Labour market flexibility						
Long-term unemployment	Long-term unemployment rate, %	2.3.1	4.2	3.9	2.8	Modest fall in long-term unemployment rate; higher values than in AT and SI, but lower than in DE, PT, HU, PL and SK. However, the share of the long-term unemployed is still the third-highest behind SK and DE.
	Long-term unemployment as a share of total unemployment, %	2.3.1	53	54	52	
Regional differences in unemployment	Coefficient of variation in the unemployment rate (at regional level, NUTS-3)	2.3.1	44 (2004)	47 (2005)	47 (2007)	Declined in 2007 compared to 2005 and 2006 (new Eurostat data). However, still probably the highest among the countries compared.
Population mobility	Internal migration – per 1,000 inhabitants	2.3.1	20.9	21.9	24.9	Internal migration probably lower than in AT and DE and higher than in PL, SI and SK.
International migration	Immigrants – per 10,000 inhabitants	2.3.2	59	66	101	High growth since 2005 linked with growing economy. Less intensity than in AT, DE and SI and more than in HU, PL and than the latest figure for DE (2006). The strong inflow of foreign workers is a sign of flexibility, but is also a manifestation of other rigidities in the Czech labour market.

Analysis	Method / Category	Section	Value 2006 ^o	Value 2007 ^a	Value 2008 ^b	Commentary
Institutional environment	Trade unions and collective bargaining – coverage of employees by collective agreements (%)	2.3.3	minor impact	minor impact	51	Higher in CZ than in HU and PL and lower than in DE, AT, PT and SI. The practice of increasing the binding nature of higher collective agreements is not very common in the Czech Republic. Wage flexibility in the wage formation area is thus not fundamentally constrained in the business sector.
	Minimum wage as % of average wage in industry and services	2.3.3	38.8 (2004)	39.1 (2005)	38.2	The halt in growth and slight decline is a positive development.
	Employment protection legislation index – permanent employment (OECD)	2.3.3	3.3 (2003)	3.3 (2006)	3.2 (2007, CNB estimate)	Behind PT the highest among the countries compared (OECD data for 2006). According to CNB estimates the index fell only slightly in 2007 owing to the change in labour law in the Czech Republic. The figures are valid for 2008 as well.
	Employment protection legislation index – temporary employment (OECD)	2.3.3	0.5 (2003)	1.1 (2006)	1.1 (2007, CNB estimate)	Behind SK the lowest level among the countries compared. According to a CNB estimate the figure remains valid for 2008.
	Overall labour taxation (persons on the average wage, %)	2.3.3	43.8	42.6	42.9	A slight rise. Lower than in AT, DE and HU, but higher than in the other countries compared.
	Overall labour taxation (persons on two-thirds of the average wage, %)	2.3.3	42.1	40.1	40.5	
	Share of net income of households without and with employment, % ^d	2.3.3	81 (2004)	74 (2006)	74 (2006)	A decline in 2006, but the financial incentive for the long-term unemployed (families with children) to seek a job is still quite low. Simulations show a weakening of the financial incentive to seek a job for households with children following the reform of social benefits in 2007 and 2008.
Product market flexibility						
Administrative barriers to entrepreneurship	Index of administrative barriers to entrepreneurship (OECD)	2.4.1	1.9 (2003)	1.9 (2003)	1.9 (2003)	The highest behind PL. Some improvements occurred in 2005-2008 (amendments of business and trades licensing laws, digitisation of commercial register).
	Conditions for starting a business (ranking, World Bank)	2.4.1.	-	-	86 (2008)	Year-on-year improvement. Conditions for establishing a business are better in PT, HU, SI and SK, but worse in AT, DE and PL.
	Conditions for closing a business (ranking, World Bank)	2.4.1.	-	-	113 (2008)	Year-on-year fall in ranking. Worst among the countries compared.
Tax rate	Implicit tax rate	2.4.2	-	-	23.4 (2006)	Implicit tax rate in 2006 higher than in AT, PT, PL and SK. Statutory corporate income tax rate is one of the lower ones among the countries compared.
Exit from sector	Costs associated with exit from the sector	2.4.3	-	-	-	Rising number of bankruptcies since 2004. Big increase in 2007. New insolvency act enters into force in 2008 and may increase the incentive to file for bankruptcy.

Flexibility and shock-absorbing capacity of the banking sector

Non-performing loans	Percentage share of total loans	2.5	3.9	3.7	2.8	Improvement to lowest ever value.
Net interest margin	%	2.5	2.4	2.4	2.6 ^c	The interest margin has increased modestly in the last two years. Lower than in HU and PL. Higher than in the euro area countries compared.
Net non-interest income	Percentage of average assets	2.5	1.6	1.5	1.4	Higher than in the euro area countries compared and SK.
Pre-tax profit/average assets	%	2.5	1.8	1.6	1.3 ^c	Behind PL the highest among the countries compared.
Capital adequacy in banks	%	2.5	11.9	11.4	11.5	Stagnant; remains at an acceptable level similar to that in the other countries compared.
Capital adequacy in banks after stress tests	%	2.5	10.2	9.9	10.8	Sufficient level.

- Note:
- 0) "Value 2006" is the most recent value of the indicator compared in the 2006 document. Unless stated otherwise, the data are for 2005.
 - a) "Value 2007" is the most recent value of the indicator compared in the 2007 document. Unless stated otherwise, the data are for 2006.
 - b) "Value 2008" is the most recent value of the indicator compared in the 2008 document. Unless stated otherwise, the data are for 2007.
 - c) Value 2008 is not fully comparable with value 2007. The reasons include in particular a revision of the data on the variable observed, a change in calculation, or a different implementation (in the case of fiscal policy).
 - d) Unemployed after five years, potential income from employment at 67% of the average wage. Second person economically inactive, children 4 and 6 years old.

E. Methodological Part

1. CYCLICAL AND STRUCTURAL ALIGNMENT

1.1 Direct alignment indicators

1.1.1 Real economic convergence

The comparison of GDP per capita at purchasing power parity and the average price level of GDP is based on Eurostat data, derived from the International Comparison Program (ICP). The real exchange rate against the euro is based on the Harmonised Index of Consumer Prices (or national consumer price indices where HICP data are missing). The annual rate of appreciation is calculated as the geometric mean of the appreciation since 1993 or 1998.

The estimate of future appreciation over the next five years is based on two methods. Method 1 is based on a panel estimate, which links the price level of final consumption of households with GDP at purchasing power parity per capita for 32 European countries between 1995 and 2007 (see also Čihák and Holub, 2003 and 2005). The following relationship was estimated using a two-stage least-squares panel method with no fixed or random effects:

$$P_{C,t} = 31.95 + 0.71 GDP_{PPP,t} + 0.92 AR(1)_t,$$

where $P_{C,t}$ is the price level of final consumption of households in year t , $GDP_{PPP,t}$ is gross domestic product at purchasing power parity per capita in year t (in both cases EA-13 = 100) and $AR(1)_t$ is the first-order autoregression term.¹³⁶ The simulations of the rate of equilibrium real appreciation take as their starting point the estimates of GDP and the price level for 2008 based on European Commission and Eurostat forecasts for real GDP growth, nominal exchange rates and inflation in the individual countries in 2008. They also assume beta-convergence of GDP towards the level of the EA-13 at a rate of 3% a year. A range of estimates around the mean appreciation estimate is obtained by increasing or decreasing the autoregression coefficient by one standard error of its estimate (i.e. within a range of roughly 0.90–0.95).

Method 2 uses updated estimates of equilibrium real appreciation for the Czech Republic, Hungary, Poland, Slovakia and Slovenia presented in an analysis by Brůha and Podpiera (2007). This analysis is based on a calibrated dynamic general equilibrium model for two unequally developed countries in which real appreciation is going on owing mainly to investment in product quality.

Real interest rates are derived from three-month money market interest rates. Three-month interest rates were selected for reasons of data availability in the Eurostat database for all monitored countries over the whole period under review; twelve-month interest rates would be more appropriate from the economic point of view, but the differences compared to the three-month rates are small on average (usually around 0.1–0.2 percentage point). The average annual level of interest rates is deflated by the average annual inflation rate for the country concerned, using the Harmonised Index of Consumer Prices. The estimate of real rates going forward is based on the assumptions of full elimination of the risk premium thanks to euro adoption and an equilibrium three-month real rate in the euro area of 1.8%. From this figure, the range of the estimates of equilibrium real appreciation for each of the countries

¹³⁶ A constant, $P_{C,t-1}$, $P_{C,t-2}$, $GDP_{PPP,t-1}$ and $GDP_{PPP,t-2}$ were used as the instrumental variables.

(see above) is subtracted, corresponding to the future expected inflation differential vis-à-vis the euro area average.

1.1.2 Correlation of economic activity

The alignment of economic activity in the selected countries with the euro area is analysed using correlation analysis. Mutual relationships between individual countries and the euro area are assessed using the pairwise correlation coefficients applied to real GDP time series, industrial production indices (IPIs) and export indices.

The **simple (Pearson) correlation coefficient** is used to assess the strength of the linear relationship:

$$r_{xy} = \frac{s_{xy}}{\sqrt{\sigma_x^2 \sigma_y^2}},$$

where s_{xy} is the estimate of covariance and σ_x and σ_y are estimates of the standard deviation of time series x and y .

Simple correlations are calculated over a moving time window to obtain the **rolling correlation**. The corresponding time window for a given quarter is defined as the last 20 observations (5 years). The rolling correlation should help to reveal trends in alignment.

When examining alignment of the cyclical behaviour between selected economies in order to assess the impact of economic policy, it is appropriate to monitor the correlation only within a certain band. Cycles between one and a half and eight years long are considered most frequently. **Dynamic correlation**¹³⁷, which allows this requirement to be met, was therefore used as a third method. Dynamic correlation is based on spectral analysis of time series, takes values in the range [-1,1] and, analogously to the static correlation coefficient, is defined by the relationship:

$$\rho_{xy}(\lambda) = \frac{C_{xy}(\lambda)}{\sqrt{S_x(\lambda)S_y(\lambda)}},$$

where $S_x(\lambda)$ and $S_y(\lambda)$ are spectral density functions and $C_{xy}(\lambda)$ is a cospectrum, while λ takes values in the range $[-\pi, \pi]$. The simple static correlation is then a function (approximately the average) of the dynamic correlations across the entire observed spectrum.

The analysis uses quarterly real GDP time series at 2000 constant prices (expressed in national currencies), monthly time series of the Industrial Production Index adjusted for working days, and monthly or quarterly time series of total exports and exports to the euro area expressed in the national currency. The source of the GDP and IPI data is Eurostat; the export data are obtained from the IMF database.

As in previous years, results for Portugal are not included in the analysis of real GDP correlation, since no comparable data are available for the country. Export data are available only in USD from the IMF database, so they had to be converted into national currencies. Average monthly or quarterly exchange rates according to the IMF were used for the conversion.

¹³⁷ Croux, Forni and Reichlin (2001).

Time series are expressed in logs, seasonally adjusted and detrended. As the literature¹³⁸ does not offer a consensus on the optimal detrending method, the analysis applies two different detrending methods – namely year-on-year differences between the original time series and quarter-on-quarter (month-on-month) differences between the seasonally adjusted time series:

Method 1

Year-on-year differences in the seasonally unadjusted (log) time series are given by:

$$\ln y_t - \ln y_{t-s},$$

where y denotes the variable under investigation, t is the time period and s is seasonality ($s = 4$ for quarterly data, $s = 12$ for monthly data).

Method 2

The correlation of economic activity can also be analysed using quarter-on-quarter or month-on-month changes in the seasonally adjusted time series ($\ln y_{sa,t}$):

$$\ln y_{sa,t} - \ln y_{sa,t-1},$$

where y_{sa} is seasonally adjusted using the TRAMO/SEATS method.

In most cases, it is possible – based on the resulting time series – to conclude that the above methods succeed in detrending. As regards GDP in the Czech Republic or Slovakia, the results are not entirely clear. However, the shortness of the time series makes it impossible to check reliably whether the resulting series are stationary. Moreover, the same detrending method has to be used for all the series under review to maintain comparability.

Given the requirement to assess the development in the alignment of the business cycles of individual countries vis-à-vis the euro area, correlation coefficients (both static and dynamic), with respect to the quarterly real GDP time series are calculated separately for two time periods: 1997 Q1–2001 Q4 and 2002 Q1–2008 Q1. An analysis using rolling correlations was prepared as an alternative to the breakdown into two periods. As the time series of the Industrial Production Index begin at different points in time for different countries, the periods are defined as January 1999–December 2001 and January 2002–May 2008 in this case. Relatively long time series are available for export data, so it was possible to calculate all correlation coefficients for two periods as in the case of GDP. Specifically, these periods are 1997 Q1–2001 Q4 and 2002 Q1–2007 Q3 for quarterly data and January 1997–December 2001 and January 2002–November 2007 for monthly data. The choice of intervals was motivated by maximum possible unification to make the results mutually comparable.

1.1.3 Synchronisation of economic shocks

A bi-variate structural vector autoregressive (SVAR) procedure is applied to identify demand and supply shocks (see Blanchard and Quah, 1989; Bayoumi and Eichengreen, 1993; and Babetskii, 2004 and 2005). Quarterly seasonally adjusted GDP series at constant prices and the GDP deflator in selected new EU countries (Czech Republic, Hungary, Poland, Slovakia and Slovenia) and current euro area members (Germany, Portugal and Austria) are the inputs for the SVAR model. The source of the data is Eurostat and the data cover the period 1996 Q1–2008 Q2.

¹³⁸ For example, Frankel and Rose (1997). The features of the individual methods are described in Canova (1998).

This method identifies supply and demand shocks in the following way. First, the shocks with and without a lasting impact on GDP are identified. Using an over-identifying restriction, it is subsequently verified whether contrary movements in GDP and the price level occur for the former shocks. Where this condition is met, the shock can be regarded as a supply shock. For shocks without a lasting impact on GDP it is verified whether co-movement of GDP and the price level occurs. Such a shock is then considered a demand shock. The calculation of the correlation of shocks between the group of new EU Member States and the current euro area members and the whole EU-13 indicates the degree of asymmetry of shocks vis-à-vis the euro area.

As the mean correlation of the shocks for the whole estimated period represents a simplified view for the new Member States and may have been affected by their transition to a market economy and the EU accession negotiations, the correlation was also calculated for an earlier and a later period, namely 1996–2001 and 2002 to date.

1.1.4 Analysis of cyclical alignment using the Taylor rule

The interest rate is estimated using the classic Taylor rule (Taylor, 1993).¹³⁹ In contrast to the more complicated variants, the advantage of this rule is that it works only with current output gap values and the deviation of inflation from the target (equilibrium real interest rates are added as an exogenous variable). This rule is generally regarded as relatively realistically capturing the behaviour of central banks and at the same time being highly robust.

An estimate of the GDP gap based on the HP filter is used to calculate the “appropriate” interest rates. As in Taylor (1993), equilibrium interest rates and the inflation target are 2%. The comparison therefore assumes that the equilibrium rates are the same in all countries. However, some non-euro area countries have different – usually higher – inflation targets. They will have to adopt the common inflation target after euro area entry.¹⁴⁰ When interpreting the results, we must also bear in mind that the estimate of the output gap using the HP filter is merely approximate and imperfect.

The time series of seasonally adjusted GDP, annualised three-month money market rates and the HICP are taken from Eurostat’s database. The time series of monetary-policy relevant inflation in the Czech Republic is obtained from the CNB’s database.

Implied (nominal) rates for country X are derived from the Taylor rule as:

$$X_TR_t = \pi_{x,t} + \frac{1}{2} y_{x,t} + \frac{1}{2} (\pi_{x,t} - \pi_t^*) + r^{eq} ,$$

where π_t is the inflation rate, y_t the output gap (derived using the Hodrick-Prescott (HP) filter), π_t^* the inflation target and r^{eq} equilibrium rates. In accordance with Taylor’s original specification, we set $\pi_t^* = 2$ and $r^{eq} = 2$.

¹³⁹ Estimating the reaction rules of central banks is a complex task. The more sophisticated reaction functions are forward-looking, but their estimation is rather complicated. Although a simple backward-looking rule (like the Taylor rule) is cruder, it can be directly interpreted as a statistic of the current cyclical position of the economy. However, the disadvantage of this simple rule is the fact that current inflation can also include the effects of temporary shocks (e.g. due to changes in regulated prices) which are non-cyclical (exogenous) and/or one-off in nature and to which central banks either cannot respond in time or do not want to respond at all (and apply escape clauses, for example).

¹⁴⁰ However, the common inflation target for the euro area can also implicitly mean a different inflation target for each economy according to its equilibrium real appreciation.

The sums of the squares of the deviations of country X from the implied rate for the whole euro area (EU_TR) are calculated as:

$$S_x = \sum_t \left(\frac{X_TR_t - EU_TR_t}{EU_TR_t} \right)^2.$$

It follows from this relationship that $S_{EU} = 0$. To follow developments over time, S_x is calculated for three different periods: 1999 Q1–2008 Q1, 2001 Q1–2008 Q1 and 2003 Q1–2008 Q1.

1.1.5 Structural similarity of the economies

The structural similarity of the economies is compared using the Landesmann structural coefficient. The coefficient is calculated by comparing the shares of individual sectors, e.g. industry or construction, in total value added in country A (in our case, the Czech Republic, Germany, Austria, Portugal, Hungary, Poland, Slovenia and Slovakia) vis-à-vis country B (i.e. the EA-12). The difference between the shares is weighted by the share of the sector in country A in the total, and the weighted shares are then summed.

The calculation of the coefficient can be expressed formally as follows:

$$SL = \sum_{i=1}^n \sqrt{(sh_A^i - sh_B^i)^2} \cdot \left(\frac{sh_A^i}{100} \right),$$

where sh_A^i is the percentage share of the i -th sector in value added as a whole in country A and sh_B^i is the percentage share of the i -th sector in value added as a whole in country B. The calculation is performed separately for each selected period. In our case, it is based on annual data. The structure of the coefficient is described in detail in Landesmann (1995) and also in Flek et al. (2001).

For the purposes of the analysis the coefficient was modified to $SL/100$.¹⁴¹ Adjusted in this way, the coefficient takes a value in the range of $[0, 1]$. The closer the coefficient is to zero, the more similar in structure are the economies.

Owing to missing 2007 observations for the Czech Republic in the Eurostat database, the data used for the calculation of the entire time series are taken from the CZSO. The values of the indicators for 1998–2006 are identical for both data sources.

1.1.6 Convergence of the interest rate differential

The simple method of a chart showing the interest rate differential vis-à-vis the euro area is used to analyse interest rate convergence in the Czech Republic, Hungary, Poland, Slovenia and Slovakia.¹⁴² Eurostat data (three-month rates) and Bloomberg data (five-year government

$$141 \quad SL = \sum_{i=1}^n \sqrt{(I_{sh_A^i} \cdot 100 - I_{sh_B^i} \cdot 100)^2} \cdot \left(\frac{I_{sh_A^i} \cdot 100}{100} \right) = 100 \sum_{i=1}^n \sqrt{(I_{sh_A^i} - I_{sh_B^i})^2} \cdot I_{sh_A^i} = 100 \cdot I_{SL}$$

In this case, indices are used rather than the percentage shares of individual sectors in the total.

¹⁴² Interest rate convergence can be examined using the unit root test (see, for example, Lee and Wu, 2004, and Kočenda, 2001). However, the analyses must take into account the relatively short length of the available time series, as well as breaks in the time series.

bonds) were used to measure the interest rate differentials between three-month and five-year rates in the euro area and these countries.¹⁴³

The time series of three-month interest rates starts in January 1998 for all of the countries monitored, excluding Slovenia, whose time series starts in May 1998. The time series of five-year interest rates starts in January 1998 for the euro area, the Czech Republic and Hungary, March 1999 for Poland and February 2002 for Slovakia; no data are available for Slovenia. The time series terminate in July 2008 for three-month rates and August 2008 for five-year rates.

The time series “EMU convergence criterion bond yields” from the New Cronos database (Eurostat) were used to compare 10Y government bond yields. These time series are based on the gross yield on government bonds on the secondary market with approximately ten years to maturity. A weighted yield is created by Eurostat for the euro area, in which the weights applied are the nominal stocks of government bonds in each country. For the period before 1999, the weights are based on national GDP in purchasing power parity. The compared data cover the period between January 1990 and July 2008 and are published monthly.

1.1.7 Exchange rate convergence

Aguilar and Hördahl (1998) express the probability of adoption of the euro by eleven EMU candidate countries using the correlation of the exchange rates of their currencies and the Deutsche Mark (as a substitute for the euro) vis-à-vis the US dollar.¹⁴⁴ The exchange rates of the two currencies are thus expressed in terms of the currency of a third country which is not an EMU member. The correlation between the movements of two currencies in a monetary union should by definition equal 1; therefore, a higher correlation means a higher probability of participation in the EMU since its creation.

The analysis in this document uses the same method to assess how close the Czech Republic, Hungary, Poland, Slovakia and Slovenia are to adopting the euro.

The correlation coefficient is based on a GARCH estimate and is calculated according to the following formula:

$$corr = \frac{\text{cov}(NC/USD, EUR/USD)_t}{\sqrt{\text{var}(NC/USD)_t * \text{var}(EUR/USD)_t}}, \text{ where } NC \text{ represents the national currencies.}$$

This method returns a correlation coefficient which changes over time and therefore provides more information than a simple correlation coefficient of the exchange rate of the national currency against the euro. Moreover, the use of the GARCH technique allows all the information in the data to be utilised. A higher GARCH correlation means similar developments in exchange rate volatility, which can be interpreted as synchronisation of exchange rate shocks in the countries under review.

The analysis covers the period from 1 January 1998 to 4 September 2008 and uses Eurostat data.

¹⁴³ The codes in the Bloomberg system are as follows: GECU5YR Index, CZGB5YR Index, GHGB5YR Index, POGB5YR Index and CTSKK5YR Govt.

¹⁴⁴ The same method is used in Castrén and Mazzotta (2005).

1.1.8 Analysis of exchange rate volatility

The historical exchange rate volatility is calculated as a standard deviation of logarithmic daily returns for a period of six months:

$$\sigma = \sqrt{\frac{1}{T-1} \sum_{t=1}^T (r_t - \bar{r})^2},$$

where σ is the standard deviation, r_t is the daily return and T is the number of working days in the period of six months (126 for a year with 252 working days). We use the following relationship to translate the standard deviation of logarithmic daily returns to an annual form:

$$\sigma_{ann} = \sigma \sqrt{N}, \text{ where } N=252 \text{ represents the approximate number of business days in the year.}$$

The historical volatility of the exchange rates of the countries under comparison against the euro is calculated using exchange rates announced by the CNB.

The implied volatility is derived from market prices of options using the given valuation model. This volatility is directly quoted in the trading system. The source of the data is Bloomberg, and the index codes are EURCZKV6M, EURSKKV6M, EURPLNV6M and EURHUFV6M.

The fundamental-based exchange rate volatility ($FVOL_{ij}$) is calculated as a weighted average of the selected economic values describing the alignment between the analysed countries and the euro area:

$FVOL_{ij} = \alpha + \beta OPENNESS_{ij} + \chi FIN_{ij} + \mu DISSIM_{ij} + \rho TRADE_{ij}$, where $OPENNESS_{ij}$ describes the openness of the economies, FIN_{ij} financial development, $DISSIM_{ij}$ dissimilar commodity structure of exports and $TRADE_{ij}$ integration of international trade. The respective weights ($\alpha, \beta, \chi, \mu, \rho$) are assumed based on the estimates in Horváth (2005), as well as the methodology of calculation of the above economic variables. The justification of selection of the respective economic variables can be found in Bayoumi and Eichengreen (1997) and Horváth (2005).

As the calculation of the fundamental-based volatility is based on quarterly economic data, the historical exchange rate volatility used for comparison with the fundamental-based volatility is calculated using quarterly data in 1999–2006 as follows: $VOL_{ij} = SD[\Delta(\log e_{ij})]$, where SD is the standard deviation of the quarter-on-quarter change (Δ) in the logarithm of the nominal rate (e_{ij}) between countries i and j . The fundamental-based and historical volatilities are then translated to their annualised value in accordance with the above formula.

1.2 The effect of international economic relations

1.2.1 The integration of the economy with the euro area

The data for the calculation of the shares of exports to the euro area and imports from the euro area in total exports and imports are taken from the Direction of Trade Statistics database of the International Monetary Fund (IMF).

The source of data for the analysis of the regional structure of direct investment is the Eurostat database. Data on the inflow of foreign direct investment (FDI) from euro area countries and the outflow of direct investment (DI) to euro area countries were used.

1.2.2 Intra-industry trade

The Grubel-Lloyd index (GLI) was used to analyse intra-industry trade. The GLI is the ratio of the absolute value of intra-industry trade to foreign trade turnover. X_{it} and M_{it} denote total exports and imports of the i -th commodity at time t . The index takes values ranging from 0 to 1. A value of 0 indicates that all trade is inter-industry trade and that there is specialisation in different commodities. A value of 1 indicates that all trade is intra-industry trade (Flek et al., 2001).

$$GLI_t = 1 - \frac{\sum_i |X_{it} - M_{it}|}{\sum_i |X_{it} + M_{it}|}$$

The GLI is calculated using data on total exports and imports in the countries under review, broken down according to the three-digit SITC classification (the commodities are thus given by SITC groups at the three-digit level). The source of data is the OECD OLISnext database.

1.3 Financial market

1.3.1 Financial sector

Financial system assets/GDP (ratio of net book value of financial sector assets to GDP at current prices) – expresses the asset strength of intermediation by banks and non-bank financial institutions: insurance corporations, pension funds, credit unions, investment companies and investment funds (unit trusts), financial leasing corporations and other financial corporations (forfeiting and factoring companies, investment firms, bureaux de change, etc.). Generally speaking, the more advanced the market, the larger the assets and the deeper the financial intermediation relative to GDP.

The inclusion of assets provided to both residents and non-residents is a methodological problem. For the purposes of economic interpretation, it is appropriate also to analyse the share of residents' assets alone.

Bank loans to non-bank clients/GDP (ratio of gross book value of loans to non-bank clients, corporations and households to GDP at current prices) – expresses the depth of financial intermediation by banks. Loans to both residents and non-residents present the business dimension of financial intermediation.

For the purposes of economic interpretation it would be more appropriate to use the ratio of loans granted to residents, which forms part of the monetary survey and macroeconomic analyses. However, it is sometimes difficult to exclude loans to the government, which are usually included in client loans.

Banking sector assets/financial system assets – expresses the share of the banking sector in the financial system of the country and at the same time banks' financial intermediation potential. In general, the more advanced the market, the larger the assets and the deeper the financial intermediation by non-bank financial institutions, which at the same time are usually internalised in strong bank and non-bank financial groups.

Structural change over time is important for economic interpretation – the share of banks in the financial system usually declines in developing market economies (unless one takes into account the formation of bank financial groups).

Loans to households in the Czech Republic mostly include debit balances on current accounts and balances on credit accounts of natural persons, i.e. loans to individuals

(residents) and loans to small businesses (residents), as well as loans to non-profit institutions serving households (e.g. housing co-operatives).

1.3.2 The structure of financial assets and liabilities of non-financial corporations and households

Financial accounts data from Eurostat and national central banks are used as the input data for the analysis of the alignment of the structure of corporations' and households' financial assets and liabilities. The analysis differentiates between five main types of financial assets and liabilities: currency and deposits, securities other than shares, loans, shares and other equity, and remaining accounts receivable. These are stock variables pertaining to a given point in time.

Financial assets and liabilities are defined as follows. Currency and deposits consist of currency in circulation and all types of deposits in national and in foreign currency. Securities other than shares comprise debt securities that do not grant the holder any ownership rights in the institutional unit issuing them. Loans represent interest-bearing debt to creditors that has to be repaid at maturity. Shares and other equity are property rights on corporations. They generally entitle the holders to a share in the corporation's profits and to a share in its net assets in the event of liquidation. Remaining accounts receivable/payable consist of insurance technical reserves and other accounts receivable/payable. Insurance technical reserves are products of insurance companies and pension funds. Other accounts receivable/payable comprise financial claims which are created as counterparts to financial or non-financial transactions in the event of a time mismatch between the transaction and the corresponding payment. They comprise trade credits and advances, and accounts receivable/payables not elsewhere classified. Data are not available on the financial assets and liabilities of households and corporations in Poland.

Indebtedness of non-financial corporations – loans and debt securities issued/GDP – this indicator shows the depth of corporations' indebtedness. It is an important factor affecting the sensitivity of investment to interest rate movements. An interest rate increase forces corporate debtors to spend a higher proportion of their outgoings on interest payments, which has the immediate effect of reducing further investment, and vice versa. A higher degree of development of the financial system usually leads, *ceteris paribus*, to a rise in corporate indebtedness.

Indebtedness of households – loans from banks and non-bank institutions/GDP – this indicator shows the level of indebtedness of households. Given the role of households as consumers and as depositors of savings in the financial system, a change in their behaviour caused by a high debt burden can have a significant impact on real economic activity and on the financial system as a whole. Adjustment (i.e. growth) towards the levels of indebtedness seen in advanced economies usually takes place in emerging economies.

Euroisation is the process of substitution of a domestic currency with a foreign one (the euro) to ensure the necessary functions of money as a medium of exchange and a store of value. Generally, official and unofficial euroisation can be distinguished. This analysis is concerned with unofficial spontaneous euroisation, which is important for assessing the efficiency and effectiveness of independent monetary policy. A comparison of the level of euroisation in the Czech Republic and selected Central European countries, namely Poland, Hungary and Slovakia, was performed using a survey conducted by Oesterreichische Nationalbank on the cash holdings and savings deposits of households in 2007.

1.3.3 Financial market integration

For quantification of beta-convergence, common regression analysis or the panel estimate method is applied (as in Babetskii et. al., 2007), in the form of the equation:

$$\Delta R_{i,t} = \alpha_i + \beta R_{i,t-1} + \sum_{l=1}^L \gamma_l \Delta R_{i,t-l} + \varepsilon_{i,t},$$

where $R_{i,t} = Y_{i,t} - Y_{i,t}^B$ is the difference between the asset yields of country i and a selected reference territory (a benchmark, a European stock index) at time t ,¹⁴⁵ Δ is the difference operator, α_i is a dummy variable for the respective country, L is the maximum lag and $\varepsilon_{i,t}$ is a random term. The size of coefficient β may be interpreted as a direct measure of the convergence speed. A negative beta coefficient indicates the occurrence of convergence, and the absolute value of the beta coefficient indicates the convergence speed. The β coefficient can take values ranging from 0 to -2. The closer the absolute value of the β coefficient to 1, the higher the speed of convergence. If $\beta = 0$ or $\beta = -2$, no convergence is observed. β values from 0 to -1 indicate monotonous convergence, while fluctuating convergence occurs for values from -1 and -2.

For quantification of sigma-convergence, a calculation is used of the (cross-section) standard deviation (σ), according to the formula:

$$\sigma_t = \sqrt{\left(\frac{1}{N-1}\right) \sum_{i=1}^N [\log(y_{it}) - \log(\bar{y}_t)]^2}$$

where y is the asset yield, \bar{y} is the mean value of the yield over time t and i stands for the individual countries ($i = 1, 2, \dots, N$). For the purposes of this analysis, we introduce $N = 2$, i.e. we examine the evolution of sigma-convergence over time between the euro area and one of the countries under review.¹⁴⁶ σ takes only positive values in theory. The lower is σ , the higher is the level of convergence. In theory, full integration is reached when the standard deviation is zero, while high (several digit) values of σ reflect a very low degree of integration. For chart type expression, the results were filtered using the Hodrick-Prescott filter with the recommended weekly time series coefficient $\lambda = 270,400$.

The calculations were carried out using weekly data (daily data averages) from Thomson Datastream, covering the period January 1995 to August 2008 for the foreign exchange and stock markets, January 1999 to August 2008 for the money market and January 2002 to August 2008 for the bond market – see Table E.1. Three-month interbank rates were used for the money market, national currencies quoted against the US dollar for the foreign exchange market, five-year government bonds for the bond market and national stock indices for the stock market.

¹⁴⁵ $Y_{i,t} = [\ln(A_{i,t}) - \ln(A_{i,t-1})]$, where Y denotes the yield on the relevant asset, A the price index of the relevant asset (expressed as a basic index) and i the individual country.

¹⁴⁶ For pairs of countries, the calculated values in each period are essentially equal to half the square of the yield differential.

Table E.1: Data sources

	Money market 1999-2008	Foreign exchange market 1995-2008	Bond market 2001-2008	Stock market 1995-2008
CZ	PRIBK3M	PRUSDSP	BMCZ05Y-(RY)	CZPXIDX
AT	n.a.	n.a.	BMOE05Y-(RY)	ATXINDEX
DE	n.a.	n.a.	BMBD05Y-(RY) ^B	DAXINDEX
PT	n.a.	n.a.	BMPT05Y-(RY)	POPSI20
HU	HNIBK3M	HNUSDNB	BMHN05Y-(RY)	BUXINDEX
PL	POIBK3M	POUSDSP	BMPO05Y-(RY)	POLWIGI
SI	SJIBK3M	SJUSDSP	n.a.	SLOESBI
SK	SXIBK3M	SXUSDSP	SXGOVT1-(RY) ^b	SXSAX16
EU-13	BBEUR3M ^B	USECBSP ^B	n.a.	DJES50I ^{B, a}

Notes: B – benchmark, n.a. – data not available, a) DJES50I is made up of the following weights of the national stock indices of the selected euro area countries: France 34.9%, Germany 23.3%, Spain 13.5%, Netherlands 12%, Italy 11.8%, Finland 3.5% and Ireland 0.9%. b) – data from 2002 onwards.

Source: Thomson Datastream.

1.4 Asymmetric shocks

1.4.2 Macroeconomic effects of financial flows from EU funds

The analysis of the macroeconomic effects of financial flows from the EU funds is based on Ministry of Finance working estimates of financial flows between the Czech Republic and the EU in 2008–2013. The estimated financial flows are primarily in euros and have been converted to Czech korunas using the outlook for the CZK/EUR exchange rate according to the CNB's July macroeconomic forecast. The analysis also uses data on actual financial flows between the Czech Republic and the EU in 2005–2007.

The macroeconomic effects of flows from the EU funds are simulated using the quarterly prediction model.¹⁴⁷ In addition to the standard fiscal impulse (representing the impact of domestic fiscal policy), the additional impulse from the inflow of EU funds is included in the output gap equation as a residual. The macroeconomic effects are expressed as deviations of the monitored indicators from the macroeconomic scenario, which does not take the drawing of EU funds into account.¹⁴⁸

The economic impulse from flows of EU funds is derived from the actual volumes drawn by the private sector from EU funds. The private sector is primarily a recipient of funds from the Sapard and Phare pre-accession instruments (their drawdown has already terminated in the Czech Republic), funds for support of agriculture, approximately 70% of the funds for projects from the structural funds and funds for internal policies. Where the public sector is the recipient, these funds are part of the government sector's balance and are already accounted for in the main scenario (i.e. the scenario excluding the drawing of EU funds). These funds include the income from the Cohesion Fund and the Ispa pre-accession

¹⁴⁷ For further details on this model, see Beneš et al. (2003).

¹⁴⁸ Although this scenario differs from the valid baseline scenario of the CNB's July forecast, which was prepared using the g3 model, it is an adequate simulation of the macroeconomic effects on the key variables discussed in the analysis.

instrument¹⁴⁹, which is aimed at large infrastructure projects and environmental protection projects. Budget compensations represent direct revenue of the state budget.

Actual drawing on the structural funds between 2005 and 2008 H1 is derived from realised expenditure,¹⁵⁰ reported by the Ministry for Regional Development in the document “The Course of Drawdown of Structural Funds”.¹⁵¹ The forecast for realised expenditure in 2008–2013 is an expert estimate by the CNB. For example, advance payments as yet unspent to reimburse for implemented projects are excluded. The calculations consider the potential non-existence of a long lag between project implementation and the subsequent submission of the payment request by the final beneficiaries. In the case of direct payments under the Common Agricultural Policy, the financial flows are shifted one year back for the purposes of the simulations, as they are in fact paid with a lag of one year. As regards the drawdown of other EU funds (relating to internal policy and other areas of agriculture), it is assumed that they will broadly correspond to the expected recorded financial flows.

The value of the impulse expressing the additional effects of income from the EU on annual real GDP growth in percentage points is estimated using the procedure for the calculation of the fiscal impulse in the CNB’s forecasting system, i.e. the year-on-year change in the additional income from the EU as a percentage of GDP, multiplied by an estimated multiplier. The data on Czech GDP in 2008–2013 are taken from the CNB’s July forecast.

2. ADJUSTMENT MECHANISMS

2.1 Fiscal policy

2.1.1 The stabilisation function of public budgets

Decomposition of the fiscal deficit into the cyclical and structural component

The general government fiscal balance (deficit or surplus) inherently reflects both the intended effects of fiscal policy and the effect of the business cycle. The effect of the current phase of the business cycle manifests itself in the collection of direct and indirect taxes and some cycle-sensitive expenditure items, such as unemployment-related outlays. The assessment of fiscal policy therefore usually focuses on the cyclically adjusted component of the general government balance, as that component is fully controlled by the public sector.

The overall general government balance can therefore be divided into a cyclical component and a structural component (sometimes referred to as the cyclically adjusted component, depending on the treatment of one-off fiscal measures). We have applied the ESCB method¹⁵² to estimate the cyclical component, which uses a higher level of disaggregation compared to the alternative approaches of the European Commission, the International Monetary Fund and the OECD. Thus, the cyclically adjusted component is a residual indicating the impact of fiscal policy alone. Using the cyclically adjusted balance, we can answer the question of what the government sector’s performance would be if the economy were at its potential.

¹⁴⁹ The Ispa pre-accession instrument was the predecessor of financial aid from the Cohesion Fund in the period before the Czech Republic’s accession to the EU.

¹⁵⁰ Realised expenditure includes funds applied for in the payment requests submitted by final beneficiaries to the intermediate body.

¹⁵¹ www.strukturalni-fondy.cz

¹⁵² See Bouthevillain et al. (2001).

2.1.2 Government deficit and debt and the scope for stabilising fiscal policy

All the debt and deficit figures are based on the ESA 95 methodology, which is the key methodology with regard to considerations of euro area accession, except for the part of the table covering mandatory expenditures in the Czech Republic, which also includes figures from the state budget, which is monitored on a cash (non-accrual) basis.

The description of mandatory expenditures is based on the definition used by the Ministry of Finance. These include mandatory expenditures arising from statutory requirements and other mandatory expenditures (namely expenditure arising under international treaties or due to judicial and extra-judicial decisions on disputes that are binding upon the Czech Republic). Included in particular are pension insurance benefits, government payments for health insurance, government social assistance, sickness insurance benefits, debt service expenditure, state contributions related to the support of building savings schemes and private pension schemes, allocations to state funds, expenditure on contributions to political parties, payments to the EU budget, unsuccessful arbitrations, etc.

In addition to the aforementioned mandatory expenditures, there are also so-called *quasi-mandatory expenditures*, which include, for example, wages of public sector employees, defence expenditures and international humanitarian assistance, investment incentives and active employment policy. Such quasi-mandatory expenditures are not considered here, as it is within the government's powers to adjust them quite significantly through its own actions.

Macroeconomic interpretation of mandatory (and quasi-mandatory) expenditure is, however, not entirely trivial. In the short run, these expenditures limit the government's reactive ability to execute an active discretionary policy (in cases of unforeseen economic shocks). On the other hand, thanks to their inertia, they stabilise the business cycle to a certain extent. The key problem related to an increase in mandatory expenditures is that their expected growth is not compensated by any corresponding reductions in other expenditures and/or by increased taxation, which results in an increased fiscal imbalance.

2.1.3 Sustainability of public finances

The extrapolation of sustainability was taken from the publication "Public Finance in EMU" (European Commission, 2008).

2.2 Wage elasticity and inflation persistence

2.2.1 The degree of adjustment of real wage growth to the unemployment rate – the Phillips curve

A basic one-equation Phillips curve is used to estimate the elasticity of wages to the national unemployment rate (see, for example, Alogoskoufis and Smith, 1991, or Hycklak and Johnes, 1992, or Babetskii, 2006).

$$\Delta w_t = c_1 + c_2 u_t + c_3 \Delta p_{t-1} + \varepsilon_t$$

Where $\Delta w_t = \ln(w_t) - \ln(w_{t-1})$, $\Delta p_{t-1} = \ln(p_{t-1}) - \ln(p_{t-2})$, w_t is the wage component of nominal unit labour costs, p_t is the CPI index, and u_t is the natural logarithm of the standardised unemployment rate. The coefficient c_2 represents the elasticity of wages to the unemployment rate, i.e. it characterises wage flexibility. Although the left-hand side of the equation contains nominal wage costs, the coefficient c_2 in fact assesses the flexibility of real wage costs, because price inflation is also present on the right-hand side of the equation. The

rest of the variation in wage costs (e.g. as a result of changes in productivity, growth in import prices, etc.) is included in the constant c_1 . The source of the data (quarterly, seasonally adjusted time series) is Eurostat New Cronos. To assess its evolution over time, wage cost elasticity is calculated for the whole estimated period (1996 Q1–2008 Q2), and for two sub-periods, i.e. 1996–2001 and 2002–2008.

2.2.2 Downward rigidity of nominal and real wages – business survey evidence

The wage rigidity indicators are taken from the business survey coordinated by the European Central Bank within the Wage Dynamics Network. Detailed information on the network's activities and the survey is available at www.ecb.int/home/html/researcher_wdn.en.html.

A uniform questionnaire was prepared by economists from ESCB national central banks, ECB statisticians and ECB external advisers. The survey was conducted in 17 EU countries in the second half of 2007. The sample for each country covered businesses with more than five employees in manufacturing, energy, construction, services, trade and financial intermediation.

The information on the degree of downward rigidity of nominal and real wages was taken directly from the businesses' responses. Downward nominal wage rigidity is measured as the proportion of companies in the sample which froze nominal wages in the past five years. Downward real wage rigidity is defined as the proportion of businesses that reported an *automatic* relationship between nominal wages and past or expected inflation. Detailed information on measuring wage rigidity is given in Babecký et al. (2008).

2.2.3 Inflation persistence

Inflation persistence is measured by three different methods. Monthly data on HICP inflation (annual HICP changes) from January 1997 to June 2008 are used for the calculation. The source of the data is Eurostat.

Method 1

Method 1 uses the non-parametric technique proposed by Marques (2004) to estimate inflation persistence. This approach defines inflation persistence, γ , as $\gamma = 1 - n/T$, where n is the number of times actual inflation crosses the medium-term inflation value and T is the number of observations. Medium-term inflation is approximated using the Hodrick-Prescott (HP) filter. As the HP filter gives a biased trend estimate at the beginning and the end of the time series, the data for January 1998 to December 2007 were used for the actual calculation of inflation persistence.

Method 2

Inflation persistence is measured as the sum of autoregressive coefficients. For the purposes of the calculation, inflation is modelled as an autoregressive process and coefficients for the autoregressive terms are estimated. The modelled process used in Method 2 is described as

$$\pi_t = \mu + \sum_{i=1}^4 \alpha_i \pi_{t-i} + \varepsilon_t,$$

where π_t is inflation observed at time t . The sum of autoregression coefficients is defined as

$$\rho_K = \sum_{i=1}^4 \alpha_i$$

and estimated using the method proposed by Hansen (1999), which provides an unbiased estimate and asymptotically correct confidence intervals.

Method 3

Inflation persistence is again measured as the sum of autoregressive coefficients. The following model is considered:

$$\pi_{t+1}^T = \pi_t^T + \eta_{1t}$$

$$\pi_{t+1}^P = (1 - \delta)\pi_t^P + \delta\pi_{t+1}^T, 0 < \delta < 1,$$

$$\pi_t = \left(1 - \sum_{i=1}^4 \varphi_i\right) \pi_t^P + \sum_{i=1}^4 \varphi_i L^i \pi_t + \varepsilon_{1t}, \sum_{i=1}^4 \varphi_i < 1,$$

where π_t^T is medium-term inflation (or the central bank's implicit inflation target), π_t^P is the inflation target perceived by the public, η_{1t} and ε_{1t} represent independent white noises, L^i is

the lag operator and $\sum_{i=1}^4 \varphi_i$ is the sum of autoregressive coefficients. Inflation π_t is the observed variable and medium-term inflation π_t^T is approximated with the inflation time series smoothed using the HP filter. The Kalman filter and a Bayesian estimate are used to estimate the model parameters. The methodology draws on the article by Franta, Saxa and Šmídková (2007), where it is applied to data from a different source and period.

2.3 Labour market flexibility

2.3.1 Unemployment and internal labour mobility

Long-term unemployment is analysed by comparing the long-term unemployment rate (the share of those unemployed for 12 months or more under ILO methodology in the labour force) and the ratio of the long-term unemployed to total unemployment. The source of the data is Eurostat.

Regional differences in unemployment are measured by the coefficient of variation. The coefficient of variation in the regional unemployment rate is the ratio of the standard deviation weighted by the district size to the average unemployment rate. The size of the coefficient of variation depends on the degree of disaggregation. Data for similar region sizes (e.g. NUTS 2 or NUTS 3) and the evolution of the coefficient of variation over time can be used for comparison. The source of the data is Eurostat.

The **Beveridge curve** is an instrument frequently used to differentiate between cyclical and structural unemployment (Jackman, Pissarides and Savouri, 1990; Petrongolo and Pissarides, 2001; Galuščák and Munich, 2007). It expresses the dependence between vacancies and unemployment. Decreasing (increasing) unemployment amid a rising (falling) number of vacancies is associated with changes in the cyclical component of unemployment, whereas

simultaneous movements of unemployment and vacancies in the same direction signal changes in structural unemployment. Simultaneous increases (decreases) in the number of vacancies and unemployment are linked with increases (decreases) in structural unemployment. Data on unemployment and vacancies are from the Ministry of Labour and Social Affairs (MLSA).

The CZSO publishes the volume of **internal migration** (movement between municipalities). Data on registered internal migration in other countries are published in statistical yearbooks. Since 2001, migration of foreigners with long-term residence (over 1 year) has been included in the statistics, whereas before 2001 only migration of Czech citizens and foreigners with permanent residence permits was monitored. Consequently, the pre-2001 data are not comparable with the more recent data. Another reason for this non-comparability is that the data for 2001 onwards include the results of the 2001 census.

2.3.2 International labour mobility

International mobility. The source of the data on registered international mobility for individual countries (immigration and emigration) is Eurostat, and the data on registered foreign employment in the Czech Republic are obtained from the MLSA.

The analysis of foreign employment and foreigners' earnings uses anonymised individual data from the Average Earnings Information System, which is maintained by Trexima for the Ministry of Labour and Social Affairs and contains businesses in the business sector with ten employees or more. The analysed set pertaining to 2006 contains 957,279 employees, while the set for 2002 comprises 541,145 employees. The aggregate results are weighted using weight coefficients and are thus representative at the level of all businesses with ten employees or more.

The decomposition of wage differences (foreigners vs. domestic employees, 2006 vs. 2002) into the contributions of the observed characteristics and the coefficients (the returns to characteristics, indicating possible discrimination) are calculated using the method described in Machado and Mata (2005) and Albrecht et al. (2003). The results are taken from Dyczak and Galuščák (2008).

The wage equations in the individual wage distribution deciles are estimated using quantile regression, with the explanatory variables being age, education, tenure, occupation and sector. The estimated coefficients are used in the decomposition of wage differences between foreigners and domestic workers (Machado and Mata, 2005; Albrecht et al., 2003) according to the relationship:

$$w_I^\theta - w_N^\theta = (\bar{x}_I^\theta - \bar{x}_N^\theta)' \hat{\beta}_N^\theta + \bar{x}_I^\theta' (\hat{\beta}_I^\theta - \hat{\beta}_N^\theta) + (\bar{\varepsilon}_I^\theta - \bar{\varepsilon}_N^\theta)$$

where w_I^θ and w_N^θ are the logarithms of the hourly wage of foreigners and domestic workers respectively, in decile θ . On the right-hand side of this equation, \bar{x}_I^θ and \bar{x}_N^θ represent the average observed characteristics, while coefficients $\hat{\beta}_I^\theta$ and $\hat{\beta}_N^\theta$ represent the estimated returns to the observed characteristics.¹⁵³ The third term on the right-hand side of the equation

¹⁵³ While the coefficients are derived from quantile regressions estimated for the first to the ninth deciles, the average characteristics are calculated on the basis of repeated random sampling. Nine observations are randomly selected from the sample and sorted by the hourly wage in ascending order. These observations represent the individual deciles. The whole procedure is performed 500 times for each group of employees, resulting in the

represents the residuals. The first term on the right-hand side thus expresses the contribution of the different observed characteristics between foreigners and Czechs. The second term represents the contribution of the difference in rewards to the observed characteristics, which can signify discrimination in rewards. The decomposition is not residual-free; the last term on the right-hand side may reflect bias in the estimated coefficients and, therefore, greater uncertainty surrounding this decomposition. The decomposition of wage differences was performed for 2002 and 2006 and for males and females.

In the next step we decompose the observed wage differences between 2002 and 2006 in the individual deciles θ . The decomposition takes into account that the wage w^θ in each decile can be expressed as a weighted average of the wage of domestic and foreign workers, where α^θ is the proportion of foreigners. The wage differences are decomposed using the relationship:

$$w_{06}^\theta - w_{02}^\theta = \left\{ \alpha_{06}^\theta (\bar{x}_{I,06}^\theta - \bar{x}_{N,06}^\theta) \hat{\beta}_{N,06}^\theta - \alpha_{02}^\theta (\bar{x}_{I,02}^\theta - \bar{x}_{N,02}^\theta) \hat{\beta}_{N,02}^\theta \right\} + \\ \left\{ \alpha_{06}^\theta \bar{x}_{I,06}^\theta (\hat{\beta}_{I,06}^\theta - \hat{\beta}_{N,06}^\theta) - \alpha_{02}^\theta \bar{x}_{I,02}^\theta (\hat{\beta}_{I,02}^\theta - \hat{\beta}_{N,02}^\theta) \right\} + \\ \bar{x}_{N,06}^\theta (\hat{\beta}_{N,06}^\theta - \hat{\beta}_{N,02}^\theta) + (\bar{x}_{N,06}^\theta - \bar{x}_{N,02}^\theta) \hat{\beta}_{N,02}^\theta + (\bar{\varepsilon}_{06}^\theta - \bar{\varepsilon}_{02}^\theta)$$

The total difference in the logarithm of the hourly wage between 2002 and 2006 is decomposed into five contributions. The first term in braces on the right-hand side of the equation is the contribution of the different characteristics of foreigners between 2002 and 2006, expressed as the difference vis-à-vis the characteristics of domestic workers. The second term in braces is the contribution of the different returns of foreigners between 2002 and 2006, expressed as the difference vis-à-vis the returns of domestic workers. The first term on the third line captures the contribution of the different returns of domestic employees between 2002 and 2006, while the second term on the third line is the contribution of the different characteristics of domestic employees between 2002 and 2006. The last term on the right-hand side is the part of the wage difference not explained by the other contributions.

2.3.3 Institutional environment

Coverage of employees by collective agreements. The relevant indicators in the area of institutional arrangements for collective bargaining include the degree of coverage by collective agreements. The data are taken from a harmonised ECB survey. The national part of the questionnaire was prepared by the CNB through its branches in 2007. The sample in the Czech Republic comprised 399 corporations. Weighted data were used for manufacturing, construction, trade and market services, excluding financial intermediation, in corporations with 20 employees or more.

Minimum wage. The relationship of the minimum wage to the average wage and to the wage in the first decile of the wage distribution, and the share of employees earning the minimum wage. The data used are from Eurostat and the Average Earnings Information System (MLSA).

The **Employment Protection Legislation (EPL) Index** is taken from OECD. The data for CZ and SK are the CNB's own calculations (only permanent employment for SK). The index

average characteristics for the individual deciles (for details see Albrecht et al., 2003, and Machado and Mata, 2005). The deciles represent wage distribution points; for example, the fifth decile is the median.

relates to 2003 and 2006. It consists of 18 items assessed in accordance with the Labour Code in force. These items are aggregated for the areas of permanent employment, temporary employment and collective dismissals. The 2007 and 2008 data for the Czech Republic were updated according to the Labour Code in force.

Costs of individual termination of an open-ended contract, in the number of days for which the wage has been paid since notice was given by the employer. This includes the number of days of notice, severance pay and the delay to start of notice. In the Czech Republic and Slovakia, these costs differ according to the notice reasons, and the number of wage-paying days will be higher in the case of redundancy dismissals. The indicator is therefore an average of the costs incurred when giving notice due to redundancy and for other reasons. In Austria, for similar reasons, this indicator is the average for higher and lower skilled persons.

Overall labour taxation (the “tax wedge”) is defined as social security contributions paid by employees and employers and income taxes relative to overall labour costs. This indicator is calculated in line with the applicable tax legislation for model types of households. The data are from OECD (2008b).

The average effective tax burden is described by **implicit tax rates**, which are calculated as ratios, with the numerator containing the sum of aggregate revenue from direct taxes (in some countries also indirect taxes paid by the employer) and social contributions paid by both employees and employers, while the denominator comprises total compensation of employees (data under ESA95 methodology). The disadvantage of this indicator is that it is dependent on the business cycle. Inflation and real income growth increase the tax component of implicit tax rates where the income tax is progressive. Social contributions, which are usually degressive with rising income, can have the opposite effect. The overall effect of the cycle on implicit rates depends on which of the two factors is dominant. The data on implicit tax rates are taken from Eurostat (2008).

Work-incentive indicators. The data on the **net replacement rates (NRRs)** are taken from OECD tax benefit models for individual types of households, persons in the initial phase of unemployment who are entitled to unemployment benefits and persons not entitled to unemployment benefits (inactive or long-term unemployed). More detailed data and the distribution of NRRs for the Czech Republic are calculated using a micro-simulation tax and benefit model (Galušćák and Pavel 2007). The calculations have been updated using the parameters valid in 2008.

Net replacement rates measure the extent to which the combination of taxes and benefits affects the financial gain from work and thereby the motivation of unemployed or inactive persons to enter employment. The NRR is defined as the ratio of net household income when the person under consideration is jobless to that when the same person has a job. Gross incomes of the other members of the household are supposed to be identical in both cases. NRRs only identify financial entitlements to social benefits. Provided that there is sufficient monitoring of the job-seeking activity of the unemployed, even high NRRs may be associated with sufficient job seeking incentives.

2.4 Product market flexibility

2.4.1 Administrative barriers to entrepreneurship

Administrative barriers to entrepreneurship. The index of barriers to entrepreneurship is taken from a paper by Conway, Janod and Nicoletti (2005), where it is a part of a broader OECD indicator assessing the degree of regulation on product markets. The index consists of

seven items aggregated in three areas: Administrative burdens on start-ups (Administrative burdens for corporations, Administrative burdens for sole proprietors, and Sector specific administrative burdens), Regulatory and administrative opacity (Licences and permits system, and Government communication and simplification of rules and procedures) and Barriers to competition (Legal barriers to entry into the industry – limitations on the number of entities, and Antitrust exemptions for public enterprises).

Later period data for the Czech Republic were updated according to amendments to the Commercial Code and the Trades Licensing Act.

The rankings of countries in the area of starting or closing a business are taken from the World Bank's Doing Business database (World Bank, 2008). As regards starting a business, number of procedures, time (days), cost and minimum capital requirements in % of income per capita are taken into account. The area of closing a business includes data on time in years, cost in % of total assets and recovery rate in cents on the dollar. The rankings include all countries in the database and have been recalculated for 2007 to account for changes in methodology and country selection. The rankings for previous years are not available; only partial data are published, from which the country rankings were derived.

2.4.2 Tax burden on businesses

The highest **statutory tax rates** are taken from Eurostat (2008). **Implicit tax rates on corporate income**, defined as the ratio of total tax revenues to the potential tax base (national accounts data under ESA95 methodology), are an additional indicator. In contrast to statutory rates, implicit tax rates take into account depreciation, amortisation and tax exemptions, hence they express the actual average effective tax burden on corporate income. Their disadvantage is that they depend on the business cycle. For example, a decrease in the statutory tax rate does not affect the implicit rates if it is offset by a broadening of the tax base. The data are taken from Eurostat (2008).

2.4.3 Costs associated with exit from the sector

As a result of the limited availability of internationally comparable data, the number of bankruptcies is compared with Western Europe region. The comparison is based on data from Verband der Vereine Creditreform for the original fifteen EU countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom) plus Norway and Switzerland.

Data of the Ministry of Justice of the Czech Republic on the number of insolvency cases in the Czech Republic represent the flows for the given year (except for the number of insolvencies in progress). They comprise the number of petitions filed in the given year, the number of petitions dealt with in the given year, the number of insolvency proceedings in progress and the number of insolvency proceedings opened in the given year.

2.5 Flexibility and shock-absorbing capacity of the banking sector

Indicators reflecting the size of credit risk and the extent of control over credit risk through the creation of reserves and provisions, and indicators showing business success in the banking sector were selected to assess the stability and shock-absorbing capacity of the banking sector.

Non-performing loans (NPLs)/total loans (%)

NPLs (in gross book value) in the banking sector (“loans in default” in Czech accounting terminology) as a percentage of total loans in gross book value express how large or how concentrated is the credit risk faced by the country’s banking sector. NPLs are loans that are classed as substandard, doubtful or loss loans.

Capital adequacy (%)

Capital adequacy is an aggregate indicator reflecting all activities of a bank (both balance sheet and off-balance sheet) as well as the potential losses (reducing profit) which a bank may incur from the risks it undertakes and the depreciation of assets through the creation of provisions and reserves. A bank’s capital adequacy should exceed the solvency threshold of 8% under the relevant CNB Decree and CNB Provision.

Capital adequacy expressed as the ratio of a bank’s capital to the corresponding coverage of potential losses from risks it undertakes assesses the outlook for the bank’s financial situation. Capital adequacy indicates its ability to cover potential future losses with capital. A bank is sufficiently solvent if best practices have been applied in risk assessment and all potential future losses connected with present risks will be or should be covered by shareholders’ equity.

In addition to this prudential function, capital is used to develop future business activities. The higher the capital adequacy, the better the bank is protected against risks, but the less it is using its potential earnings per unit of capital. By developing the bank’s business, shareholders – represented by management – increase the profit while retaining capital coverage of risks, i.e. within the limits of appropriate use of capital.

After-tax profit/assets (RoA, %)

This indicator can be viewed as a synthetic measure of the profitability of the banking business, aggregating the results of the extent and diversification of banks’ activities and the business risks undertaken. Under less stable conditions, the profitability indicator is more volatile; the negative values of this indicator in some countries reflect losses caused mostly by failure of the business risk management system, inefficiency and other factors.

Net interest margin (NIM, %)

$$\text{NIM} = (\text{interest income} - \text{interest costs}) / \text{interest bearing assets}$$
The indicator shows the rate of profitability and business success in banking. If rates on the interbank market fall, the margin on loans and deposits usually also decreases. This is a sensitive and less available indicator.

Net non-interest income/average assets (%)

The ratio of net non-interest income (from fees and commissions and other financial operations) to average assets. Banks’ net non-interest income does not include other operating revenues and costs. Banks generally show a tendency towards rising non-interest income if

the margin on interest-bearing bank operations declines, primarily through rising fees and commissions. The conduct of competitors is a significant corrective factor.

It is difficult to determine from the available data on net non-interest income whether other operating costs and revenues were included in addition to fees and commissions and other net income on financial operations. For technical reasons, the indicators for the EU and the euro area are usually calculated relative to assets at the year-end rather than to average assets. The ratio to average assets provides a clearer picture of the distribution of costs and revenues per unit.

Basic stress test scenarios

To assess the resilience of the Czech banking sector, stress tests are performed which subject banks to hypothetical changes in key macroeconomic variables. The CNB's unified stress testing methodology was used. The proposed scenarios consist of combinations of adverse changes in interest rates, the exchange rate and loan quality.

The selected baseline scenario assumes significant adverse changes and consists in a combination of a 2 percentage point increase in interest rates, a 20% depreciation of the exchange rate and a 3 percentage point increase in the ratio of NPLs to total loans. The effects of combinations of these shocks were assessed by comparing the capital adequacy ratio before and after the shocks affected banks' portfolios. The calculations assume that had no shocks occurred, banks would be generating the same profits as they averaged over the last five years; otherwise profits in the stress situation are lower than usual. In the case of insufficient profits, the impacts of the shock are subtracted directly from capital.

The scenarios are based on extreme historical shocks. In the Czech economy they relate to the mid-1997 experience of a depreciation of the exchange rate and a rise in interest rates. The scenario of a rise in the NPL ratio is based on developments in 1997–1999. The model situations will not necessarily repeat – the scenarios are of a cautionary nature and will not necessarily materialise.

The baseline historical scenarios were further developed and complemented with a macroeconomic stress test that uses consistent model scenarios derived from the CNB's prediction model. Credit models were used to estimate credit growth and the development of non-performing loans in bank portfolios, taking into account the expected evolution of macroeconomic variables (GDP growth, inflation, interest rates and the exchange rate). This resulted in a qualitative shift in the stress tests, which work with future shock scenarios of different degrees of probability.¹⁵⁴

¹⁵⁴ Summaries of the stress test results are included in the Financial Stability Reports published by the Czech National Bank.

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