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

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A INTRODUCTION

The Czech Republic has been participating automatically in the Economic and Monetary Union (EMU) since it joined the European Union and acquired the status of a Member State with a derogation from adopting the euro. Consequently, it is not currently a member of the euro area, but has committed itself to introducing the euro and joining the euro area in the future. Reaping mainly the microeconomic benefits associated with introducing the euro will depend on the resolution of the current fiscal problems in the euro area and subsequently on the ability of the Czech economy to operate without an independent monetary policy and without the possibility 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 monetary conditions in the euro area to the current situation in the Czech Republic. The ability to adjust rapidly to economic shocks will be another important factor.

This set of analyses of the Czech economy's alignment with the euro area in 2011 has been drawn up in line with the Czech Republic's Updated Euro-area Accession Strategy and assesses the current state of economic alignment in terms of long-term economic trends, the medium-term evolution of economic activity, the structural similarity of the Czech economy to the euro area economy, and the economy's ability to absorb and adjust flexibly to asymmetric shocks.

This set of analyses is a follow-up to the documents of the same name published by the CNB in previous years. This year's document in addition reacts to recent developments in the euro area and contains a new section on the economic alignment and public finance situation of euro area countries and on the institutional changes being made in response to the problems of some Member States. Changes in the economic and political framework of the EMU may alter the view on the economic benefits and costs of joining the euro area. Changes in the functioning of rescue mechanisms may imply new and unforeseen financial obligations for accession countries. From the perspective of future accession it is also necessary to monitor the use and impacts of the unconventional instruments applied by the European Central Bank.

The analyses of the Czech Republic's preparedness for euro adoption 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 potential asymmetric shocks using its own adjustment mechanisms.

These analyses are aimed at assessing the evolution of the alignment indicators over time and in comparison with selected countries. These countries either are euro area members already (Austria, Germany, Portugal, Slovakia and Slovenia) or aspire to such membership (Hungary and Poland).[1] 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-17 level.[2]

[1] The selection of euro area countries 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 related to 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-17 group comprises the euro area Member States as of 1 January 2011, i.e. Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain. Only in exceptional cases, owing to data unavailability, do the data not cover all EA-17 countries.

B EXECUTIVE SUMMARY

The Czech Republic's future entry into the euro area ensues from the commitments associated with EU membership. Adoption of the single European currency should lead to the elimination of exchange rate risk in relation to the euro area and to a related reduction in the costs of foreign trade and investment. This should further increase the benefits accruing to the Czech Republic from its intense involvement in the international division of labour. Besides the aforementioned benefits, however, adoption of the euro will simultaneously imply costs and risks arising from the loss of independent monetary policy and exchange rate flexibility vis-à-vis major trading partners. The benefits and the costs stemming from euro adoption will be affected by the characteristics and situation in both the Czech economy and the euro area economy. These factors will influence whether adoption of the euro by the Czech Republic will lead to an increase in the country's economic stability and performance.

Developments in the **euro area** in recent years deserve increased attention. On the one hand they are pointing to differences between the countries of the EMU, and on the other hand they are leading to a change in its institutional architecture and may therefore significantly alter the benefits and costs of euro adoption. For this reason, the Analyses include a new section devoted to the euro area itself. This section examines the alignment of the euro area countries' nominal and real variables (which affects their ability to operate within the currency area), the debt problems of some euro area members, and the reform steps and their impacts on the functioning and future enlargement of the currency area.

In its initial years, the euro area showed convergence in unemployment and the inflation rate, but this trend was interrupted during the crisis. By contrast, the differences in economic level (expressed as the variability of real GDP per capita) were widening until the start of the financial crisis and then decreased slightly. The differences in the annual growth rates of euro area economies suggest that their business cycles are not moving significantly into alignment. On the contrary, the differences have generally been widening in recent years owing to different timing and intensity of the onset of the recent recession. The impacts of the escalating debt crisis in 2011 offer little hope of improvement in the near future either. Long-term interest rates were gradually converging before the crisis, but the debt problems of some member countries have led to a sharp rise in misalignment in recent years. However, insufficient financial discipline is apparent in most EMU countries. Only three euro area countries are currently compliant with the Stability and Growth Pact criteria. In response to the problems, euro area countries' governments have modified and tightened macroeconomic and budgetary supervision. Rescue mechanisms have also been created for the euro area countries. In the event of joining the euro area in the future, the Czech Republic would probably become a member – and therefore also a co-financer – of the European Stability Mechanism (ESM). Upon its establishment, the ESM, in which the Czech Republic will be a shareholder, will probably assume (at least) the undisbursed and unfunded loans of the EFSF. In reality, this represents a significant expansion of the commitment to adopt the euro in the future.

The key factors for the **Czech economy** as regards the benefits and costs of euro adoption will be flexibility, resilience to shocks and sufficient overall economic and structural similarity to the euro area. As usual, the analyses presented in this document therefore 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 functioning of financial markets. As in previous years, the characteristics of the Czech economy as regards its preparedness to adopt the euro can be divided into four groups.

The first group consists of **economic indicators that speak in the long run in favour of the Czech Republic adopting the euro**. These include the high degree of openness of the Czech economy and its close trade and ownership links with the euro area. These factors provide for the existence of microeconomic benefits of euro adoption. Another favourable factor is the achievement of long-term convergence of the inflation rate and nominal interest rates, as this reduces the macrofinancial risks associated with euro adoption. The Czech financial sector is not a barrier to joining the euro area either, as it can help absorb economic shocks and – despite a temporary deterioration during the recent crisis – is strongly integrated with the euro area.

The second group comprises **areas which, in terms of euro adoption in the Czech Republic, pose a risk of macroeconomic costs, but which have shown some improvement in recent years**. The cyclical alignment of economic activity in the Czech Republic and the euro area has recently increased significantly according to all the analytical methods used. This, however, is largely due to the extreme global developments, so only in future years will it be possible to prove or disprove the hypothesis that greater business cycle alignment has been achieved in normal global economic conditions. As regards labour market flexibility the favourable developments also include a decrease in the ratio of the minimum wage to the average wage in past years. The ability to adjust nominal wages is indicated by the use of base wage freezes and bonus cuts by corporations in response to the fall in demand in 2009. In real terms, however, there has been no increase in wage flexibility so far. Regional differences in the unemployment rate have decreased. In terms of labour market flexibility, the positive factors also include an ability to make use of inflows of foreign labour at times of economic growth and, conversely, to reduce the number of foreign workers during economic downturns. The business climate is gradually improving, but some barriers to entrepreneurship persist and are still more significant than in the other countries under comparison.

The third group consists of **areas where long-term positive trends were disrupted by the global crisis and its repercussions remain evident despite some improvement**. The real economic convergence of the Czech Republic to the euro area observed until 2008 has halted in recent years. As measured by GDP per capita, the Czech Republic is more advanced than some of the least developed euro area countries, but this is evidently no guarantee of future smooth functioning of the economy in the EMU. Compared to the euro area average, moreover, a clear difference in the price level persists. The previous price level convergence trend was temporarily interrupted in 2009 as a result of a sharp depreciation of the koruna. It seems, however, that this trend was renewed at the start of 2010. The public finance deficit has deteriorated markedly as a result of the economic slump and the anti-crisis fiscal measures adopted. The public finance consolidation process has started, but the fiscal indicators are noticeably worse than before the crisis. In 2010 the total budget deficit was 4.8% of GDP and total government debt grew to 37.6% of GDP. The implemented and planned austerity measures will result in a reduction in the public budget deficit in the near future, but fundamental reforms focused on the long-term challenges relating to population ageing are so far only in the phase of preparation or legislative debate. The impacts of the previous economic downturn are also being reflected in a rise in long-term unemployment.

The fourth group contains **areas which are showing long-term problems in terms of the Czech economy's flexibility and ability to adjust to shocks and which are not showing any significant improvement**. Structural problems in the labour market ensuing from the configuration of taxes and benefits and from labour legislation are still leading to relatively high labour market rigidity, low incentives to work among part of the population and to employment inflexibility. The low or unsuitable skills of the long-term unemployed are also a persisting problem.

The following text in this section summarises developments in the individual areas analysed. Part D examines the economic convergence of euro area countries, debt problems and changes in the institutional architecture of the EMU. Detailed results of the analyses of the developments in the Czech Republic are given in Part E.

Situation in the euro area

Economic alignment of euro area countries is a basic prerequisite for the EMU to function smoothly. However, recent developments point to shortcomings in this area. The differences in economic level between member countries were widening until the start of the financial crisis. The subsequent decrease in differences is due to a larger fall in real GDP in wealthier countries. The differences in year-on-year growth rates across euro area economies indicate that their business cycles are displaying no major change in alignment. However, these differences widened in 2008–2010, as the economies were hit by recession in different quarters and to different extents. By contrast, the unemployment rate was converging, but in recent years unemployment has risen much more strongly in some countries, leading to divergence. Inflation showed a trend towards relative alignment after euro adoption, but the crisis years saw a temporary increase in misalignment. In recent years, the biggest and fastest-growing gap can be seen for long-term interest rates, which most of all reflect the differing magnitudes of the debt problems across euro area countries. The uneven developments across euro area countries and the financial market turmoil are creating a difficult situation for the European Central Bank, which on the one hand tightened its monetary policy in 2011 H1 by raising its key interest rate twice, but on the other hand is continuing its unconventional measures, including purchases of government bonds on secondary markets.

The **public finance situation** in many euro area members is currently putting the functioning of the euro area under the biggest pressure. At present, only three countries (Estonia, Finland and Luxembourg) meet the fiscal criteria laid down in the Treaty and detailed in the protocols annexed to it. In 2010, fourteen countries exceeded the budget deficit criterion (3% of GDP) and twelve were non-compliant with the debt criterion (60% of GDP). Although compliance with the Stability and Growth Pact had been patchy right from the establishment of the euro area, the problems escalated after the outbreak of the global financial and economic crisis.

Major changes are being made to the **institutional framework** in response to the euro area's problems. The future form of the economic and political organisation of the EMU may change the view of the economic benefits and costs of joining. Changes are being made in the macroeconomic and fiscal supervision and policy coordination areas. Compliance with the fiscal criteria is to be tightened and fiscal reform efforts are to be bolstered. In addition, assessment of macroeconomic imbalances is to be introduced. The rescue mechanisms put in place for the euro area imply new and unforeseen financial obligations for both present and future euro area members. In the event of joining the euro area in the future, the Czech Republic would probably also become a member – and therefore also a co-financer – of the European Stability Mechanism (ESM). According to current estimates, it would have to provide capital of about CZK 32 billion in the first five years after ESM entry, and in subsequent years its final commitment (i.e. the said paid-in capital plus callable capital) would reach CZK 350 billion (i.e. 9.4% of GDP). Upon its establishment, the ESM, in which the Czech Republic will be a shareholder, will probably assume (at least) the undisbursed and unfunded loans of the EFSF. In reality, this represents a significant change and an expansion of the commitment to adopt the euro in the future.

Cyclical and structural alignment of the Czech economy with the euro area economy

Assuming a stable and sustainable economic situation in the euro area, 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, but it is no guarantee of future smooth functioning of the economy in the EMU. 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 reduce the potential future pressures for growth of the price level and equilibrium appreciation of the real exchange rate. From the long-term perspective, the Czech economy is converging towards the euro area in real terms. However, this trend has halted – probably only temporarily – as a result of the financial and economic crisis. In the last three years, GDP per capita was about three-quarters of the euro area average. Owing to the crisis, the convergence process was also interrupted in the case of the price level of GDP. In 2010, however, this level increased slightly again to 67% of the euro area price level, although it remains below the level corresponding to the performance of the economy. The wage level in the Czech Republic in 2009 was roughly 36% of the average euro area level when converted using the exchange rate and about 54% when calculated using purchasing power parity data. The real exchange rate of the koruna (on an HICP basis) appreciated on average by 3.4% a year between 1998 and 2010, but is displaying significant fluctuations around its long-run trend. Some of these fluctuations can be sources of macroeconomic shocks, while others can help to absorb them. The koruna's appreciation in 2007 and the first half of 2008 (i.e. in a situation of high inflation and fast economic growth) had a stabilising effect on the Czech economy, as did the subsequent weakening of the Czech currency during the recession. According to the analyses, equilibrium real appreciation of the koruna against the euro at an average rate of 1.8–2.4% a year can be expected over the next five years. Continuing real appreciation of the exchange rate following euro area entry would therefore initially mean an increase in the inflation differential vis-à-vis the euro area and related lower (or even negative) real interest rates.

Alignment of economic activity and similarity of economic shocks will increase the likelihood that the single monetary policy in the monetary union will be appropriately configured from the perspective of the Czech economy. The analyses indicate increased correlation of overall economic activity between the Czech Republic and the euro area recently; the same goes for activity in industry and export activity. The rise in the monitored correlations, particularly in 2008–2010, including supply and demand shock correlation, should be assessed in the context of the recent global economic downturn and the subsequent gradual recovery in economic activity proceeding in parallel in the Czech Republic and the euro area. For this reason, only in future years will it be possible to prove or disprove the hypothesis that greater business cycle alignment has been achieved in normal global economic conditions.

Similarity of the **structure of economic activity** with the euro area should decrease the risk 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 services, particularly financial intermediation, compared to the euro area. The differences in structure have widened slightly further in recent years owing to a decline in the share of value added in industry in the euro area in favour of financial intermediation. The above-average share of the car industry in the total output and value added of the Czech economy compared to the euro area is (as in Germany) a possible source of asymmetric developments.

Fast convergence of **nominal interest rates** in the immediate run-up to joining the euro area acted as an asymmetric shock in some economies in the past, generating macroeconomic imbalances and risks to financial stability. For a country planning to enter the monetary union, earlier gradual interest rate convergence is therefore an advantage. The fact that the difference between Czech and euro area short-term market interest rates was close to zero for a long time is favourable from this perspective. A modest positive interest rate differential opened up in the second half of 2008 and widened further during 2009. Since the start of 2010, however, short-term market interest rate differentials have been falling and even turned negative in 2011. Government bond yield differentials peaked at the start of 2009 and also edged up in 2010 Q2 because of the euro area debt crisis. They then decreased, however, and are now also negative, owing mainly to rising average yields in the euro area.

Another indicator of the possibility of sharing a single currency is long-term co-movement in the **exchange rates** of two currencies against a reference currency. Compared to the other currencies under review, the correlation between the rates of the Czech koruna and the euro against the dollar was relatively high. Since 2000, this correlation has always declined only temporarily: during the fast appreciation of the koruna in 2001–2002 and later on in connection with the general surge in global financial market volatility after the fall of Lehman Brothers in 2008 H2 and 2009 Q1, when the Czech koruna – like the Hungarian forint and the Polish zloty – came under significant depreciation pressure. In 2010 H1, however, the correlation between the Czech koruna and the euro returned to its high pre-crisis level.

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 and the reduction in transaction costs. The euro area is the partner for 66% of Czech exports and 60% of Czech imports, a level comparable to, or even higher than, that in the other countries under review. The Czech economy's ownership links with the euro area on the direct investment inflow side are relatively strong and showing an upward trend. In 2009, foreign direct investment from the euro area exceeded 53% of Czech GDP.

Despite the smaller size of the Czech **financial sector** and its smaller depth of financial intermediation relative to the euro area, it can be expected to have a similar effect on the economy in normal economic conditions. The depth of financial intermediation in the Czech Republic, as measured by the ratio of financial system assets to GDP, is roughly one-quarter of the value for the euro area. The share of bank loans to the private sector is 56% of GDP in the Czech Republic, i.e. roughly two-fifths of that in the euro area. However, the current level of the aforementioned indicators in the euro area is not necessarily optimal, since in many countries it is more a reflection of private sector overleveraging.

The **structure of the financial assets and liabilities of Czech non-financial corporations and households** is gradually converging to that of euro area entities, but still shows differences. The difference is particularly visible in a higher share of trade receivables in corporate assets and a higher share of currency and deposits in household assets. The indebtedness of Czech corporations and households is still much lower than in the euro area countries under review. On the other hand, the above entities have lower assets. In the past, the **effect of money and financial market rates on client rates** in the Czech Republic was roughly the same as in the euro area. The global financial and economic crisis has led to slower transmission of monetary policy interest rates to the Czech economy owing to growth in the interbank market premium and some client risk premia. The maturity structure of new loans to non-financial corporations is similar to that in the euro area. The low degree of **spontaneous euroisation** in the Czech Republic is due to economic agents' confidence in the domestic currency and to sustained low inflation and low interest rates. The use of foreign currency is concentrated primarily in the sector of corporations involved in foreign trade.

The analysis of **integration of financial markets** (the money, foreign exchange, bond and stock markets) reveals that the speed of elimination of shocks in the individual segments of the Czech financial market was increasing in the pre-crisis period and the level of convergence did not differ much from that of the other countries under review. The only exception was the money market, which was already showing a lower degree and speed of integration in the pre-crisis period, mainly due to different monetary policy in the Czech Republic compared to other countries. The global crisis and its impacts led to a decline in the speed of adjustment and to loosening financial market integration in all the countries under comparison. The financial market situation started to improve in 2009 H2, and in 2010 the Czech Republic saw a return to pre-crisis values. The exception is government bond market integration, which is being affected by increased dispersion across the euro area due to rising yields on such bonds in euro area countries hit by the debt crisis.

Adjustment mechanisms in the Czech economy

Fiscal policy can be a stabilising element for the economy, but it can itself be a source of economic shocks if it is set inappropriately. The closer the structural part of the public budget deficit is to zero and the lower is the accumulated public finance debt, the more room there will be at a time of economic downturn for automatic stabilisers to function and discretionary measures to be implemented. The assessment of the **roles of the structural and cyclical components of the budget balance** shows that the Czech government deficits in past years were due mainly to non-cyclical effects – the total deficit was practically identical to the structural component. Fiscal policy was pro-cyclical for most of the period under review. Windfall tax revenues in 2006–2008 were not employed to reduce the fiscal deficit, but instead tended to be used to generate new public expenditures. Similarly, tax cuts affecting the revenue side were not ultimately accompanied by corresponding austerity measures on the public expenditure side, even during years of solid economic growth. Fiscal policy was counter-cyclical in 2009, when government anti-crisis and other measures were adopted. This led to a significant widening of the structural deficit. The public finance situation improved somewhat in 2010, when a fiscal consolidation process was commenced and the structural deficit was considerably reduced by budget austerity measures. According to the current estimate, the structural deficit should narrow further in 2011 and 2012 thanks to continuing fiscal consolidation. Although the Czech Republic's **total government debt** is lower than that of many EU countries, it has been growing significantly in recent years. The high share of mandatory expenditure combined with the expected effect of demographic changes on pension system and health care system expenditures also poses a risk to public finance sustainability.

Wage flexibility can enhance the economy's ability to absorb shocks to which the single monetary policy cannot respond. The analyses show that real wages in the Czech Republic, as in the other countries under comparison, did not have a stabilising effect at the macroeconomic level. However, nominal wages responded to the buoyant economic growth and subsequent sharp downturn in the appropriate direction, dampening the impact of the recession on the Czech labour market. In addition to base wage freezes and indexation, firms often adjusted bonuses and also used other alternative labour cost adjustment channels. Differences in **inflation persistence** in the monetary union countries could also lead to the single monetary policy having different impacts. Inflation persistence in the Czech Republic is medium-low among the countries under comparison.

The **labour market** is another important mechanism through which the economy can cope with shocks within the euro area. The present Czech labour market situation reflects the impacts of the recent economic downturn, with long-term unemployment rising since 2009 H2. Structural unemployment is hovering around 6%. This is one of the lowest figures among the countries under comparison. The Czech Republic still has relatively large differences in

unemployment across regions, although they have decreased somewhat in recent years. A large difference between households' supply of labour and businesses' demand for labour is also apparent for some professions.

Although the **international mobility** of Czech workers is not very high, the increase in foreign employment in the Czech Republic until 2008 H1 and its subsequent decline as a result of the economic slump can be regarded as economic adjustment ability. On the other hand, the use of foreign labour in the pre-crisis period indicated the persistence of some serious rigidities in the Czech labour market, as demand for low-skilled labour was not satisfied from domestic sources.

Labour market flexibility is determined to a great extent by the **institutional rules**. The effect of collective bargaining on wage setting in the Czech Republic is no higher than in the current euro area members. The ratio of the minimum wage to the average wage was rising until 2006. Since then it has been decreasing, however. This is important above all in low-skilled jobs, for which the negative impact of a high minimum wage on wage flexibility can be greater. The costs of dismissing employees in the Czech Republic are relatively high, particularly for open-ended short-term contracts. This should be resolved in the future by new legislation. In contrast to permanent employment, employment protection is low in the case of temporary employment. Overall labour taxation in the Czech Republic is relatively high, and increased slightly further in 2010. However, the implicit taxation rate, expressing the average effective tax burden, decreased in 2008 and 2009. The financial incentives to seek and accept a job are weak in the Czech Republic, particularly in low-income households with children.

In the area of **product market flexibility** the situation is showing some improvement. In particular, gradual steps are being made mainly to reduce the administrative burden on corporations. However, the domestic business environment remains in some respects (e.g. starting a business) more burdened with administrative obstacles than in most of the countries under comparison. The rate of taxation of Czech firms has decreased gradually in recent years and is one of the lowest among the countries under comparison.

Stability and effectiveness of the banking sector is a precondition for the sector to be able to assist in absorbing economic shocks. By contrast, an unsound financial sector can generate shocks and propagate them to the real economy. It can also cause problems in the fiscal area, as recent experience shows. The Czech banking sector displays very good macroprudential indicators such as profitability, capitalisation and liquidity and limited dependence on other countries. It is therefore not a source of shocks and should be able to absorb fluctuations emanating from the domestic economy or from abroad. The results of stress tests conducted on portfolios as of 30 June 2011 indicate that the Czech banking sector is also sufficiently resilient to extremely adverse macroeconomic and financial developments.

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 is often used to assess the appropriateness of adoption of the single currency by the existing 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 each economy. The main benefits are improved functionality of money and reduced transaction costs (including, for example, greater usability of the single currency, easier-to-compare prices, lower transaction costs and the elimination of exchange rate risk and the costs of hedging against it) and potentially also in increased macroeconomic and financial stability, reflected in a more favourable investment environment (thanks to the elimination of excessive exchange rate fluctuations, financial market integration and potentially an overall increase in the credibility of the monetary authority).[4]

The costs are broken down into non-recurring ones, associated with the change of legal tender,[5] and long-term ones. The latter include a reduction in the effectiveness of domestic macroeconomic policies and the risk of greater volatility in output and consumption, because with 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 real and/or financial shocks, on the degree of alignment of the business cycle with the cycle to which the monetary policy of the currency area responds, and on the ability of the economy to employ other adjustment channels.[6] Additional costs may arise from the build-up of imbalances in the monetary union as a result of suboptimal economic policy settings for individual economies and as a side effect of resolving the economic problems of monetary union members.

There is no consensus on the definition of an optimum currency area. The potential costs and benefits differ depending on the specific situation, and political decisions play a significant role

[3] 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). A recent paper worth mentioning is Dellas and Tavlas (2009). The authors describe the history of the optimum currency area theory over the last fifty years. In a summary of the modern empirical literature they show, among other things, that pegged exchange rates tend to be associated with higher GDP volatility.

[4] The enhanced macroeconomic stability and lower risk should 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 can be a drawback at times of financial crises, which can spill over to other countries as the recent situation has shown. Similarly, the latest developments show that a fall in interest rates and the elimination of exchange rate volatility can reduce the pressure for macroeconomic discipline in individual countries, with negative consequences.

[5] The non-recurring costs include the physical exchange of money, the conversion of all contracts to the new accounting unit, and similar costs. In the context of transition to another currency, there is also a 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] For new EU members planning to join the euro area, another possible cost is fulfilment of the Maastricht criteria prior to entry, especially the price stability criterion. A potential cost for converging countries is a persisting inflation differential, which may be reflected in a rise in nominal client rates and a fall in real client rates and may adversely affect the economy (the welfare cost of inflation theory – Hampl and Skořepa, 2011; Ahrend et al., 2008; Taylor, 2009; Martin, 2010).

in the choice of exchange rate regime. This aspect is emphasised by Eichengreen (2008), who highlights the differences in the architecture and functioning of the EMU compared to previous monetary unions. Similarly, there is no method which can in practice 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 applied to identify potential sources of macroeconomic imbalances associated with entering the monetary union and to assess the economy's ability 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.[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 not only that the ability to benefit from a monetary union and the risks of unbalanced developments in a monetary union can be affected by appropriate reforms, but also that large shifts seem to result from the very introduction of the single currency (the "endogeneity hypothesis", Frankel and Rose, 1998).[9] 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.

The conclusions of empirical analyses for the euro area have evolved over time. The review article by De Grauwe and Mongelli (2005) found support primarily for the endogeneity hypothesis, i.e. that the similarity of economic shocks probably increases with greater

[7] 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. A meta-analysis of this literature (Havránek, 2009) in fact demonstrates that the effect of euro adoption on trade between euro area countries is not statistically significant and with high probability is less than 5%. The first article Rose (2000) finds effects of hundreds of per cent, while Micco, Stein and Ordonez (2003) measure just a few per cent for the euro area.

[8] In the event of an asymmetric shock, fiscal policy can assist by means of either automatic 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). Nevertheless, discretionary fiscal measures regained importance during the recent financial and economic crisis.

[9] 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. Greater trade integration can lead to greater business cycle correlation (Frankel and Rose, 1997). 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.

economic integration. Babetskii (2005) shows an increase in the correlation of demand shocks in new EU member countries with the euro area and Germany amid rising trade integration. By contrast, Giannone, Lenza and Reichlin (2009) state that euro adoption has not significantly changed the characteristics of member countries' business cycles, as countries with lower long-run volatility retain this characteristic after euro area entry. Likewise, the trend in countries with historically higher volatility in economic activity and lower business cycle correlation with the euro area average persists. 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. Similarly, Frankel (2008), despite believing that the endogeneity hypothesis applies in the euro area, considers the risks of asymmetric shocks in the transitory phase to be substantial; on the other hand, alignment increases over time even without euro adoption. Frankel therefore recommends that the new EU Member States should wait. The experience of the recent global financial and economic crisis also suggests that increasing financial market integration is not unequivocally favourable for the healthy functioning of an economy in a monetary union. An analysis of the causes of non-fulfilment of the endogeneity hypothesis is provided, for example, by De Grauwe (2010). EEAG (2011) emphasises the significance of structural differences across economies in the monetary union and the resulting economic and financial divergence.

The empirical literature analysing the nature of economic shocks hitting the euro area countries is divided. Giannone and Reichlin (2006), Eickmeier (2007) and Stavrev (2008) find the significance of common shocks to be decisive in explaining the variability of economic output. The increase in the significance of common shocks is attributed to the effect of the single monetary policy on the synchronisation of cycles. The GDP growth differences among the euro area countries are mostly due to idiosyncratic shocks, i.e. shocks characteristic of individual countries. However, different transmission of common shocks, i.e. shocks hitting the entire euro area, can also have an asymmetric effect. However, the effect of this channel is found to be rather small. In this regard, European Commission (2008) sees risks mainly in the effect and spillover of global imbalances, demand for commodities and their prices, and in the implications of population ageing. 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. European Commission (2006), in addition to the importance of common shocks, emphasises the significance of idiosyncratic shocks affecting individual countries, in particular a fall in the risk premium after euro adoption, an easing of the monetary conditions, and the development of productivity in the tradable and non-tradable sectors. As a result of the monetary policy response, these shocks can also have secondary impacts on other countries. Ahrend et al. (2008) and Taylor (2009) point out that an excessive decrease (compared to that implied by the Taylor rule under independent monetary policy) in long-term interest rates after the adoption of the single currency in some economies gave rise to bubbles in asset markets, property markets in particular.

On the occasion of the 10th anniversary of the euro area, numerous papers focused on assessing its real benefits (see, for example, Mackowiak et al. (eds.), 2009). The undoubted benefits include the achievement of price stability. In other areas, however, the assessment is less clear-cut. European Commission (2008) arrived at a generally positive assessment, while admitting that the growth potential of the euro area remained low and significant differences persisted in inflation and unit labour costs across the individual countries. Giannone et al. (2009) found that the growth of the euro area in 1999 had been lower than would correspond to historical experience and the observed evolution in the USA. At the same time, there had been no change in the correlations of economic cycles between individual countries. Hurník et al. (2010) also point to an absence of the expected benefits for the real economy (2010).

The latest literature (e.g. Gros and Alcidi, 2010; Wyplosz, 2010 a,b) critically examines the experience of the euro area during the crisis and the efforts to strengthen fiscal policy coordination. Eichengreen (2009) considers the global crisis of 2008–2009 to be textbook example of an asymmetric shock, but he also claims that small European countries are better off inside the euro area during a crisis. Hankel et al. (2010) argue that the euro area is not in essence an optimum currency area and that the endogeneity hypothesis has not been confirmed. On the contrary, they say that the periphery economies are diverging from the core of the euro area. They also conclude that the crisis did not cause euro area problems, but has merely highlighted them.

D ECONOMIC (MIS)ALIGNMENT OF EURO AREA COUNTRIES

The global financial and economic crisis revealed structural weaknesses in some economies and their public finances, as well as low institutional readiness of the EU and the euro area to resolve such situations.[10] There is an increasing debate about the internal economic cohesion of euro area countries and their ability to function within a single currency area. The continuing or even deepening debt problems of some euro area countries are leading to the adoption of reforms and rescue measures that are having large impacts on the functioning and future enlargement of the currency area. It is thus important for countries that have undertaken to adopt the euro, such as the Czech Republic, to closely monitor institutional and economic developments in the euro area countries and in the euro area as a whole in addition to their domestic parameters of economic alignment with the euro area.

1 ANALYSIS OF EURO AREA ECONOMIC COHESION

Following the recent global recession and the current debt crisis, an increasing number of people believe that it was not very appropriate to form a monetary union in the current composition of differently performing economies. Despite having met the Maastricht criteria prior to euro adoption (thanks only to inaccurate statistics in the case of Greece), the euro area countries are heterogeneous and the differences now seem to be widening even further. This section analyses the evolution of the alignment of these countries over time on the basis of simple descriptive statistics of key macroeconomic indicators.

1.1 CONVERGENCE OF REAL AND NOMINAL VARIABLES

The pursuit of a single monetary policy requires economies to be aligned in terms of their business cycles. Such alignment is aided by the similarity of structural variables, in particular GDP and structural unemployment.

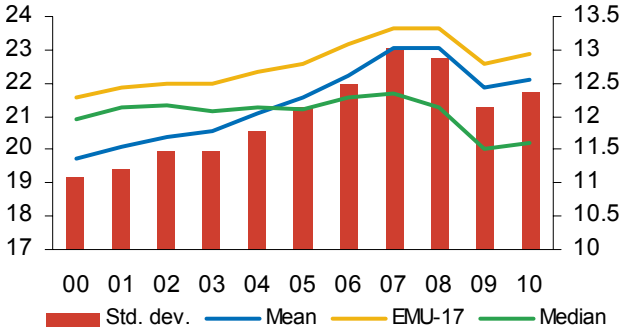
Chart 1 illustrates the evolution of the weighted and simple average of GDP per capita expressed in purchasing power parity in euro area countries and its standard deviations. The chart shows that the differences in economic level between member countries had been widening before the onset of the financial crisis and then decreased slightly. The decrease in dispersion was mostly due to a larger fall in real GDP in wealthier countries than in poorer countries in 2009.

In the period under review (2000–2010) there were only two changes in the relative level of economic activity per capita (Slovenia overtook Portugal and the Netherlands dropped below Austria and Finland). On the other hand, some degree of (beta-)convergence occurred, as shown in Chart 2, where we can see that poorer countries tended to outperform wealthier ones in the period under review. Italy deserves mention as being the only country to record a decline in real GDP per capita in the period under review.

The standard deviation of quarterly year-on-year growth rates in the economies under review shows no trend (Chart 3). This indicates that their business cycles are displaying no major change in alignment. However, the dispersion of the countries' growth rates widened in 2008–2010, as the economies were hit by recession in different quarters and to different extents (as measured by the length and depth of the recession).

[10] The fiscal crisis and its possible implications for the euro area and also for euro adoption in the Czech Republic were discussed in Box 1 in last year's Alignment Analyses.

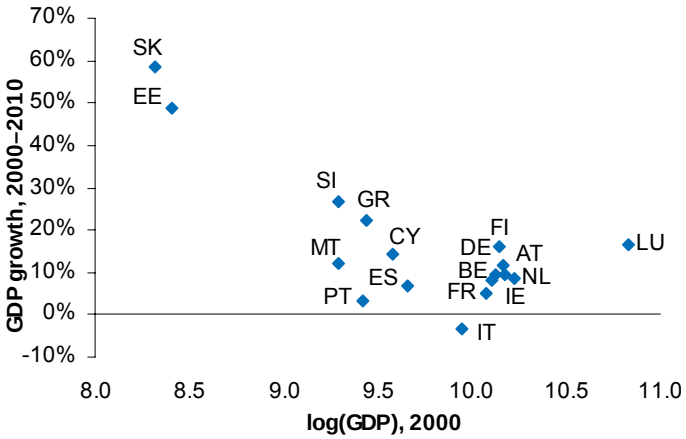
Chart 1: Real GDP per capita in euro area countries (EUR thousands)



Note: Right-hand scale – standard deviation. The EMU-17 aggregate is created by dividing the real GDP of the euro area countries by the population.

Source: Eurostat, CNB calculations.

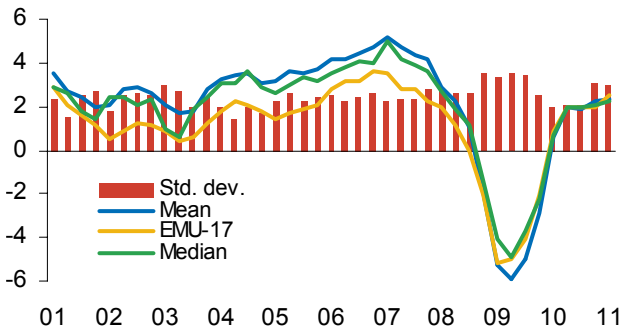
Chart 2: Beta-convergence of real GDP in euro area countries



Source: Eurostat, CNB calculations.

By contrast, the unemployment rate (see Chart 4) is following a trend. The differences in the unemployment rate were on a downward trend as from 2000, mainly because of falling unemployment in the countries with the highest rates (Slovakia and Spain). During the financial crisis, conversely, unemployment rose in almost all countries and the rates in the hardest hit countries (Spain, Estonia, Slovakia, Ireland and Greece) started to diverge from the other countries, resulting in a dramatic increase of the mean above the median and widening gaps between countries.

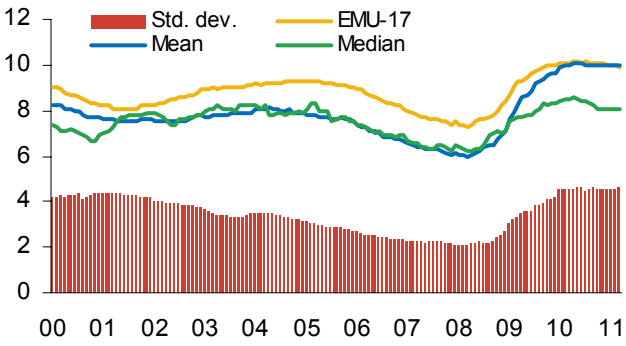
Chart 3: GDP growth in euro area countries (y-o-y, %)



Note: The EMU-17 aggregate represents GDP growth in the euro area as a whole.

Source: Eurostat, CNB calculations.

Chart 4: Unemployment in euro area countries (%)



Note: The EMU-17 aggregate represents unemployment in the euro area as a whole.

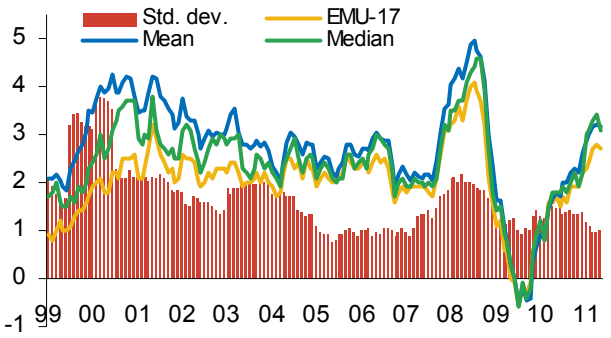
Source: Eurostat, CNB calculations.

The convergence of nominal variables reflects the success of the single monetary policy in the context of other economic policies. The differences in long-term interest and inflation rates signal structural differences and lead to differing real interest rates with different impacts on the real economy.

Chart 5 shows that inflation showed a trend towards relative alignment after euro adoption, but the crisis years saw a temporary increase in misalignment. Long-term interest rates recorded a similar trend, i.e. gradual convergence in the pre-crisis years (see Chart 6). Here, the increasing misalignment in recent years is due to a sharp rise in interest rates in countries

with debt problems. This rise is also the cause of the increase of the mean above the median long-term interest rate.

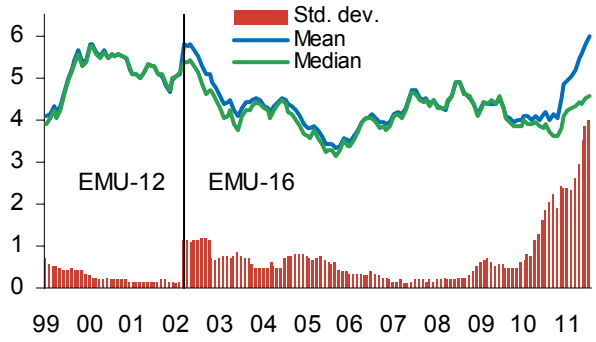
Chart 5: The inflation rate in euro area countries (y-o-y, %)



Note: The EMU-17 series is a weighted average of the inflation rates of euro area countries, where the weights are the shares of household expenditure of the given countries in household expenditure in the euro area.

Source: Eurostat, CNB calculations.

Chart 6: Long-term interest rates in euro area countries (%)

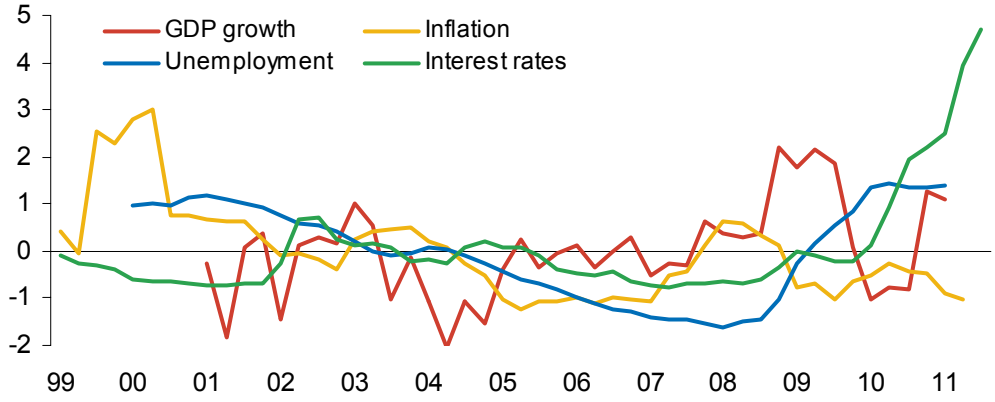


Note: Bond yields for the convergence criteria. The bond maturity is about ten years. Estonia is not included in the chart because a sufficiently long time series is not available (hence the EMU-16).

Source: ECB, CNB calculations.

In sum, the degree of alignment of euro area economies – besides their evident fiscal misalignment (see section 1.2) – can be shown on the levels of key macroeconomic variables (GDP growth, the unemployment rate, the inflation rate and interest rates) using normalised standard deviations (see Chart 7). Negative (positive) values indicate that the dispersion of a variable is below (above) the long-term average. All variables saw increasing relative alignment until the financial crisis broke out. Some difference was observed in the case of the higher variability of the normalised standard deviations for GDP growth. After 2008, there is a clear upward trend in the misalignment of the variables, except for the inflation rate, whose dispersion – after rising temporarily in 2008 – fell back below the long-term average owing to a decline across countries. The biggest and fastest-growing gap can be seen for long-term interest rates, which most of all reflect the differing magnitudes of the debt problems across euro area countries; however, these problems are also reflected in greater misalignment of real variables.

Chart 7: Evolution of the alignment of the variables under review



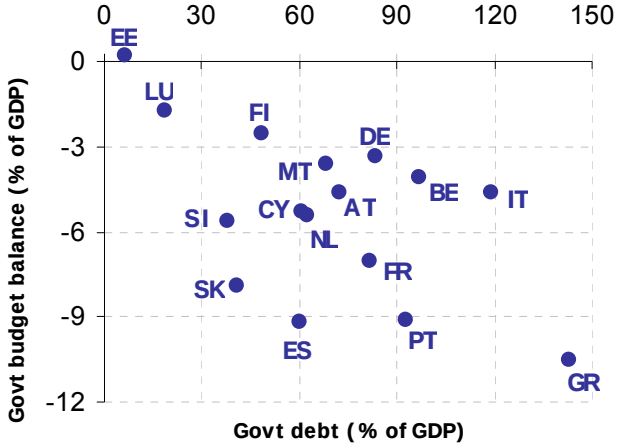
Note: The individual series in the chart depict the normalised standard deviations of the given variables.

Source: ECB, Eurostat, CNB calculations.

1.2 FISCAL POSITIONS IN THE EURO AREA

The evolution of the euro area countries' fiscal positions also points to the degree of alignment and to the perils stemming from the fiscal indiscipline of some EMU members. Chart 8 clearly shows the current sizeable differences in compliance with the Stability and Growth Pact (deficit and debt criteria). At present, only three euro area countries (Estonia, Luxembourg and Finland) meet both criteria. Two others (Slovenia and Slovakia) are at least compliant with the debt criterion. At the opposite end of the spectrum are Greece and Ireland, which are nowhere near compliant with either criterion. Fulfilment of the fiscal criteria, however, has been a sore point of the euro area since its creation. Chart 9 shows the number of countries in breach of the Stability and Growth Pact and the number of countries in an excessive deficit procedure (EDP) each year. The fiscal imbalance has thus increased over time and is the main source of the euro area's current problems.

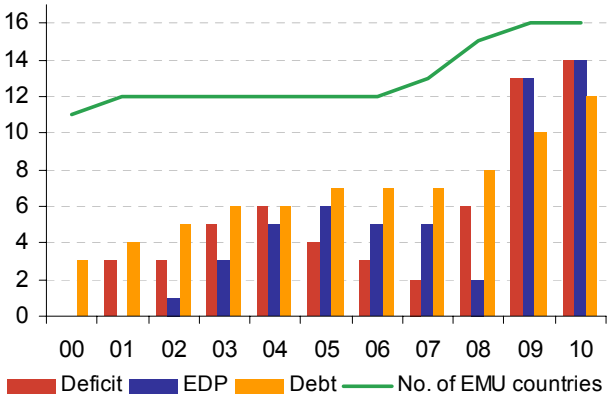
Chart 8: Fiscal positions in the euro area



Note: 2010 data The chart does not include Ireland, whose deficit was 32.4% of GDP and whose debt reached 96.2% of GDP. Estonia, which joined the euro area in 2011, is included for illustration. Countries compliant with the Stability and Growth Pact lie in the grey area.

Source: Eurostat.

Chart 9: Compliance with the fiscal criteria



Note: The number of countries not compliant with the Stability and Growth Pact, which sets limits on government deficits (3% of GDP) and debt (60% of GDP). The EDP series shows the number of countries in an excessive deficit procedure. The number of countries in an EDP can be higher than the number of countries with an excessive deficit, as EDPs usually last several years.

Source: ECB, Eurostat, CNB calculations.

2 CHANGES IN THE ECONOMIC POLICY COORDINATION FRAMEWORK AND STEPS TAKEN IN CONNECTION WITH THE ESCALATION OF THE EURO AREA DEBT CRISIS

The institutional architecture of the euro area is currently being overhauled.[11] The basic pillars of the functioning of the euro area in the economic policy area have been rebuilt compared to when the Czech Republic joined the EU and undertook to adopt the euro. The main principles of operation of the euro area, such as the Stability and Growth Pact, the no bail-out clause and the prohibition of monetary financing, have come under strong pressure. The future form of the economic and political organisation of the EMU may thus change the view of the economic benefits of euro area membership for the Czech Republic.

[11] This section describes the situation as of 31 October 2011.

Many changes are being made in the area of **macroeconomic and fiscal supervision**. The first "European semester", integrating previously independent EU economic policy processes, started in January 2011. The *Convergence/Stability Programmes* and *National Reform Programmes* setting out the Member States' planned economic policy measures are now assessed jointly by Ecofin. The European semester is organised so that the recommendations are available in time for countries to prepare their key national economic documents for the following year, in particular their draft state budgets. The recommendations issued to the euro area as a whole in 2011 include strict adherence to the time limits for correcting excessive deficits and to the medium-term budgetary targets, using any fiscal windfalls to accelerate adjustment.[12] In the **structural policy** area, the reform process gained a political boost in euro area countries in 2011 in the form of the *Euro Plus Pact*.[13]

An important change in the **economic governance in the EU** is a package of six legislative measures known as the *Six Pack*.[14] These measures, which are planned to come into effect in 2012, are intended to significantly enhance budgetary and macroeconomic surveillance in the EU. The main new elements of the preventive part of the Stability and Growth Pact will include rules for public expenditure growth.[15] A sanction mechanism should also be applied in this phase of budgetary surveillance. Under the excessive deficit procedure sanctions of up to 0.5% of GDP may be imposed on euro area members (repeatedly in the event of long-term non-compliance with the Council's recommendations).[16] The sanctions take the form of either an interest-bearing deposit deposited by the country on the European Commission's account in the preventive part or a non-interest-bearing deposit or fine in the corrective part.[17] Stricter budgetary surveillance therefore also entails high potential costs for euro area countries if they fail to comply with the recommendations and rules. In addition, under the *Excessive Deficit Procedure* (EDP) the role of the debt criterion will be significantly increased and a rule will be set for the pace of reduction of government debt. The new directive on national budgetary frameworks is supposed to enhance the ability to meet the commitments arising from EMU membership and enhance the budget process. The introduction of the new *Excessive Imbalance Procedure* (EIP) is meant to improve economic policy coordination in combating excessive macroeconomic imbalances and prevent the emergence of such imbalances in the future. The EIP, like the SGP, contains an enforcement mechanism in the form of financial sanctions limited to an interest-bearing deposit and a fine of 0.1% of GDP.[18,19] The EIP decision-making process will be based on the assessment of a scoreboard and to some extent should be automatic using *Reversed Qualified Majority Voting* in the Council,[20] which will also be applied in the Stability and Growth Pact. In addition, the EIP will take into consideration the

[12] Other recommendations include introducing or reinforcing strong national budget frameworks, implementing reforms to social security system, improving the functioning and stability of the financial system, pursuing tax reforms which give priority to growth-friendly sources of taxation, and enhancing competition in service sectors.
[13] The EU's key strategic document in the structural reform area is the new *Jobs and Growth Strategy* of 2010 (known as *Europe 2020*), which should – via improved economic policy coordination – increase the EU's potential in the field of sustainable economic growth and competitiveness. The Czech Republic has decided not to join the Euro Plus Pact yet.
[14] The Six Pack consists of amendments of the preventive and corrective parts of the Stability and Growth Pact (SGP), a regulation on the effective enforcement of budgetary surveillance in the euro area, a regulation on the prevention and correction of macroeconomic imbalances, a regulation on enforcement measures to correct excessive macroeconomic imbalances in the euro area and a directive on requirements for national budgetary frameworks.
[15] The rules for public expenditure growth, together with a change in the structural budget balance, will be used to assess the adequacy of fiscal consolidation efforts, including within the preventive part of the SGP.
[16] To give an idea, if the Czech Republic had the euro, its GDP-based sanction would be about CZK 18.6 billion in 2011.
[17] The aim of the preventive part of the Stability and Growth Pact is to prevent excessive budgetary imbalances. The corrective part, whose main element is the excessive deficit procedure, is meant to ensure timely correction of excessive budget deficits and government debt.
[18] In this case the hypothetical sanction for the Czech Republic would be about CZK 3.7 billion.
[19] An important aspect regarding considerations about future euro adoption is that the sanction mechanism will initially apply only to euro area countries. However, the sanctions are to be widened to all EU countries in the future in the form of suspension/elimination of claims for financing from the EU budget.
[20] The Ecofin Council will reject the Commission's proposals only if the Council decides to do so by qualified majority.

specific nature of the macroeconomic imbalances in individual EU Member States and scope will be provided for country-specific *in-depth reviews*.

The **rescue mechanisms for safeguarding financial stability in the euro area** have been revised following the escalation of the debt crisis in the euro area. In December 2010, the European Council decided to extend the euro area rescue mechanisms from three years to an unlimited period. It was also decided that the *European Stability Mechanism* (ESM) would become the direct successor of the *European Financial Stability Facility* (EFSF) in mid-2013.[21] The ESM will be activated only in situations where the stability of the euro area as a whole is endangered. The granting of financial assistance to euro area countries unable to meet their commitments will moreover be strictly conditional on the fulfilment of economic conditions.[22] The provision of assistance to indebted countries commenced in May 2010. The establishment of the EFSF and the ESM conflicted with the *no-bailout clause* in the current *Treaty on the Functioning of the EU*.[23]

The operational parameters of the EFSF and ESM were modified at an **extraordinary summit of euro area countries** in July 2011. Besides providing standard loans and intervening in primary government bond markets, these institutions will be able to provide conditional preventive support and assistance to governments for recapitalising financial institutions (including in countries with no economic adjustment programme) and to intervene/purchase government bonds of crisis-hit countries in secondary markets. At the same time, it was decided to raise the real lending capacity of the EFSF to EUR 440 billion by the end of 2012. This decision was ratified by the parliaments of all euro area countries during October. Euro area representatives also agreed that a new loan would be disbursed to Greece under the EFSF and that Greek bonds held by private investors involved in the country's rescue would be guaranteed by bonds issued by the EFSF.

A summit of euro area countries held on 26 October 2011 announced an extraordinary and unique agreement to write off half of the Greek debt held by private investors so as to reduce the Greek government debt to 120% of GDP by 2020. It was also agreed to leverage the capacity of the EFSF to EUR 1 trillion. This will be achieved by paying default risk insurance for these securities from EFSF funds to private entities investing in government bonds of crisis-hit euro area countries, and by raising additional funds with a combination of resources from private and public financial institutions and investors (through special purpose vehicles) in order to enlarge the resources available to lend from the EFSF, recapitalise banks and buy government bonds in the primary and secondary markets. The euro area also agreed to make additional changes to national fiscal frameworks and rules, to increase the role of the Commission in national budget processes and to modify euro area administrative structures. The European Council (EU Summit) preceding the above meeting of the Heads of State or Government of the euro area agreed to increase in capital ratio of banks in the EU to 9% of Tier 1 capital. Banks will have to meet this new requirement by June 2012.

[21] It was also decided that the *European Financial Stabilisation Mechanism* (EFSM), with its lending capacity of EUR 60 billion, most of which (EUR 48.5 billion) had been used up to provide assistance to Ireland and Portugal, would no longer be used. Loans provided from the EFSM are guaranteed by all EU Member States (including the Czech Republic) in proportion to their contributions to the financing of EU policies. Unlike the intergovernmental ESM and EFSF, which the Czech Republic as a non-euro area country does not participate in, guarantees on EFSM loans are a potential future Czech public budget expenditure if debtor countries are unable to meet their obligations.

[22] The ESM will be able, exceptionally, to purchase government bonds on the primary market. The rescue measures will be financed through borrowing by the ESM on international financial markets and potentially through direct involvement of the private sector.

[23] In March and July 2011 the European Council decided to extend Article 136 of the Treaty in order to define the basic parameters of the ESM. The revision of the Treaty is currently with the EU Member States for ratification. However, a Treaty establishing the ESM is being prepared on an intergovernmental basis outside the framework of EU law, so Article 136 of the Treaty is not the legal foundation of the ESM. The real reason for changing the Treaty by amending Article 136 is the need for legal certainty in Germany, where EU primary law is part of the constitutional order.

The key thing from the Czech Republic's perspective is that it will probably be expected to become member and co-financer of the ESM in the event of joining the euro area in the future. According to the current version of the ESM Treaty, the mechanism will operate with a capital stock of EUR 700 billion.[24] The contribution key that determines the size of the member countries' capital contributions is based on the subscribed capital of the ECB. Less advanced countries (those with a GDP per capita ratio of less than 75% of the EU-27 average) have been granted a more favourable key for a temporary period of 12 years. Theoretically, if it were a euro area member, the Czech Republic would currently rank among these economies.[25]

It is possible that on becoming an ESM member, the Czech Republic – besides being required to subscribe the relevant share of the ESM capital stock and being ready to supplement the ESM's capital – would have to guarantee *pro rata* the outstanding obligations arising from loans provided from the EFSF. The Czech Republic did not have the option of participating in the negotiations on the conditions for the provision of assistance from the EFSF.[26]

The creation of rescue mechanisms for euro area countries can be regarded as a consequence of the evolution and transformation of economic and financial conditions globally and in the EU and the euro area since the Czech Republic joined the EU in 2004. However, these changes, including those ensuing from the July 2011 euro area summit, **in fact constitute political pressure to link the issues of euro area entry and ESM accession and therefore represent a significant expansion of the commitment to adopt the euro in the future.** For the Czech Republic, adopting the euro would entail additional and unforeseen financial commitments. Such commitments, whose expected amount is based on a combination of the size of the guarantees provided and the probability that they will have to be paid, would be quite high for the Czech Republic over the next few years. This does not mean, however, that they will always be high. If the euro area and its member countries rid themselves of their fiscal problems and implement the necessary reforms, the Czech Republic's expected commitments arising from euro adoption could fall to an acceptable level as a result of a marked reduction in the probability of calls on guarantees materialising.

In addition to the aforementioned steps taken by euro area countries and EU institutions, the **policy of the European Central Bank** (ECB) played an important role in the response to the deepening debt crisis in the euro area last year. In reaction to the escalation of the debt crisis the ECB in 2010 relaxed its requirements for the quality of the collateral accepted in its refinancing operations and continued to accept government bonds of the countries hit by the fiscal crisis for these purposes. Under its *Securities Market Programme*, the ECB this year continued to buy large amounts of government bonds of crisis-hit countries on secondary markets. It also twice raised its key interest rate in 2011 in response to rising inflation and

[24] The capital stock will be divided into EUR 80 billion of paid-in shares and EUR 620 billion of callable shares, which take the form of an undertaking to pay cash on demand. The creation of a reserve fund and other buffers to improve the lending conditions so as to achieve a high credit rating for the ESM and hence also favourable borrowing rates reduce the total lending capacity of the ESM to about EUR 500 billion.

[25] According to the current exchange rate, the corrective key would tentatively mean the Czech Republic providing capital of about CZK 32 billion in the first five years after ESM entry (i.e. one-fifth of this amount each year, 0.9% of GDP overall) and undertaking to provide additional capital of about CZK 250 billion (6.7% of GDP) if necessary. Twelve years after euro area entry, however, any entitlement to the corrective key will end and the only key deciding the contribution to the mechanism will be that for the subscribed capital of the ECB. The Czech Republic's final commitment would then be about CZK 40 billion (1.1% of GDP) of paid-in capital and an obligation to provide an additional CZK 310 billion (8.3% of GDP) if necessary.

[26] The paid-in capital of the ESM will be invested in the capital markets and income from such investment in excess of the paid-in capital limit can be paid to member states in proportion to their paid-in capital in the form of dividends. The establishment of the ESM as an international financial institution with a relatively high share of paid-in capital guarantees that the bonds issued by the ESM to raise funds for its needs will be debited to the ESM and not to participating member countries. On the other hand, the ESM capital paid in by individual countries will – if these countries use government bond issues to raise the necessary funds – correspondingly increase the countries' general government debt. The same applies to the potential use of callable capital.

accelerating economic growth. The ECB then continued to supply liquidity to the euro area banking sector through refinancing operations conducted for still quite long periods at fixed rates and with full allotment. This testifies to evident tension in the monetary policy of the ECB. On the one hand, the ECB tightened monetary policy in reaction to real economic developments in the euro area as a whole, and particularly in the fast recovering economies led by Germany. On the other hand, it is maintaining its monetary measures to reduce the costs of financing the southern countries' governments. This fact reflects the economic heterogeneity of the euro area. The situation described above is instructive for EU countries outside the euro area, including the Czech Republic.

In addition to the above changes mainly concerning euro area economic policies and their coordination, there are some institutional reforms that directly affect non-euro area countries as well. The EU as a whole is still in a phase of continuing intensive **reforms of the regulatory and supervisory framework** for the financial sector. The declared goal of these reforms is to implement better consumer and investor protection and an adequate crisis resolution mechanism. A direct outcome of the reform process was the establishment in January 2011 of the *European System of Financial Supervisors* (ESFS), consisting of the *European Systemic Risk Board* (ESRB) and the *European supervisory authorities* (ESAs). The ESRB is responsible for the macroprudential oversight of the financial system in order to contribute to the prevention or mitigation of systemic risks to financial stability and the stability of the financial sector in the EU. The *European Banking Authority* (EBA) is one of the aforementioned ESAs focused on microprudential supervision. The EBA inherited all of the tasks of the *Committee of European Banking Supervisors* (CEBS) and has been assigned a number of new tasks. The EBA has so far conducted two rounds of stress tests of the banking sector. The ESAs also include the *European Securities and Markets Authority* (ESMA) and the *European Insurance and Occupational Pensions Authority* (EIOPA). Besides the establishment of these new authorities, other changes are under preparation in the financial markets area.[27]

3 CONCLUSION

The process of changing the institutional architecture of the euro area is also changing the economic benefits and costs of the Czech Republic's membership of this monetary union. On the one hand, concrete steps are being taken to resolve problem areas of the economic and political framework of the euro area. This should lead to a desirable improvement in the economic performance and functioning of the euro area. However, it will take time to evaluate the impacts of the measures already taken, and the fact that new reform steps are constantly being added may make it more difficult to identify which measures were useful and which were not.[28] At the same time, the measures adopted imply a sizeable increase in the (potential) financial costs associated with adopting the euro overall. The heavy new workload will also probably make economic policy coordination in the EU more difficult from the organisational point of view, and the demands on national and EU resources (personnel and financial) will increase. Initially, this will apply mainly to the euro area countries, given the limited application of sanctions to non-euro area countries. Moreover, the creation of euro area rescue facilities is probably not over yet and further major proposals may be issued. The considerable uncertainty about the future form of the economic, political and institutional architecture of the euro area is a major obstacle to assessing the Czech Republic's alignment with the euro area.

[27] These include, among other things, a revision of the *Capital Requirements Directive* (CRD IV), in which the European Commission in July 2011 proposed to implement Basel III into EU law.

[28] A quantitative assessment of the impact of structural reforms on economic growth (Babecký and Campos, 2011) shows the importance of maintaining a time gap, without which it is impossible to identify the positive significant effect of reforms on growth. In addition to reform measurement itself, it is important to include variables assessing the situation of institutions and the initial conditions of economies.

E 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. For the Czech economy, the risk of time misalignment or 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. Disequilibrium pressures could stem, among other things, from different economic structures and from insufficient convergence at the 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 derived from this parity, is a fundamental indicator of an economy's similarity to the euro area. A low degree of real convergence may indicate some challenges as regards euro adoption, as has been confirmed by the developments in euro area countries in the last few years. The real convergence process is often associated with convergence of price levels and structures towards 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.[29] This departure from equilibrium can be viewed as an asymmetric shock acting 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 will be lower short-term real interest rates compared to both the past and the euro area average. Real interest rates may even be negative in some cases. Low interest rates can have many favourable impacts, such as investment support, faster long-term convergence (see Čihák and Holub, 2003) and lower public debt service costs. However, as the experience

[29] 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 convergence criteria may require a temporary undervaluation of the exchange rate. However, this potential problem is mitigated by the fact that the exchange rate criterion is significantly more tolerant of appreciation than depreciation. Moreover, the increased emphasis laid in recent years on sustainable fulfilment of the price stability criterion means that a converging country – like Slovakia in 2009 – can adopt the euro with an overvalued real exchange rate so as to avoid inflationary pressures associated with price level convergence in the years following euro area entry.

of many converging economies with fixed exchange rates in recent years shows, they can create major macro-financial imbalances (Ahrend et al., 2008; Taylor, 2009; Martin, 2010).

As Table 1 shows, the convergence of **GDP per capita at purchasing power parity**, which was interrupted by the recent global financial and economic crisis, has not renewed yet. The level of Czech economic activity has thus been close to 75% of the euro area average for several years and is therefore still comparable with the least advanced countries of the monetary union (some of which, however, have been facing serious economic problems in recent years).[30] Portugal and Slovakia are the most similar to the Czech Republic in terms of this indicator. It also still holds true that the Czech Republic is more advanced than the other new EU Member States outside the euro area (Hungary and Poland), while still lagging well behind the wealthier euro area countries (Austria and Germany).

Table 1: GDP per capita at purchasing power parity (EA-17 = 100)

	1998	2004	2005	2006	2007	2008	2009	2010
CZ	63	69	70	71	73	75	75	74
AT	117	116	114	115	113	115	115	116
DE	109	106	107	107	106	107	107	110
PT	70	70	72	72	72	72	74	75
HU	49	58	58	58	57	59	60	59
PL	42	46	47	48	50	52	56	58
SI	70	79	80	80	81	84	81	81
SK	46	52	55	58	63	67	67	69

Source: Eurostat, CNB calculations.

Table 2 illustrates the **price level of GDP** compared to the euro area. The long-term convergence in this indicator has now renewed after being temporarily affected by exchange rate swings in 2008 and 2009. However, the Czech Republic still lagged well behind not only Austria and Germany, but also Portugal and Slovenia as regards its price level in 2010. By contrast, Slovakia, whose price level rose sharply before it joined the euro area due to fast real exchange rate appreciation and a subsequent strong conversion rate on euro adoption, had a somewhat lower price level in 2010, which has been flat in the last three years. Of the countries under review, Hungary and Poland also have slightly lower price levels than the Czech Republic.

Table 2: Average price level of GDP (EA-17 = 100)

	1998	2004	2005	2006	2007	2008	2009	2010
CZ	44	52	56	60	61	68	64	67
AT	103	100	103	103	105	106	106	105
DE	111	103	101	101	101	101	101	101
PT	78	82	80	80	80	80	79	78
HU	44	58	60	59	63	63	57	60
PL	48	47	54	57	59	65	54	58
SI	71	70	71	73	76	78	79	79
SK	41	50	52	54	59	64	64	64

Source: Eurostat, CNB calculations.

[30] Except for Estonia, which entered the euro area in 2011 and, with GDP per capita at purchasing power parity of 60% of the euro area average, is clearly less advanced than the Czech Republic.

An analysis of the empirical relationship between the price level of GDP and GDP per capita at purchasing power parity for 36 European countries (see the *Methodological Part*) reveals that the Czech price level in 2010 continued to lie below the level corresponding to the production capacity of the economy. According to the estimated relationship, the Czech price level should be roughly 13 percentage points higher in relation to the euro area price level.

Table 3 presents the **evolution of the real exchange rate** vis-à-vis the euro. Between 1998 and 2010, the real exchange rate of the koruna appreciated by almost 50%, i.e. at an average rate of 3.4% a year. The rate of real appreciation of the Czech currency was distinctly higher than in the current euro area countries under comparison except Slovakia. In the case of Austria and Germany, the real exchange rate actually depreciated somewhat, helping to increase their price competitiveness.[31] The Hungarian forint and particularly the Polish zloty appreciated less in real terms than the Czech koruna.

Table 3: Real exchange rate against the euro (HICP deflated)

	Basic index (1998 = 100)								Av. annual rate (in %)	
	1999	2004	2005	2006	2007	2008	2009	2010	1998–2010	Outlook[a)]
CZ	98	115	122	128	132	151	143	149	3.4%	(1,8 ; 2,4)
AT	100	98	98	97	97	97	98	98	-0.2%	(0,5 ; 1,0)
DE	100	96	96	96	96	96	95	95	-0.4%	(0,6 ; 1,0)
PT	102	107	107	108	108	107	106	106	0.5%	(0,2 ; 0,4)
HU	104	131	135	129	143	147	137	143	3.0%	(1,9 ; 2,2)
PL	98	101	114	116	120	131	110	120	1.6%	(2,4 ; 2,9)
SI	100	102	102	102	104	106	106	107	0.6%	(1,1 ; 1,4)
SK	98	140	146	154	170	184	193	191	5.5%	(1,9 ; 2,4)

Note: a) Interval estimate of the average rate of equilibrium real appreciation for the next five years.

Source: Eurostat, CNB calculations.

The real exchange rate also displays significant fluctuations around its long-run appreciation trend. Some of these fluctuations may generate macroeconomic shocks while others may help to absorb them. For example, the appreciation of the Czech koruna in 1998 and in 2001–2002 contributed to two periods when inflation was well below the CNB's target and there was a negative output gap (Šmídková, ed., 2008). By contrast, the koruna's appreciation in 2007 and 2008 H1 amid high inflation and still fast economic growth had a stabilising effect, as did the subsequent depreciation starting in 2008 H2 (and on average for 2009) in a situation of rapidly emerging recession and fading inflationary pressures.

According to numerous studies,[32] continued equilibrium real appreciation can be expected for the currencies of the converging countries (the Czech Republic, Hungary, Poland, Slovakia and Slovenia). Interval estimates of equilibrium real appreciation for the next five years based on a panel estimation of price convergence (see the *Methodological Part* for details) are given in the last column of Table 3. The range for the Czech koruna is 1.8–2.4%. Its midpoint is distinctly higher than those of most current euro area members. Only in the case of Slovakia are the estimates similar to those for the Czech Republic. For converging countries outside the euro area, i.e. Hungary and Poland, the estimates are comparable to, or slightly higher than, those for the Czech koruna. The above range corresponds to the average inflation differential vis-à-

[31] The price levels of Germany and Austria are thus below the level corresponding to their GDP per capita in international comparison, as in the case of the Czech Republic. For this reason, the estimates presented in Table 3 predict modest equilibrium real appreciation going forward. This could occur, for example, via low inflation or even deflation in other euro area countries which have lost price competitiveness and must undergo a price and wage adjustment process in the future.

[32] For example, Čihák and Holub (2003; 2005). For more details, see the *Methodological Part*.

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 3.8–4.4% during the initial years following euro area entry, similarly to the other countries of the region. This would mean a marked increase in inflation compared to the 2% target set by the Czech National Bank as from 2010.

Owing to higher inflation the Czech Republic and the other countries of the region would face lower **real interest rates** (see Table 4) compared to the average in the euro area and most of the Member States under review (Austria, Germany, Portugal and Slovenia) as well as to its own long-term average (which can, to some extent, proxy for equilibrium rates). Short-term real money market interest rates would very probably be negative in the Czech Republic and in the other converging countries. In the Czech Republic, the real three-month[33] interest rate would drop to -0.6–0.0% on average. On the other hand, the Czech Republic has in the last five years had low real interest rates, which implies a need for smaller future adjustment towards the post-euro adoption situation.

Table 4: Three-month ex-post real interest rates (%; HICP deflated)

	1998	2004	2005	2006	2007	2008	2009	2010	Average[a)]	Outlook[b)]
CZ	4.2	-0.1	0.4	0.2	0.2	-2.1	1.6	0.2	1.2	(-0.6 ; 0.0)
AT	2.7	0.1	0.1	1.4	2.0	1.4	0.8	-0.9	1.3	(0.8 ; 1.3)
DE	2.9	0.3	0.2	1.3	2.0	1.8	1.0	-0.3	1.5	(0.8 ; 1.2)
PT	2.1	-0.4	0.1	0.0	1.8	1.9	2.1	-0.6	0.6	(1.4 ; 1.6)
HU	3.3	4.3	3.5	2.8	0.0	2.5	5.0	1.4	2.9	(-0.4 ; -0.1)
PL	7.8	2.5	3.1	2.9	2.1	2.0	0.4	1.2	4.5	(-1.1 ; -0.6)
SI	13.5	-2.6	0.1	0.1	2.4	0.2	0.3	0.1	1.4	(0.4 ; 0.7)
SK	2.2	1.0	1.5	1.0	0.5	-0.9	0.4	-1.3	1.0	(-0.6 ; -0.1)

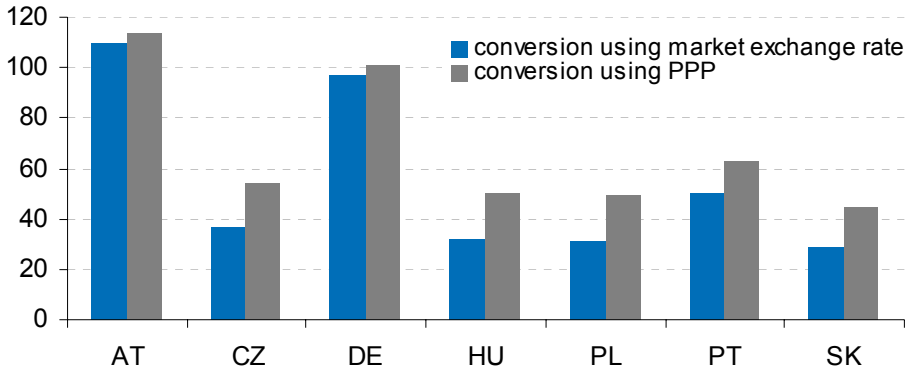
Notes: [a)] Average for 1998–2010.
[b)] Estimated real average interest rate for the next five years derived from the range of the estimated pace of equilibrium real exchange rate appreciation as set out in Table 3, assuming an unchanged nominal exchange rate and a zero risk premium. The nominal rate assumed in the outlook is 3.8% (the sum of the estimated equilibrium real interest rate in the euro area of 1.8% and the inflation rate of just below 2% in line with the ECB's definition of price stability).

Source: Eurostat, CNB calculations.

Wages are another aspect of economic convergence. The evolution of wages in market economies is related mainly to labour productivity growth and the share of the service sector in the economy. Chart 10 compares the average annual wage with the euro area in 2010. The purchasing power of wages on the domestic market is described by the PPP indicator, while the data converted using the market exchange rate reveal the external purchasing power and wage competitiveness of the economy. The chart shows a large difference between the average wage level in the euro area as a whole and in Germany and Austria on the one hand, and in the rest of the countries under comparison on the other hand. The wage level in the Czech Republic is around 38% of the average euro area wage level when converted using the exchange rate and roughly 58% using purchasing power parity data. It can therefore be expected that the Czech economy and the other new EU Member States under comparison will, together with GDP and price level convergence, also see convergence in the area of wages. It is of crucial importance that this convergence is founded on corresponding productivity growth and does not result in a loss of competitiveness.

[33] 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 probably be more appropriate from the economic point of view, but the differences compared to three-month rates are small on average.

Chart 10: Average annual wage in 2010 (EA = 100)



Note: Data for the whole economy converted into full-time annual equivalent. Euro area data are non-weighted average for EU-15, i.e. excluding Cyprus and Greece, for which data are not available.

Source: OECD.Stat, CNB calculations.

To sum up, the Czech Republic's convergence towards the euro area as regards GDP per capita at purchasing power parity has halted. By contrast, its price level convergence has renewed. Going forward, there is still substantial room for faster growth of economic activity compared to most of 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

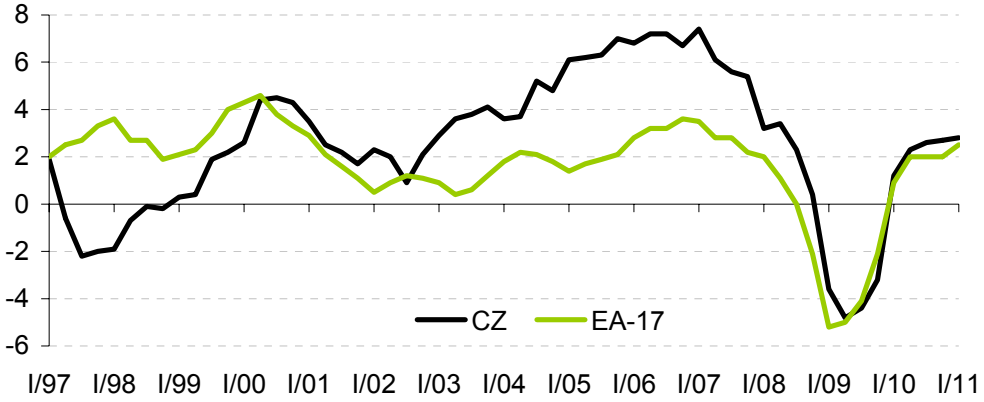
Upon euro area entry, monetary policy decision-making independence will be replaced by the implementation of a single monetary policy responding to economic developments at the monetary union level. For a country that is in a different phase of the business cycle than the euro area average, the monetary policy settings may be suboptimal and cause 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 preconditions for greater business cycle correlation. The following analysis focuses on the degree to which the cycles of the Czech economy and the other countries under comparison are similar to that of the euro area.

To measure the 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 de-trending methods have been applied to the time series under comparison: year-on-year differences on the logarithm of the original time series (Method 1) and quarter-on-quarter (or month-on-month) differences on the logarithm of the seasonally adjusted time series (Method 2). To monitor the evolution of alignment over time, the data have been divided into two periods, where the dividing line is the entry of the Czech Republic (and other countries) into the EU in May 2004. This enables us to isolate the influence of clearly asymmetric developments at the start of the period under review which had non-cyclical causes and to compare economic alignment before and after the Czech Republic's accession to the EU. Supplementary information on the time development of the correlation of economic activity is provided by an analysis of the correlation for moving five-year time periods (rolling correlation). The analysis deals first with the overall economic activity of the countries under review as described by 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 the overall exports of a specific country 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 used.

Chart 11 illustrates year-on-year real GDP growth in the Czech Republic and the euro area. Different trends are apparent in these economies at the start of the period under review. The economic decline in the Czech Republic during that period was due to the combination of abating transformation problems, structural changes and specific shocks (such as the 1997 monetary crisis). During 2000–2002, the rate of Czech economic growth copied the adverse trend in the euro area to some extent, while the effect of the external slowdown was magnified by appreciation of the exchange rate. The growth of the Czech economy increased significantly as from 2003 thanks to reforms, foreign direct investment inflows and changes on the supply side. Economic growth in the euro area countries also rose in this period, but remained significantly slower than in the Czech economy. Economic growth started slowing in 2007 in both the Czech economy and the euro area. This can be interpreted as a shift to a downward phase following the peak of the business cycle. The originally gradual decline in real GDP changed into a sharp year-on-year fall in both economies in late 2008 and early 2009 as a result of the global financial and economic crisis. Since around mid-2009, both the Czech economy and the euro area have been gradually recovering, with annual growth switching to positive values in 2010.

Chart 11: Year-on-year changes in real GDP (%)



Source: Eurostat, CNB calculations.

Table 5 summarises the results of the **simple correlation analysis** for GDP and the IPI.[34] For the first period, neither method 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. By contrast, in the second period the correlation of Czech and euro area GDP shows statistically significant values of 0.8–0.9 according to both methods. The substantial increase in correlation can be attributed to some extent to an increase in cyclical alignment, although a significant effect of recent observations – characterised by a sharp global economic slump and subsequent recovery – must also be taken into account. The results are also affected by the previous combination of a cyclical recovery abroad and rising trend GDP growth in the Czech Republic. The correlation coefficients for Slovakia, Slovenia, Portugal and Hungary also increased substantially in the second period. Nevertheless, statistically significant and relatively high GDP growth correlations can now be identified for all the economies under review. In comparison with other

[34] Compared to last year's analysis some results saw shifts mainly in the first period, due, among other things, to a change in the division of the total period into two time segments with roughly the same number of observations.

countries, the correlations for the Czech Republic can be evaluated as average or slightly above average. Given the extremely strong global shock in the recent past, which, from the Czech Republic's perspective, was predominantly an external demand shock, only in future years will it be possible to prove or disprove the hypothesis that greater business cycle alignment has been achieved in normal global economic conditions.

Table 5: Correlation coefficients of economic activity – evolution over time

		1997 Q1–2004 Q1		2004 Q2–2011 Q1		1999 M1–2004 M4		2004 M5–2011 M6	
		GDP		GDP		IPI		IPI	
Method 1	**CZ**	-0.23	(-0.51 ; 0.08)	0.92 **	(0.85 ; 0.96)	0.41 **	(0.22 ; 0.57)	0.95 **	(0.92 ; 0.96)
	AT	0.76 **	(0.59 ; 0.87)	0.97 **	(0.94 ; 0.98)	0.84 **	(0.77 ; 0.89)	0.94 **	(0.92 ; 0.96)
	DE	0.95 **	(0.90 ; 0.97)	0.94 **	(0.89 ; 0.97)	0.95 **	(0.93 ; 0.97)	0.99 **	(0.99 ; 0.99)
	PT	0.64 **	(0.40 ; 0.79)	0.91 **	(0.84 ; 0.95)	0.49 **	(0.32 ; 0.64)	0.73 **	(0.64 ; 0.81)
	HU	0.57 **	(0.32 ; 0.75)	0.92 **	(0.84 ; 0.96)	0.77 **	(0.66 ; 0.84)	0.96 **	(0.94 ; 0.97)
	PL	0.53 **	(0.26 ; 0.72)	0.78 **	(0.61 ; 0.88)	0.41 **	(0.22 ; 0.57)	0.84 **	(0.78 ; 0.89)
	SI	0.52 **	(0.25 ; 0.72)	0.94 **	(0.88 ; 0.97)	0.57 **	(0.42 ; 0.70)	0.94 **	(0.91 ; 0.96)
	SK	-0.56 **	(-0.74 ;-0.30)	0.88 **	(0.78 ; 0.94)	0.02	(-0.19 ; 0.22)	0.88 **	(0.84 ; 0.92)
Method 2	**CZ**	-0.19	(-0.46 ; 0.11)	0.80 **	(0.65 ; 0.89)	0.09	(-0.12 ; 0.29)	0.42 **	(0.26 ; 0.55)
	AT	0.44 **	(0.17 ; 0.65)	0.68 **	(0.47 ; 0.82)	0.33 **	(0.13 ; 0.50)	0.40 **	(0.24 ; 0.54)
	DE	0.74 **	(0.56 ; 0.85)	0.95 **	(0.91 ; 0.98)	0.80 **	(0.70 ; 0.86)	0.64 **	(0.52 ; 0.73)
	PT	0.31 *	(0.01 ; 0.55)	0.77 **	(0.60 ; 0.88)	0.30 **	(0.10 ; 0.48)	0.50 **	(0.35 ; 0.62)
	HU	0.45 **	(0.18 ; 0.66)	0.80 **	(0.64 ; 0.89)	0.07	(-0.14 ; 0.27)	0.24 **	(0.07 ; 0.40)
	PL	0.25	(-0.05 ; 0.51)	0.66 **	(0.43 ; 0.81)	0.21	(0.00 ; 0.40)	0.35 **	(0.18 ; 0.49)
	SI	0.14	(-0.17 ; 0.42)	0.88 **	(0.78 ; 0.94)	0.15	(-0.06 ; 0.35)	0.36 **	(0.20 ; 0.51)
	SK	-0.41 **	(-0.63 ;-0.13)	0.69 **	(0.48 ; 0.83)	0.20	(-0.01 ; 0.39)	0.24 **	(0.07 ; 0.40)

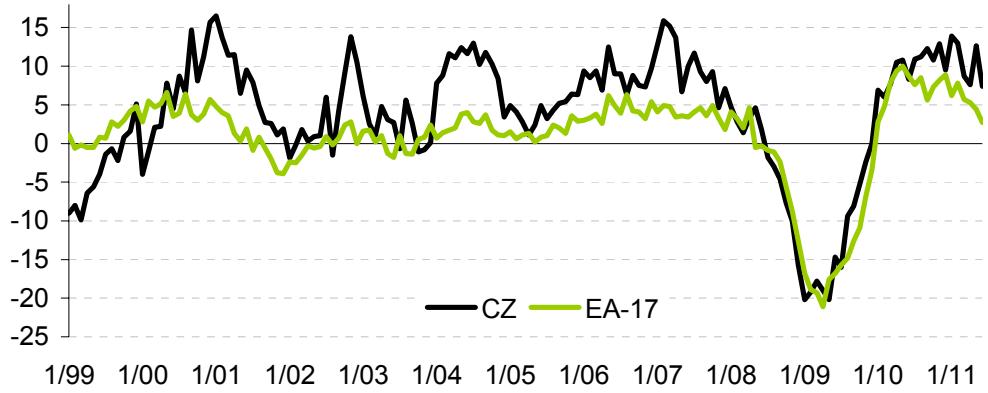
Note: Method 1 – year-on-year differences; Method 2 – quarter-on-quarter (or month-on-month) differences. The significance of the correlation coefficient is marked ** and * for the 5% and 10% significance levels respectively. The 90% confidence interval is in parentheses.

Source: Eurostat, CNB calculations.

Under Method 1, the correlation analysis of the industrial production index signals an increase in the correlation between the periods under review for all countries, while under Method 2, shifts in both directions are recorded and the resulting correlations are much lower for all countries compared to Method 1. This is due to greater volatility of the month-on-month data for the individual countries compared to euro area average and also to the possible effect of the lag in propagation of economic shocks to industrial production in individual countries. Generally, however, the positive correlations in the second period are statistically significant in all the countries under review and according to both growth calculation methods.[35] In the second period, the correlation of the industrial production indices of the Czech Republic and the euro area using year-on-year changes is comparably high as for the other countries. The correlation of the month-on-month changes between the individual countries differs significantly and the Czech Republic is among those countries under review showing higher values. Chart 12 illustrates the annual changes in the **industrial production index** of the Czech Republic and the euro area. This chart also indicates the strong effect that the synchronised recession and subsequent recovery in both economies has recently had on the measured correlation.

[35] The information obtained by comparing the correlation of industrial production is only complementary, 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). 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.

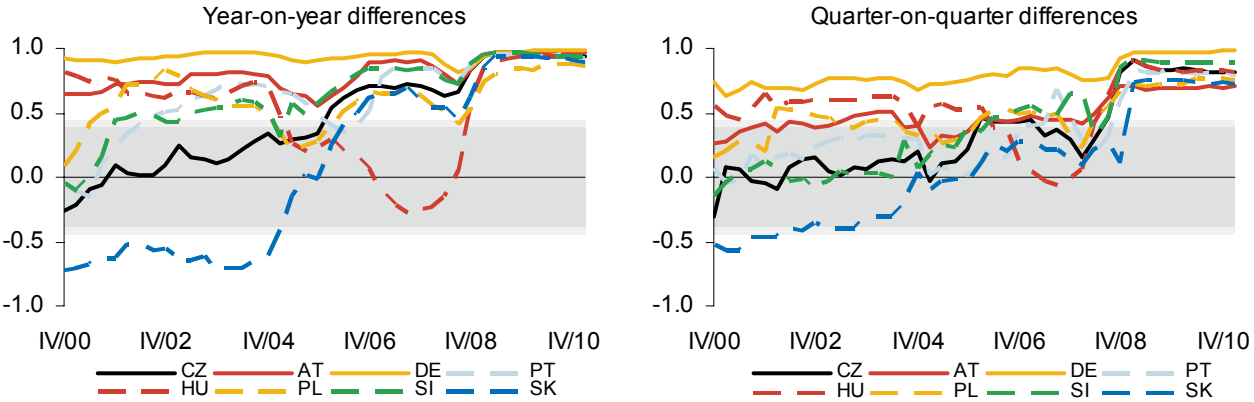
Chart 12: Year-on-year changes in the industrial production index (%)



Source: Eurostat, CNB calculations.

Chart 13 shows the **rolling correlations** of real GDP growth for the two methods. Under Method 1, the alignment has gradually increased over time, the correlation values having been statistically significant since 2006; following a modest decline in 2008, the correlation rose sharply and since 2009 has stayed at high levels. The rolling correlations calculated on the basis of quarter-on-quarter differences show a temporary fall in the originally rising trend between mid-2007 and 2008 Q3, after which they resume their increase, as in Method 1. The aforementioned temporary fall can be explained as being a result of the lag with which the global financial and economic crisis hit the Czech Republic and some other countries in comparison with the euro area average.

Chart 13: Rolling correlations of economic activity

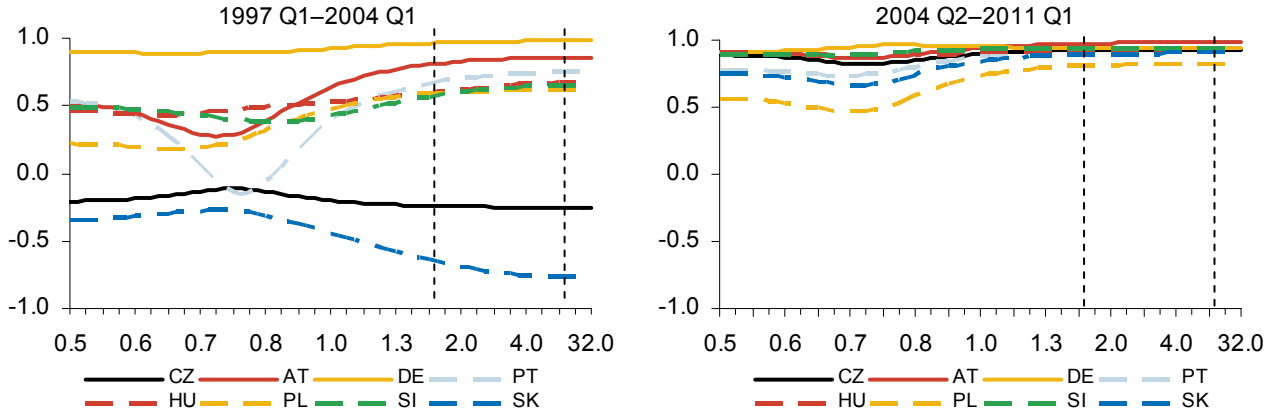


Note: The time data indicate the end of the rolling window of 5 years. The statistical significance of the correlation coefficients is indicated in the chart: values statistically significant at the 5% level lie in the white area of the chart, and values statistically significant at the 10% level lie in the white and light grey parts of the chart. Values in the dark grey part of the chart are not statistically significant at the 10% level.

Source: Eurostat, CNB calculations.

Chart 14 illustrates the results of the **dynamic correlation** based on spectral analysis of the time series of annual GDP changes. The aim of this method is 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. In the chart, the standard cycle length of 1.5–8 years is depicted by vertical dashed lines. The results of this analysis indicate a fundamental increase in the correlation in the second period across all the countries under review.

Chart 14: Dynamic correlations of economic activity (annual changes in real GDP) with the euro area



Note: 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 6. The measured correlations of the total exports of the Czech Republic with the total exports of the euro area are positive and statistically significant in both periods and according to both methods, and in the second period they increased. The correlations of Czech exports to the euro area with euro area GDP are lower under Method 1, but comparable under Method 2. As with the previous indicators, a large part of the increase in the correlation of export performance in the second period can be explained by the one-off shock in the form of the global crisis and its gradual abatement.

Table 6: Correlation coefficients of overall export activity and exports to the euro area with euro area GDP – evolution over time.

		1997 M1–2004 M4	2004 M5–2010 M12	1997 Q1–2004 Q1	2004 Q2–2010 Q4
		EXP_{TOTAL}	EXP_{TOTAL}	$EXP_{to\ EA-17}$ vs. GDP_{EA-17}	$EXP_{to\ EA-17}$ vs. GDP_{EA-17}
Method 1	**CZ**	0.77 ** (0.68 ; 0.83)	0.88 ** (0.83 ; 0.92)	0.65 ** (0.43 ; 0.80)	0.85 ** (0.72 ; 0.92)
	AT	0.87 ** (0.82 ; 0.91)	0.97 ** (0.96 ; 0.98)	0.72 ** (0.52 ; 0.84)	0.92 ** (0.85 ; 0.96)
	DE	0.93 ** (0.91 ; 0.95)	0.99 ** (0.98 ; 0.99)	0.76 ** (0.58 ; 0.86)	0.95 ** (0.91 ; 0.97)
	PT	0.68 ** (0.57 ; 0.77)	0.94 ** (0.91 ; 0.96)	0.50 ** (0.22 ; 0.70)	0.90 ** (0.81 ; 0.95)
	HU	0.72 ** (0.62 ; 0.80)	0.82 ** (0.75 ; 0.87)	0.57 ** (0.31 ; 0.75)	0.84 ** (0.72 ; 0.92)
	PL	0.56 ** (0.43 ; 0.67)	0.58 ** (0.44 ; 0.69)	0.38 ** (0.08 ; 0.62)	0.37 * (0.05 ; 0.62)
	SI	0.83 ** (0.77 ; 0.88)	0.91 ** (0.87 ; 0.93)	0.64 ** (0.41 ; 0.79)	0.83 ** (0.70 ; 0.91)
	SK	0.39 ** (0.23 ; 0.53)	0.92 ** (0.88 ; 0.94)	0.32 * (0.01 ; 0.57)	0.90 ** (0.81 ; 0.95)
Method 2	**CZ**	0.35 ** (0.19 ; 0.50)	0.64 ** (0.51 ; 0.73)	0.34 * (0.03 ; 0.59)	0.65 ** (0.42 ; 0.81)
	AT	0.56 ** (0.42 ; 0.67)	0.67 ** (0.55 ; 0.76)	0.42 ** (0.13 ; 0.65)	0.74 ** (0.54 ; 0.86)
	DE	0.67 ** (0.55 ; 0.75)	0.85 ** (0.79 ; 0.90)	0.43 ** (0.14 ; 0.65)	0.87 ** (0.75 ; 0.93)
	PT	0.29 ** (0.12 ; 0.44)	0.67 ** (0.55 ; 0.76)	0.21 (-0.11 ; 0.49)	0.56 ** (0.29 ; 0.75)
	HU	0.31 ** (0.14 ; 0.46)	0.53 ** (0.38 ; 0.65)	0.32 * (0.00 ; 0.57)	0.60 ** (0.35 ; 0.77)
	PL	0.31 ** (0.14 ; 0.46)	0.51 ** (0.36 ; 0.64)	0.34 * (0.04 ; 0.59)	0.02 (-0.30 ; 0.34)
	SI	0.52 ** (0.37 ; 0.63)	0.38 ** (0.21 ; 0.53)	0.42 ** (0.12 ; 0.64)	0.58 ** (0.32 ; 0.76)
	SK	0.34 ** (0.18 ; 0.49)	0.59 ** (0.46 ; 0.70)	-0.02 (-0.33 ; 0.29)	0.62 ** (0.37 ; 0.78)

Note: 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: Eurostat, IMF, CNB calculations.

To sum up, the cyclical alignment of economic activity in the Czech Republic and the euro area has recently increased significantly, reaching high values. This is evidenced both by the simple correlations of overall economic activity, industrial production and exports, and by the rolling and dynamic correlations of economic activity. Given the exceptionally strong global shock in the recent past, however, the results should be taken with a pinch of salt, since they cannot automatically be expected to continue into the future.

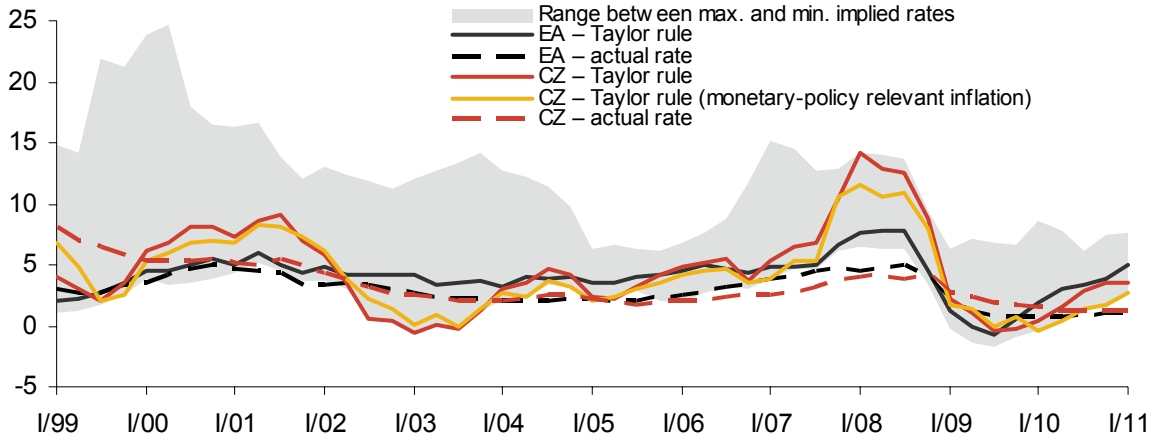
1.1.3 Analysis of cyclical alignment using the Taylor rule

The pro-cyclicality of unified nominal interest rates in the euro area is often discussed in the context of cyclical alignment. For an economy in an expansionary phase of the cycle with higher inflation and hence lower real rates, this can mean a further increase in its rate of growth. The opposite effect can be observed with an economy in the opposite phase of the cycle with *ceteris paribus* lower inflation and higher real rates.[36] The divergence of optimum monetary policy settings and differences in cyclical positions in the individual countries of the monetary union can be analysed using **implied monetary policy interest rates** estimated on the basis of the Taylor rule.[37] This analysis does not seek primarily to estimate the optimum rate settings in a particular economy, but rather sets out to identify approximately the cycles of individual economies.[38]

Chart 15 illustrates the overall evolution of the implied monetary policy rates in all the economies under review. The grey area shows the range between the maximum and minimum implied rates for all the countries under review in the given period. In addition to the implied rates, the actual rates for the Czech Republic and the euro area are illustrated. For the Czech Republic the chart also illustrates the implied rates derived from monetary-policy relevant inflation, which abstracts from the first-round effects of changes to indirect taxes, from which the CNB also routinely abstracts in its monetary policy decision-making. The trend of a narrowing spread between the maximum and minimum implied rates (a narrowing grey area) can be interpreted as being a consequence of the stabilisation of the transforming economies, for which the Taylor rule prescribed higher rates at the start of the period under review. A narrowing of the spread to around 7 percentage points can be observed from the end of 2007. In mid-2009, however, there was an increase to around 9 percentage points, due to unusually low and negative implied rates in some countries during the global crisis. Since mid-2010 the spread has narrowed to about 5 percentage points thanks to the economic recovery. The differences between the implied rates for the entire euro area and the ECB's actual rates reflect the chosen method and its purpose, namely to compare the business cycles of the individual economies, not to estimate the optimum real interest rate settings.[39]

[36] See, for example, Björksten and Syrjänen (1999).
[37] The Taylor rule (Taylor, 1993) is a simple but relatively robust form of the central banks reaction function. The Taylor rule gives the implied monetary policy rates which central banks are supposed to have set in relation to the size of the divergence of actual and targeted inflation and actual and potential GDP. It is a backward-looking rule which can be interpreted as a statistic of the current cyclical position of the economy. However, it is not able to abstract sufficiently from temporary and non-cyclical shocks and to capture the forward-looking nature of monetary policy.
[38] For details, see the *Methodological Part*.
[39] To some extent, however, the systematically lower than implied rates for the euro area in 2001–2008 may reflect excessively easy monetary policy conditions around the world before the current financial and economic crisis broke out.

Chart 15: Implied monetary policy rates



Note: The grey area marks the range between the maximum and minimum implied rates for all the countries under comparison in the given period.

Source: Eurostat, CNB calculations.

For most of the period under review, the estimate of the implied interest rates for the Czech economy is relatively close to the implied rate for the euro area. The rate implied by monetary-policy relevant inflation is mostly (i.e. except for 2010) closer to the euro area rate than the rate implied by headline inflation. The implied rates for the Czech economy are mostly among the lower ones, lying in the lower half of the grey range and even forming its lower boundary between mid-2002 and the end of 2003. More pronounced deviations of the implied rate for the Czech economy from the implied rate for the euro area occurred in 2000–2001, 2002 Q3–2003 Q3 and 2007Q4–2008 Q4. The first of these periods saw a domestic economic recovery replacing the previous recession, amid a concurrent weakening of the previously relatively robust economic growth in the euro area. In 2002 Q3–2003 Q3, the Czech Republic experienced a significant fall in inflation following a strong appreciation of the exchange rate. In the last of the three periods of more pronounced deviations, a fluctuation in the Czech implied rates in the opposite direction was recorded, up to the upper boundary of the range. This can be explained partly cyclically and partly by domestic inflation, which was substantially higher as a result of harmonisation of indirect taxes with the EU (see the rate implied by monetary-policy relevant inflation, which lies much lower for the given period), growth in administered prices and a stronger impact of rising world prices of raw materials. The Czech National Bank in reality set interest rates much lower than the rates implied by the Taylor rule. This was due to the forward-looking nature of monetary policy, which assessed the rise in inflation as temporary and therefore did not need to raise interest rates dramatically.[40]

The average square of the difference between the implied interest rate of a specific country and the implied rate for the entire euro area can be a measure of cyclical misalignment (see Table 7). This average of the deviations in the group of countries under comparison has been gradually decreasing except in the penultimate period (and in the last period in the case of Poland), as has the difference between the old euro area countries (Germany, Portugal and Austria) and the new ones (Slovakia and Slovenia) and candidate countries, including the Czech Republic. In 1999–2006, the average square in the Czech Republic was relatively stable and was initially one of the lower ones among the new member countries. In 2007–2008, however, this misalignment indicator increased as a result of faster economic growth and

[40] The backward-looking Taylor rule applied is not able to differentiate between long-term changes in inflation, to which central banks usually respond, and temporary changes, to which central banks mostly do not respond. When analysing the interest rates implied by the Taylor rule, 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.

inflation shocks recorded particularly in 2008. Some of the other new member countries under comparison also saw growth in misalignment in this period. In the period from the start of 2009 the deviation in the Czech Republic fell to an all-time low, owing to similar impacts of the global crisis on both the euro area and the Czech Republic. An alternative illustration of cyclical misalignment is provided by the statistics on the deviations of implied rates calculated on the basis of monetary-policy relevant inflation.[41] These deviations indicate greater alignment of the Czech economy with the euro area until 2008, when the deviations are substantially smaller than those calculated using headline inflation. However, the opposite is true for the period since 2009 (as changes to indirect taxes in this period brought headline inflation in the Czech Republic closer to the average level in the euro area).

Table 7: Average squares of deviations from implied euro area rates

	from 1999Q1	from 2001 Q1	from 2003 Q1	from 2005 Q1	from 2007 Q1	from 2009 Q1
CZ	6.0	6.4	6.0	5.8	8.2	1.1
CZ (MP rel. inflation)	4.5	4.4	4.3	3.9	5.4	3.2
AT	0.4	0.5	0.5	0.2	0.1	0.1
DE	0.8	0.7	0.7	0.4	0.3	0.3
PT	2.6	2.4	1.1	0.8	1.0	1.0
HU	52.7	34.3	29.3	27.5	34.5	23.4
PL	28.0	9.1	8.5	9.1	11.8	21.2
SI	30.6	21.1	9.1	7.0	10.2	0.4
SK	53.9	20.5	20.4	3.6	3.5	2.0
CZ (actual rate)	5.0	4.0	4.9	5.7	6.4	5.1
EA (actual rate)	2.5	3.0	3.5	3.8	4.3	4.7

Note: Periods always ending with 2011 Q1.
Source: Eurostat, CNB calculations.

To sum up, the estimate of the rates implied by the Taylor rule for the Czech economy is relatively close to the rate implied for the euro area for most of the period under review. The average square of the difference between the implied interest rate for the Czech Republic and that for the euro area has recently fallen to a historical low, indicating increasing cyclical alignment. As in the case of the correlation of economic activity, the synchronised impact of the global economic crisis on economic and monetary developments in the Czech Republic and the euro area may play an important role here.

1.1.4 Synchronisation of economic shocks

In the optimum currency area literature, similarity of economic shocks is viewed as another precondition for monetary policy to have an appropriate effect on the individual national economies in a monetary union.[42] 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 an unanimous opinion on the need for alignment of supply shocks.

The following analysis identifies the degree of synchronisation of economic shocks between the countries under review and the euro area. Economic shocks are divided into demand shocks, i.e. shocks with a short-term effect on GDP growth accompanied by co-movement of inflation,

[41] Monetary-policy relevant inflation is inflation to which monetary policy responds. It is defined as headline inflation adjusted for the first-round effects of changes to indirect taxes.
[42] For example, Frankel and Rose (1998).

and supply shocks, i.e. shocks with a long-term effect on GDP growth accompanied by opposite movement of inflation.[43] The analysis draws on quarterly estimates of economic shocks for 1997 Q1–2011 Q1. To compare the synchronisation of shocks over time, the periods 1997 Q1–2004 Q1 and 2004 Q2–2011 Q1 are also assessed separately. The correlation of the shocks can take values in the range of [-1;1]. High 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, 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. It is also important to take into account that the model interprets shocks with a long-lasting effect on real economic output as supply shocks, whereas the relatively long downturn in economic activity resulting from the global crisis was caused largely by a demand shock. The rise in supply shock correlation presented below thus needs to be interpreted very cautiously.

Table 8 shows the resulting **demand shock correlations**. The measured correlation of the demand shocks identified for the Czech Republic vis-à-vis the euro area changed from a statistically insignificant value of -0.17 for the period 1997–2004 Q1 to a value of 0.36 statistically different from zero at the 10% significance level for 2004 Q2–2011. A comparison with previous years' results shows that the alignment of this type of shock rose in 2004–2011. A comparison of the results of the analysis indicates that the risk due to demand shock asymmetry is lower for the Czech economy than for the other countries under review, since their correlations (except for Germany) do not take on statistically significant positive values.

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

	1997–2011	1997–2004 Q1	2004 Q2–2011
CZ	0.04	-0.17	0.36 *
AT	-0.17	-0.40 **	0.24
DE	0.61 ***	0.65 ***	0.56 ***
PT	-0.11	-0.09	-0.13
HU	0.14	0.12	0.18
PL	-0.14	-0.16	-0.14
SI	-0.10	-0.24	0.21
SK	-0.07	0.21	-0.44 **

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

As regards **supply shocks** (see Table 9), the correlation for 2004 Q2–2011 is positive and the coefficients are statistically significant for the Czech Republic, Germany, Poland and Austria. Compared to the previous period, most of these countries have thus seen shifts towards higher and statistically significant alignment of supply shocks with the euro area. By contrast, asymmetry of supply shocks has increased in the case of Hungary, Portugal, Slovakia and Slovenia. The correlation coefficients for these countries are negative and statistically significant, and in the case of Slovenia and Slovakia this applies to the entire period. The measured correlation of the Czech Republic with the euro area changed from a statistically insignificant value of -0.15 for the period 1997–2004 Q1 to a positive value of 0.49 statistically

[43] This method identifies economic shocks using econometric methods and does not ascribe specific structural interpretations to them, for example their source or form. The estimated shocks do not necessarily correspond to the traditional concept of demand and supply shocks. Since we work with real data of limited length, a demand shock that has a temporary effect on GDP growth (e.g. the recently observed decline in economic activity) may be identified by the model as a supply shock. In the literature, such structural shocks are alternatively described respectively as shocks that do not have a lasting effect on GDP and shocks that do have a lasting effect on GDP.

different from zero at the 1% significance level for 2004 Q2–2011. For the last period, the symmetry of supply-side shocks in the Czech Republic is comparable to that in Austria.

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

	1997–2011	1997–2004 Q1	2004 Q2–2011
CZ	0.30 **	-0.15	0.49 ***
AT	0.33 **	-0.08	0.53 ***
DE	0.83 ***	0.74 ***	0.88 ***
PT	-0.32 **	-0.13	-0.39 **
HU	-0.46 ***	0.00	-0.62 ***
PL	0.33 **	0.40 **	0.37 *
SI	-0.51 ***	0.19	-0.79 ***
SK	-0.23 *	0.32 *	-0.56 ***

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

Overall, therefore, the Czech economy faces demand shocks which correlate only weakly with shocks in the euro area, whereas the supply shocks identified by the model have been similar in recent years. This is because the contraction in economic activity during the crisis – given its long duration – is interpreted in the analysis as a supply shock (whereas in reality it was largely a significant demand shock). Of the countries under review, the Czech Republic's results are most similar to Austria's overall, suggesting greater shock alignment with the euro area than for most other countries under review (except for Germany, which has a large weight in the euro area as a whole and for which greater alignment can thus be expected).

1.1.5 Structural similarity of the economies

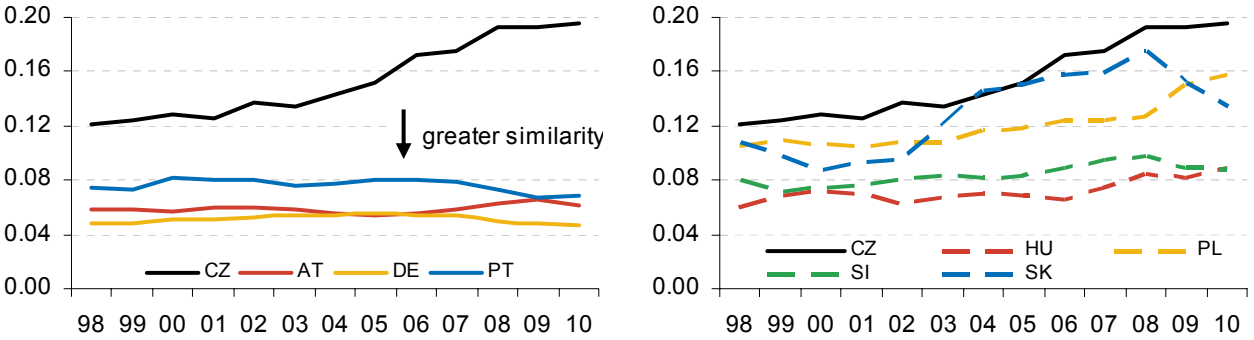
Greater similarity of the structure of economic activity between the acceding economy and the other economies of the monetary union decreases the risk of occurrence of an asymmetric economic shock. The structural similarity of the economies of the countries under comparison with the euro area is measured using the Landesmann structural coefficient, which compares the shares of the six main 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 16 shows that the Landesmann coefficient for the Czech Republic is the highest of all the countries under review over the entire period 1998–2009. The structural differences between the Czech Republic and the euro area rose quickly in 2003–2008 and then their growth rate slowed. The structure of economic activity in the Czech Republic was therefore the least similar to the euro area average of all the countries compared.[44] The difference in the structure of value added in the Czech economy consists mainly in a high share for industry[45] and in a lower share for services, in particular financial intermediation, real estate and other services (see

[44] In 2003–2008, Slovakia recorded a similar Landesmann coefficient as the Czech Republic in the context of an increasing share of value added of industry in total value added in combination with a broadly stable contribution of industry to total value added in the euro area. In the following years, however, the share of value added of industry in Slovakia – as in the euro area – decreased in favour of financial intermediation and growth in other services.

[45] In Czech industry as a whole there is, moreover, a high share for the car industry, which is comparable with Germany and thus higher than the euro area average. In the event of an industry shock, it can thus be assumed that the single monetary policy would not respond to inflationary or anti-inflationary risks in the Czech economy in the same way as an independent monetary policy would probably react. A detailed analysis of product specialisation, among other things with regard to the share of the car industry, can be found in the 2008 Analyses of the Czech Republic's Current Economic Alignment with the Euro Area (section 1.4.3 *Product specialisation*, including Box 2, pp. 59–61).

Table 10). In 2009–2010, the share of value added of industry (C, D and E) in the euro area decreased in favour of financial intermediation (J and K) and other services (L–P). This explains the further rise in the Landesmann coefficient in the Czech Republic in this period.

Chart 16: Structural similarity vis-à-vis the euro area



Source: Eurostat, CNB calculations.

Table 10: Shares of economic sectors in GDP in 2010 (%)

	A, B	C, D, E	F	G, H, I	J, K	L–P
CZ	2	31	6	23	16	14
AT	1	21	5	21	23	19
DE	1	21	3	16	28	21
PT	2	15	5	22	21	22
HU	3	23	3	17	20	19
PL	3	24	6	23	15	15
SI	2	23	5	19	20	18
SK	3	24	7	22	19	15
EA-17	2	17	5	19	26	21

Note: 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, CNB calculations.

1.1.6 Interest rate convergence

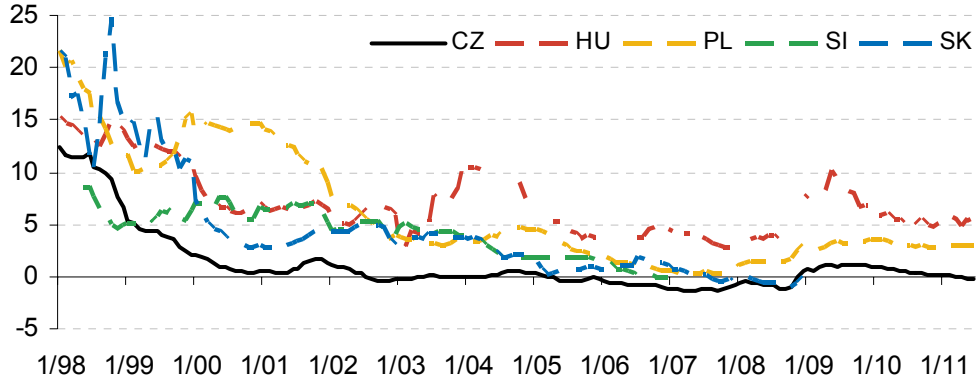
Some countries entering the euro area faced fast nominal interest rate convergence[46] to the Union level, which acted as an asymmetric shock manifesting itself mainly in the emergence of property market bubbles and weaker fiscal discipline. However, long-term interest rates can be expected to be more differentiated in the EMU countries in the future. Nevertheless, earlier nominal interest rate convergence – based on fundamentals – is better for smoother accession to the euro area, as it will suppress the additional asymmetric shock associated with euro adoption and sudden elimination of the risk premium.[47]

The following comparison of the **nominal interest rate differential** vis-à-vis the euro area reflects 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

[46] 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).
[47] See also section 1.1.1.

effect on the economy. Charts 17 and 18 illustrate the interest rate differentials of selected countries vis-à-vis the euro area for three-month rates on the interbank market and five-year government bonds.[48]

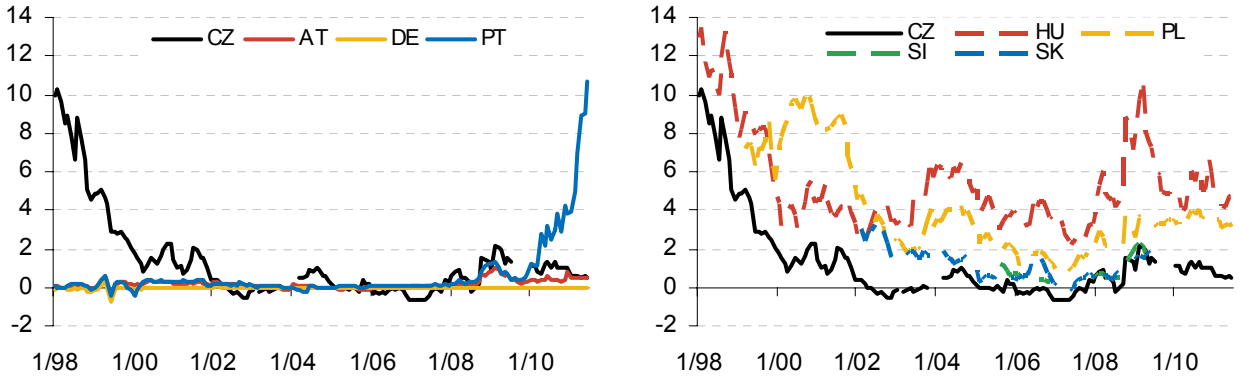
Chart 17: Differences in three-month interest rates vis-à-vis the euro area (p.p.)



Source: Eurostat, CNB calculations.

Chart 17 shows that short-term interest rate convergence proceeded more or less continuously for all the countries under comparison until 2008 Q3. In the Czech Republic, short-term interest rate differentials were fairly close to zero throughout the period, and even negative in 2005–2008. The differences in interest rates vis-à-vis the euro area started to grow again following the escalation of the global financial crisis in 2008, reaching a local high in 2009 H2. The calming of the interbank market situation and the monetary policy easing in the region caused the differentials to decline and stabilise in 2010–2011. Over the last year they have remained fairly flat, fluctuating around 5 p.p. in Hungary and 3 p.p. in Poland. In the Czech Republic they were very close to zero and turned negative again in 2011 Q2.

Chart 18: Differences in five-year interest rates vis-à-vis Germany (p.p.)



Note: There are gaps in the time series in months when no new bonds were quoted and no bonds with residual maturity of five years were traded.

Source: Bloomberg, CNB calculations.

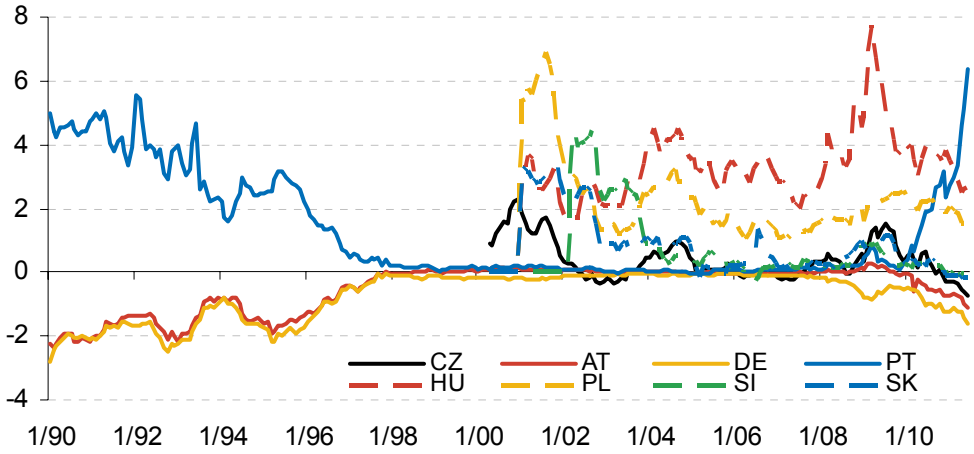
Chart 18 illustrates the differentials for five-year government bond yields between the selected countries and Germany. As in the case of short-term interest rates, convergence of five-year interest rates proceeded more or less continuously for all the countries under comparison until

[48] Time series of average 5Y interest rates in the euro area are not available, so German bond reference values are used.

2008 Q3. Following the escalation of the global financial crisis, five-year interest rate differentials increased to various degrees in all the countries under review between September 2008 and the end of 2009 Q1. Although they later tended to decline, there were again short periods of growth as a result of shocks linked with the debt crisis in countries in the southern periphery of the euro area. In the case of Portugal, the differentials rose continuously, exceeding 10 p.p. As for the countries of Central Europe, over the last year they were fluctuating around 5 p.p. in Hungary, declined slowly to 3 p.p. in Poland and edged down to 0.5 p.p. in the Czech Republic. The interest rate differential for the Czech Republic thus remains the lowest in the sample of Central European countries and is comparable to the situation in Austria and Slovakia.

The interest rate differentials for ten-year government bonds are shown in Chart 19. The chart also provides a comparison with the situation in the euro area countries prior to euro adoption.[49] For Central European Countries these interest rate differentials show a similar pattern as five-year interest rates, i.e. convergence until 2008 Q3, a gradual increase in 2009 H1 and a renewed decline in 2009 H2. The interest rate differential for Czech ten-year government bonds fluctuated around zero between 2005 and 2008, but rose somewhat in 2009. In November 2010 it turned negative again and continued to decline. In most of the euro area countries under comparison, ten-year interest rates responded more moderately to the debt crisis than rates with shorter maturities. In 2011 H1 they dropped below the euro area average, with the notable exception of Portugal, where the ten-year interest rate differential increased gradually to 6.3 p.p. in June 2011.[50] The differentials in Poland and Hungary edged down but remained positive. Long-term rates in the Czech Republic thus remain closest to the euro area average among the non-euro area countries under comparison.

Chart 19: Differences in long-term interest rates vis-à-vis the euro area (p.p.)



Source: Eurostat, CNB calculations.

It can be summed up that Czech interest rates have long been close to euro area rates and so do not create a risk of a rapid fall in rates and related generation of macroeconomic imbalances and risks to financial stability upon euro adoption. This also indicates that the Czech Republic's government debt situation is still relatively sustainable.

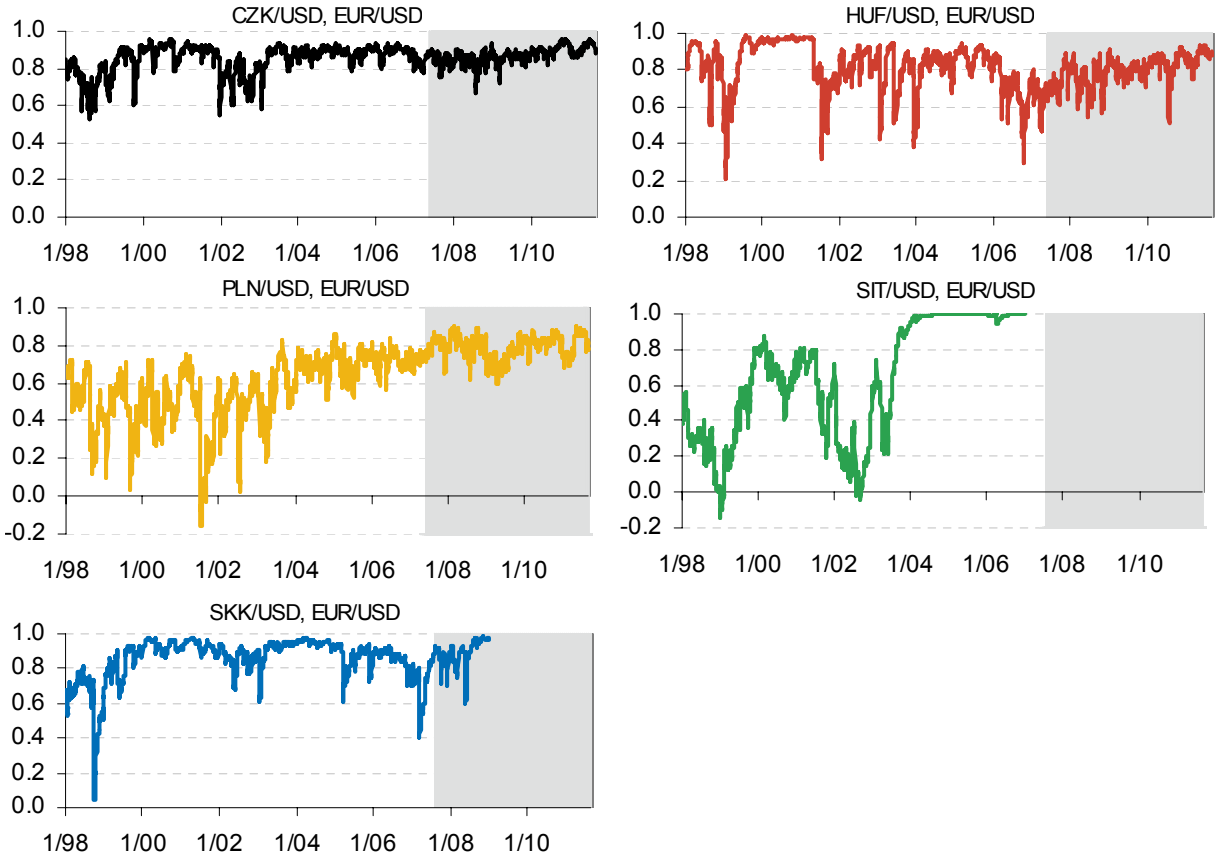
[49] When comparing the levels and evolution of historical interest rate differentials of euro area countries, the fact that the structural characteristics of the economies have changed since the 1990s should be taken into account.
[50] For comparison, the corresponding values in Greece and Ireland were 12.2 p.p. and 6.9 p.p. respectively in June 2011.

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.[51] 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 (until joining the monetary union in the last two cases) 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 20 plots the correlation coefficients in the new EU member countries under review. Compared to the other currencies under review, the correlation of the Czech koruna vis-à-vis the euro can be assessed as relatively high. Declines in the correlation of the koruna and euro exchange rates were recorded in the period of strong appreciation in 2001–2002. During the 2008–2009 crisis, the correlations declined for the Czech Republic and for Hungary and Poland, while the volatility of the coefficients increased. Last year, the correlation between the Czech koruna and the euro was in the range of 0.85–0.95. The correlation of the zloty and the forint remains slightly lower and has been showing higher coefficient volatility since mid-2009.

Chart 20: Correlation coefficients of exchange rates against the US dollar



Note: The light-grey colour of the background marks the period from the beginning of the crisis.

Source: Thomson Datastream, Eurostat, CNB calculations.

[51] See Aguilar and Hördahl (1998).

There is a difference in the convergence of the exchange rates of Slovenia and Slovakia during their stays in ERM II. This difference 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). The outbreak of the financial crisis increased the volatility of the correlation between the Slovak koruna and the euro, but the approaching euro changeover date after the central rate had been set helped keep the correlation at high levels.

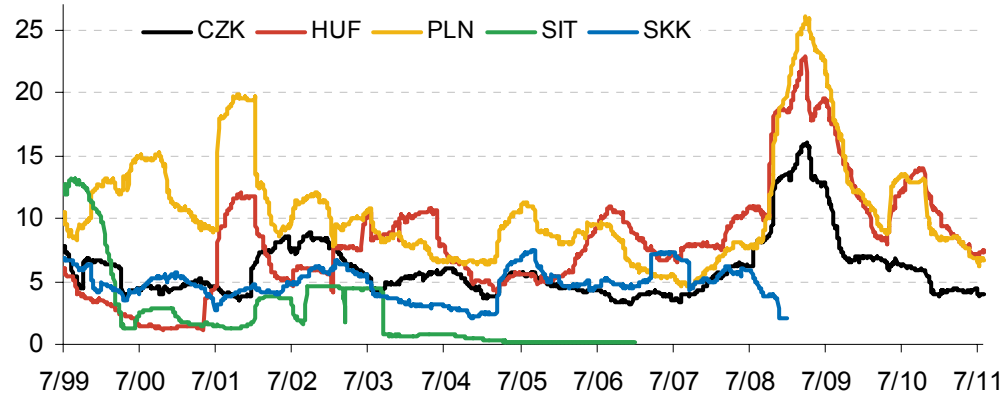
To sum up, the relatively high correlation between the Czech koruna and the euro observed in recent years suggests that the Czech currency responds to changes in the external environment outside the euro area similarly as the euro.

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 21 describes the historical exchange rate volatility of selected countries vis-à-vis the euro between 1999 and 2011.[52] The measure of historical volatility is based on the annualised standard deviation of daily returns for the last six months. The chart shows that the Czech koruna was among the currencies with average to lower volatility in the sample under comparison.[53] The increase in volatility associated with the global financial and economic crisis affected the Czech koruna as well as the forint and the zloty. However, the volatility of the Czech koruna was lower than that of the last-mentioned two currencies and did not rise again in connection with the euro area debt crisis. Between July 2010 and July 2011, the volatility of the exchange rates of all the currencies under review fell to pre-crisis levels. The Czech koruna continued to show the lowest volatility among the currencies under review.

Chart 21: Historical volatility of exchange rates vis-à-vis the euro (%)



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

Source: Datastream, CNB calculations.

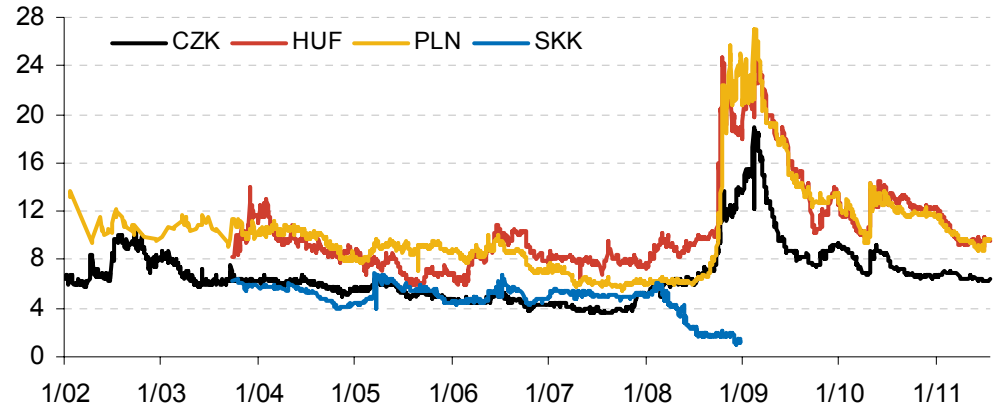
An outlook for exchange rate volatility can also be derived from financial market data. Chart 22 shows the movements in the volatility of the exchange rates of the countries under

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

[53] The lowest volatility was recorded for the Slovenian tolar, whose daily changes were negligible owing to the exchange rate regime applied.

review expected by the financial markets and reflected in the prices of options for the individual currencies (implied volatility). In 2002–2007, the implied volatility had been falling gradually for all currencies and was always lower for the Czech Republic and Slovakia than for Hungary and Poland. In 2008, the increased uncertainty associated with the financial crisis fostered a sizeable rise in the implied volatility of these currencies, except for the Slovak koruna. In 2009 Q2, the implied volatility of the Czech, Polish and Hungarian currencies started to fall again, but the exchange rates of these currencies remained highly volatile until mid-2010, suggesting increased perceptions of the risk to the three currencies on financial markets. The implied volatility started to fall again in 2010 Q3, but remained higher at the end of 2011 H1 than before the crisis.

Chart 22: Implied volatility of exchange rates vis-à-vis the euro (%)



Source: Bloomberg.

Market data on the volatility of the Czech koruna's exchange rate against the euro therefore show frequent exchange rate changes. According to a CNB estimate (2009), the exchange rate volatility fundamentals are roughly similar for the Czech Republic, Hungary and Slovenia, slightly lower for Slovakia and higher for Poland.[54]

For the Czech Republic, the variability is due partly to the appreciation trend of the Czech koruna, but also to global factors not related to Czech fundamentals. Nonetheless, except during the financial crisis, the volatility of the koruna's exchange rate against the euro was low and stable, which is a favourable factor for euro adoption. At the same time, the exchange rate dampened in a desirable way the impacts of economic shocks on the Czech Republic immediately before and after the crisis, and this was reflected in exchange rate volatility.

1.2 EFFECT OF INTERNATIONAL ECONOMIC RELATIONS

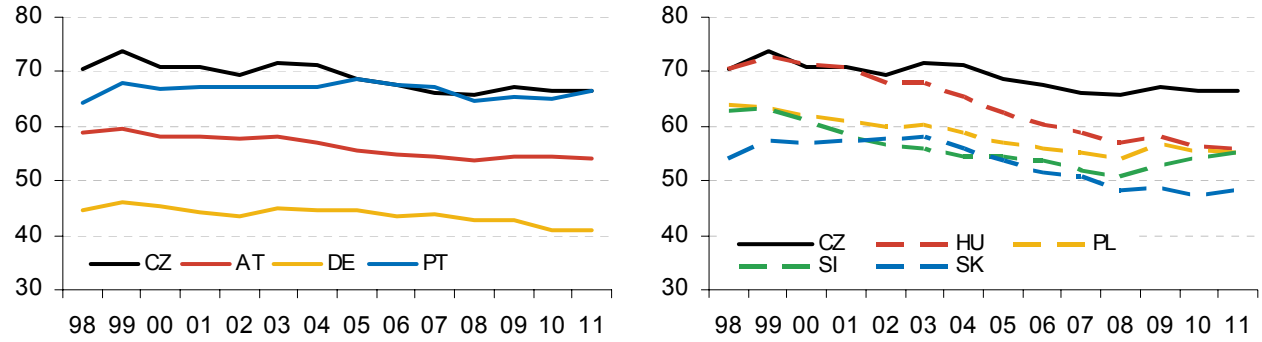
The integration of an economy into international economic relations has an influence on the effectiveness of independent monetary policy and the probability of asymmetric economic shocks. Similarity of economic developments of two economies can be fostered both by trade links and by ownership links.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

[54] The CNB (2009) estimates fundamental-based (i.e. theoretically expected) exchange rate volatility; the situation for Slovakia and Slovenia is hypothetical. 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 (for more details, see, for example, Horváth, 2005).

1.2.1 Integration of the economy with the euro area

Greater economic integration between countries increases the probability of their experiencing similar economic development.[55] It can thus be expected that higher intensity of trade of the countries under the review with the euro area (see Charts 23 and 24) creates conditions for similar cyclical development of the economy. All the countries under review currently have a high degree of economic integration with the euro area. Trade with the euro area countries accounts for around 66% of the Czech Republic's total exports and 60% of its total imports.[56] Except for the imports of Portugal and Austria, this is a higher level than in the other countries under review. The high share of trade with the euro area in the Czech Republic's foreign trade was maintained during the 2008–2009 crisis. Thus there exists a relatively wide channel for transmission of economic impulses from the euro area to the Czech economy.

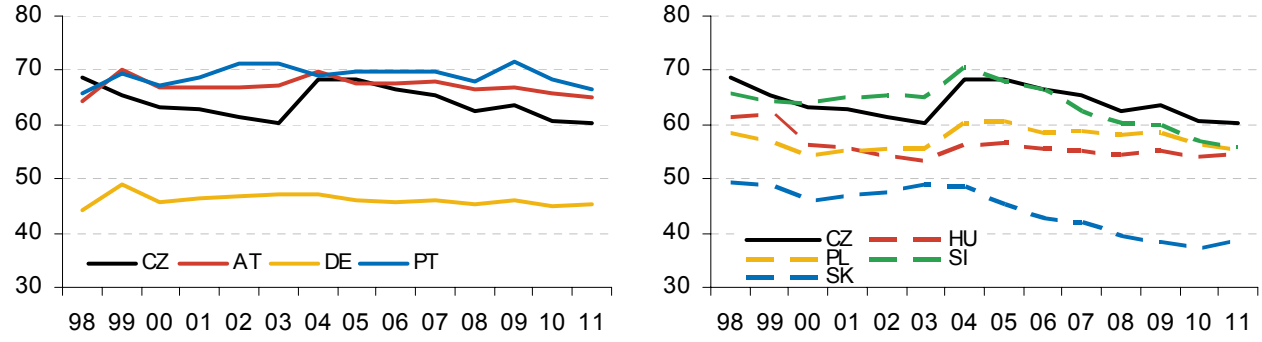
Chart 23: Shares of exports to the euro area in total exports (%)



Note: The preliminary value for 2011 was calculated from the 2011 H1 data. Data are not available for Hungary and Poland for June 2011.

Source: IMF-DOTS, Eurostat, CNB calculations.

Chart 24: Shares of imports from the euro area in total imports (%)



Note: The preliminary value for 2011 was calculated from the 2011 H1 data. Data are not available for Hungary and Poland for June 2011.

Source: IMF-DOTS, Eurostat, CNB calculations.

[55] Closer trade links thus foster higher correlation of economic activity within a single currency area (Frankel and Rose, 1997). On the other hand, higher trade intensity may lead to growing specialisation and decreasing structural similarity and thus to less economic symmetry (Krugman, 1993).

[56] According to the data for 2011 H1, six countries of the monetary union accounted for almost 90% of the Czech Republic's trade with the euro area. Germany accounted for 49.2% of the total, followed by Slovakia with 12.3%, Austria, France and the Netherlands each with 7% and Italy with 6.4%.

Like trade links, ownership links foster higher alignment of economic activity. If domestic companies are part of multinational groups, this may help to transmit economic impulses.[57] In addition, capital integration between two countries can help to dampen a negative unilateral demand shock.[58] Ownership links with the euro area are measured by the share of foreign direct investment (FDI) from the euro area in the countries under review in GDP (see Table 11) and by the share of direct investment (DI) from the surveyed country in the euro area in GDP (see Table 12).

Table 11: Shares of FDI from the euro area in GDP (%)

	2002	2003	2004	2005	2006	2007	2008	2009
CZ	39.7	36.7	37.2	41.3	42.8	47.0	50.0	53.3
AT	12.1	11.8	13.2	17.3	21.6	24.3	24.9	25.0
DE	15.2	15.6	14.7	15.1	16.1	16.4	16.8	17.6
PT	20.0	19.0	19.7	21.9	26.8	31.4	25.5	-
HU	29.5	35.8	36.2	37.7	40.5	43.3	45.3	47.8
PL	16.1	17.7	23.3	23.4	26.1	28.7	23.9	30.7
SI	11.4	12.2	13.9	14.9	15.9	22.6	23.7	23.6
SK	19.7	28.1	29.7	33.9	34.8	34.5	37.3	36.8

Source: Eurostat, national central banks for the Czech Republic, Austria, Germany, Hungary and Slovakia, CNB calculations.

The Czech Republic's share of foreign direct investment from euro area countries in GDP is the highest among the countries under comparison and is showing an upward trend. The inflow (increase in the stock) of FDI from the euro area to the Czech Republic almost doubled in 2010 compared to 2009 (to around CZK 84 billion, from CZK 46 billion in 2009).

Table 12: Shares of DI in the euro area in GDP (%)

	2002	2003	2004	2005	2006	2007	2008	2009
CZ	1.2	1.6	1.7	1.8	2.2	3.1	5.0	5.2
AT	6.7	7.0	7.3	8.0	10.9	11.7	13.1	14.6
DE	13.5	13.4	15.3	17.5	19.5	22.6	24.7	26.6
PT	9.7	9.7	10.6	11.7	13.0	13.6	13.4	-
HU	1.2	1.5	2.7	3.9	4.2	4.2	4.9	4.3
PL	0.3	0.4	0.6	0.5	1.7	1.6	1.9	2.8
SI	1.1	1.3	1.7	1.8	1.9	1.9	1.9	1.7
SK	0.3	0.2	-0.3	-0.4	0.2	0.3	0.9	1.5

Source: Eurostat, national central banks for the Czech Republic, Austria, Germany, Hungary and Slovakia, CNB calculations.

Ownership links defined in the other direction, i.e. direct investment from the countries under review in the euro area as a percentage of their GDP, are so far still low in the case of the new EU members.[59] However, the Czech Republic's share is gradually increasing. According to the available data, it was the highest of the new member countries under review in 2009.

[57] Thanks to the penetration of technology, foreign investment also has a favourable effect on the productivity of domestic firms (Javorcik, 2004; Havránek and Iršová, 2010); the high and rising investment volumes from the euro area are therefore furthering convergence.

[58] 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).

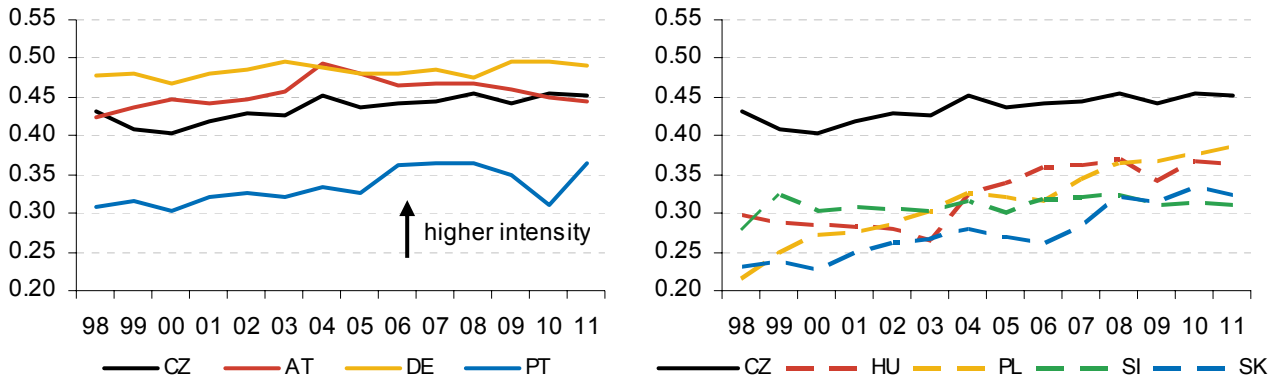
[59] The stock of Slovak investment in the euro area in 2004 and 2005 was slightly negative, as credit relations were dominated by liabilities of Slovak parent companies to their subsidiaries in the Netherlands.

The Czech economy's intensive economic integration with the euro area, coupled with its high degree of openness, increases the probability of alignment. This is confirmed by developments in recent years, when volatility in euro area demand has been the main source of the business cycle in the Czech Republic. It also generates potential for transaction cost savings upon euro adoption. Together with the elimination of exchange rate risk, it is therefore one of the most significant arguments for the Czech Republic's joining the euro area.

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[60] and can also affect the economy's ability to absorb economic shocks.[61] The theory of intra-industry trade[62] 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 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 25 plots this indicator in the countries under review.

Chart 25: Intensity of intra-industry trade with the euro area



Note: The results were calculated using the five-digit SITC classification. The preliminary value for 2011 was calculated from the data for January-April 2011.

Source: Eurostat, CNB calculations.

The SITC5-based Grubel-Lloyd index was virtually flat in most of the countries under review in 2010 and 2011.[63] The index for Portugal recorded the largest decline compared to the other countries in 2008–2010, but returned to the pre-crisis level in 2011.[64] The Grubel-Lloyd indices for the Czech Republic in 2010 and 2011 are among the highest of the countries under comparison, and the preliminary estimate for 2011 is slightly higher than that for Austria. The results based on the more detailed CN8 classification show a similar assessment of the Czech Republic (see Table 13). The Czech Republic therefore continues to be characterised by an above-average share of intra-industry trade compared to the other countries.

[60] Frankel and Rose (1997).
[61] 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. An increase in the proportion of intra-industry trade (horizontal in particular) after accession to a monetary union may also indicate refutation of the specialisation hypothesis based on inter-industry foreign trade.
[62] Krugman (1981) and Hoekman and Djankov (1996).
[63] The estimate for 2011 is preliminary, however, and may change after the data for the whole of 2011 are included.
[64] This estimate is preliminary, however, and may change after the data for the whole of 2011 are included.

Table 13: Grubel-Lloyd index for 2010 by degree of aggregation

	SITC 1	SITC 2	SITC 3	SITC 5	CN8
CZ	0.78	0.69	0.59	0.45	0.38
AT	0.78	0.68	0.61	0.45	0.38
DE	0.77	0.69	0.62	0.49	0.43
PT	0.58	0.51	0.43	0.31	0.26
HU	0.77	0.64	0.55	0.37	0.30
PL	0.81	0.64	0.52	0.38	0.30
SI	0.73	0.59	0.46	0.31	0.23
SK	0.76	0.64	0.49	0.33	0.26

Note: SITC 1, 2, 3 and 5 represent the one-, two-, three- and five-digit SITC breakdowns. CN8 corresponds to the eight-digit breakdown.
Source: Eurostat, CNB calculations.

Trade can be classified as horizontal, i.e. trade in goods of similar quality or degree of processing, or vertical, i.e. trade in goods with significant differences in quality or degree of processing.[65] Horizontal intra-industry trade occurs between countries with a similar economic structure and allows for a wider variety of goods. If, however, the level of economic development of the trading partners differs, intra-industry trade is usually vertical, i.e. trade in goods of very different quality or degree of processing. Thanks to a detailed data classification, it is possible to calculate the intensity of intra-industry trade for each type of trade.

Table 14 shows that just over 40% of both horizontal and vertical trade between the Czech Republic and the euro area is intra-industry trade. The intensity of intra-industry trade along both the vertical and horizontal dimensions in the Czech Republic continues to be more similar to the situation in Germany and Austria than in the other countries. Table 14 also shows that about 61% of the trade of the Czech Republic with the euro area countries was vertical and 29% of it was horizontal.[66] All the countries under review have a dominant share of vertical trade in total trade, although this share is higher for the Czech Republic than for the other countries. The share of horizontal trade in total trade in the Czech Republic is comparable to the situation in the other Central European countries.

Table 14: Grubel-Lloyd index for 2010 by type of trade

	Intensity of intra-industry trade			
	Horizontal		Vertical	
CZ	0.43	(29%)	0.41	(61%)
AT	0.40	(34%)	0.42	(53%)
DE	0.48	(35%)	0.45	(57%)
PT	0.36	(21%)	0.33	(56%)
HU	0.35	(23%)	0.28	(53%)
PL	0.34	(32%)	0.34	(55%)
SI	0.26	(29%)	0.31	(48%)
SK	0.37	(27%)	0.29	(54%)

Note: Numbers in parentheses show the share of the given type of trade in the countries' total trade with the euro area.
Source: Eurostat, CNB calculations.

[65] Fontagné and Freudenberg (1997) and Fontagné et al. (2006).
[66] The difference between total foreign trade turnover and the sum of horizontal and vertical trade consists of one-way trade and measurement errors.

The high share of intra-industry trade in total trade between the Czech Republic and the euro area indicates that the structure of the export-oriented sectors of the Czech economy and the euro area economy is similar. This is a favourable factor for euro adoption.

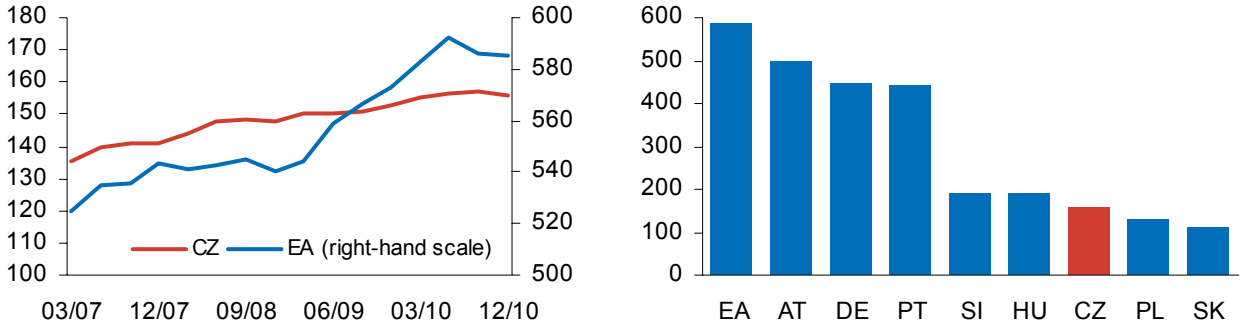
1.3 FINANCIAL MARKET

From the viewpoint of the optimum currency area theory it is useful to examine how advanced and how similar the financial sectors and capital markets of the countries considering participation in a single currency area are to the markets within that area.[67] 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 in those parameters which can be regarded as desirable and their integration into European markets would be a positive signal in terms of euro adoption. In a situation of asymmetric shocks stemming from the financial markets it is necessary to analyse the differences in structure of national banking sectors, taking into account the prudential rules and the risks undertaken, which affect the functionality and stability of the financial sector.

1.3.1 Financial system

The **depth of financial intermediation** in the Czech Republic, expressed as the ratio of financial institutions' assets to GDP, increased by 3 p.p. to 156% in 2010 (see Chart 26). The increase in the depth of financial intermediation was fostered by a rise in financial institutions' total assets amid slow nominal GDP growth in the Czech Republic. By contrast, the euro area financial sector shrank, mainly because of the removal of bad assets from the sector. The importance of the financial sector in the euro area remains higher than in the Czech Republic; in this respect, the domestic financial system is comparable with that in Poland, Hungary or Slovakia (see Chart 26). The main advantage of relatively deeper financial intermediation lies in greater competition between financial institutions and the resulting pressure for lower prices and a wider range of financial products for clients. Nevertheless, a too large financial sector can represent a substantial risk, limiting the ability of institutions or states to solve problems in the hypertrophied financial system. Although the Czech Republic is at a relatively low level in terms of financial intermediation and is converging slowly towards the euro area, the depth of financial intermediation in the euro area is not necessarily an optimal target. The size of the euro area financial sector may stay flat or even decline in the years ahead.

Chart 26: Depth of financial intermediation (assets of financial institutions as % of GDP, 2010)

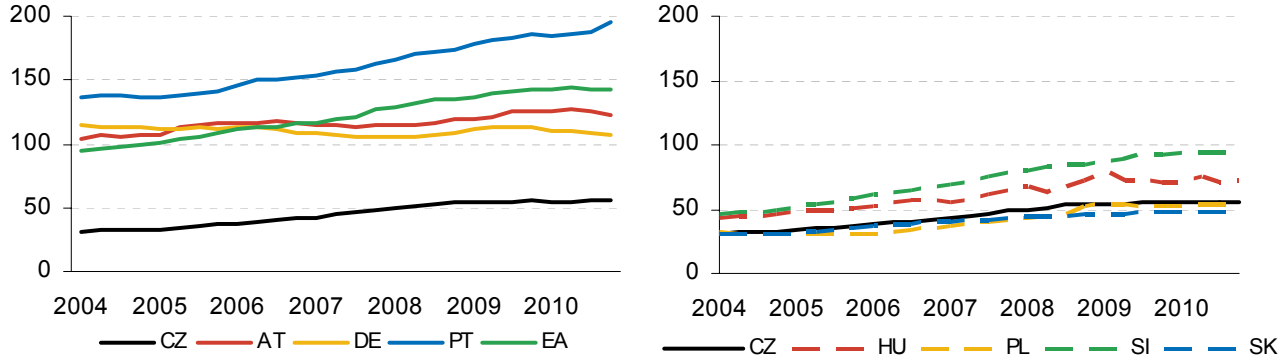


Note: Data for Hungary, Germany, Austria and Slovakia are for 2009 due to data unavailability.
Source: CNB, ECB, Deutsche Bundesbank, Narodowy Bank Polski.

[67] However, 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.

The depth of financial intermediation is closely linked to the **private sector debt ratio.** Czech households and corporations are significantly less indebted than their euro area counterparts and are comparable more with Hungary, Poland and Slovakia in this respect (see Chart 27). Loan growth in both the euro area and the Czech Republic has slowed sharply as a result of the financial crisis. Demand for loans is being negatively affected by the uncertainty surrounding future global economic developments. This is also affecting the behaviour of banks, which are still demanding higher risk mark-ups on interest rates than before the crisis. It can be assumed that private sector debt in the Czech Republic is below its long-term equilibrium level and convergence to it will continue in connection with the global economic recovery.[68] By contrast, numerous euro area countries are showing signs of overleveraging, and a gradual decline in the private sector debt of these states may also aid convergence.

Chart 27: Private sector debt (as % of GDP)



Note: EA represents the average of euro area member countries.
Source: IMF IFS.

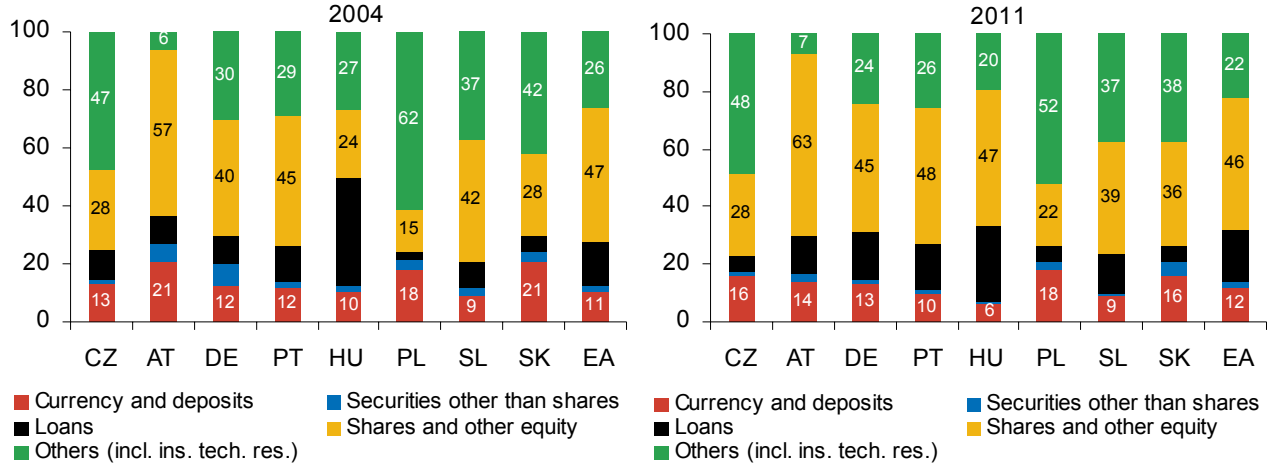
1.3.2 Structure of financial assets and liabilities of corporations and households

A similar structure of financial assets and liabilities of economic agents of individual economies is important for the single monetary policy to have a symmetric effect and for the transmission mechanism to function.

There are still differences in the structure of **financial assets of non-financial corporations** in the Czech Republic compared to the euro area. The share of other assets, comprising mainly trade receivables, is relatively high compared to the euro area, while the share of corporations' shares and other equity is lower. The structure of corporations' financial assets has been broadly unchanged since 2004; the share of other assets increased slightly last year, while that of currency and deposits fell. The euro area saw no such changes. Poland has a similar financial asset structure as the Czech Republic (see Chart 28).

[68] Geršl and Seidler (2011).

Chart 28: Financial assets of non-financial corporations (%)

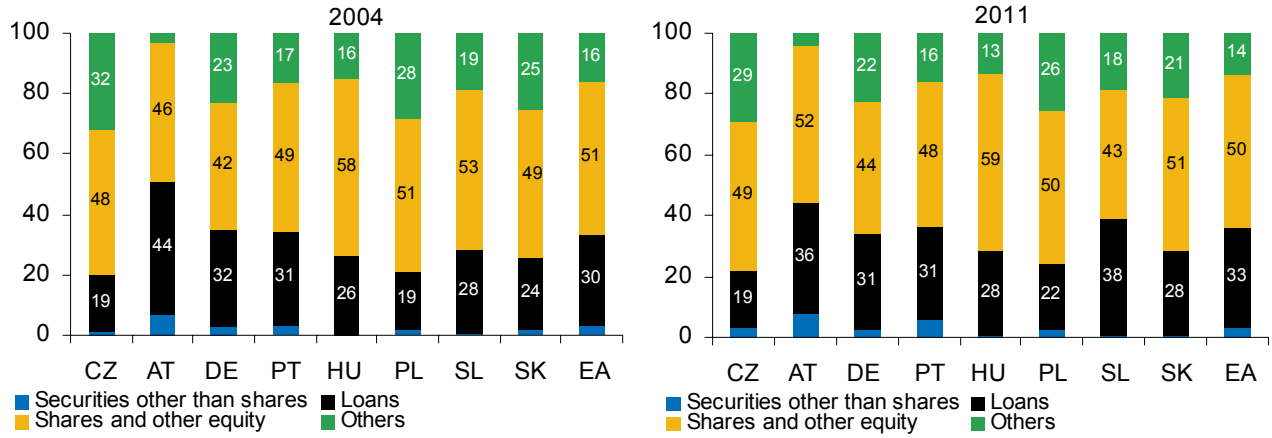


Note: The 2011 data are as of Q1.

Source: ECB, CNB, CNB calculations.

Compared to the euro area, the **financial liabilities of Czech non-financial corporations** consist of a lower proportion of loans and a higher proportion of other liabilities, comprising mainly trade credits and other accounts payable. The structure of financial liabilities of corporations in the Czech Republic has also remained broadly unchanged since 2004. In most of the other countries under review the share of loans has increased, while the share of own funds in the form of equity has declined. It accounts for almost one-half of financial liabilities in all the selected economies (see Chart 29). Having dropped in 2009 owing to both supply and demand factors, the share of loans in financial liabilities is currently flat or rising slightly in the Czech Republic, while declining in the euro area, Germany, Portugal and Hungary. The share of own funds in the form of equity is increasing in these countries. Debt security financing is less significant in most of the countries under review, despite rising in 2008–2010. As in the case of financial assets, the structure of financial liabilities in the Czech Republic is closest to that in Poland.

Chart 29: Financial liabilities of non-financial corporations (%)



Note: The 2011 data are as of Q1.

Source: ECB, CNB, CNB calculations.

The **debt of non-financial corporations**, as measured by the ratio of loans and debt securities to GDP, has been above 45% since 2008 (see Table 15). Having increased in 2009, the debt-to-GDP ratio of corporations declined in 2010 in most of the countries under review. The debt level of Czech corporations is comparable with Slovakia, but is much lower than the euro area average. The lower debt of Czech corporations relative to the euro area should not represent an adverse factor for euro adoption.

Table 15: Debt of non-financial corporations (loans and debt securities, % of GDP)

	2004	2005	2006	2007	2008	2009	2010
CZ	44.9	44.0	43.2	42.2	46.1	45.8	46.7
AT	78.0	78.7	78.5	81.2	84.9	91.1	91.3
DE	68.9	67.3	66.2	68.1	71.1	75.7	73.8
PT	122.2	124.8	124.5	135.5	149.3	156.9	154.3
HU	65.3	78.4	83.9	93.7	117.4	128.4	113.4
PL	29.2	28.8	33.2	35.4	40.6	39.2	38.8
SI	58.6	66.0	68.9	80.8	90.7	97.7	95.7
SK	51.8	48.0	48.9	50.2	48.4	49.7	47.2
EA-17	84.9	87.3	90.4	95.4	100.5	105.4	104.7

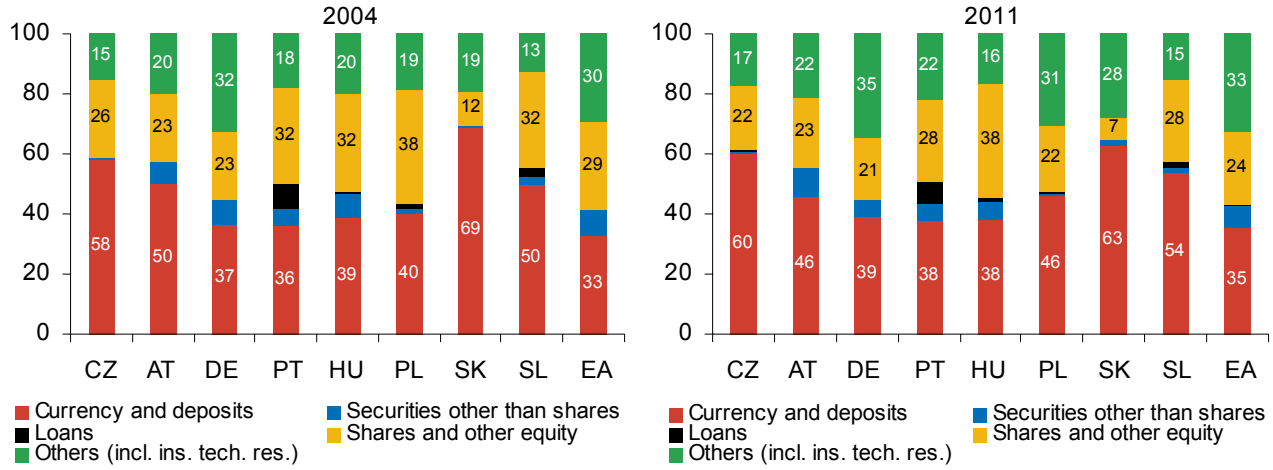
Note: Loans comprise loans granted to corporations by domestic banks, financial intermediaries and other corporations, and loans obtained from abroad. The ratio of loans provided to non-financial corporations by domestic banks to GDP was about 21% in the Czech Republic in 2010.

Source: ECB, CZSO, CNB calculations.

The structure of **financial assets of Czech households** also still shows some differences from the euro area (see Chart 30). The Czech Republic and Slovakia have the highest shares of currency and deposits among the countries under comparison, owing to a traditionally conservative approach of households to managing their financial assets and to a shallower capital market. The share of currency and deposits in Czech households' financial assets has risen slightly since 2004, although it has edged down recently owing to the economic situation and the still weak labour market. A rise in the market value of shares is also reflected in a higher share of equity securities. A significantly higher ratio of deposits to loans in the Czech Republic than in the euro area and the other countries under review remains a positive factor for financial stability at the macroeconomic level and for households themselves. The share of household investment in insurance reserves and pension funds in the Czech Republic is still roughly half that in the euro area, although it has increased very slightly since 2004. Austria and Slovenia have similar household financial asset structures. The ratio of total financial assets of households to GDP is around 89%, which is significantly lower than in the euro area, where it is 207% (the ratios for total assets, expressing household wealth, are 194% in the Czech Republic and 500% in the euro area). The **structure of financial liabilities of households** was similar in all the countries under review in 2011 (see Chart 31).[69]

[69] In addition to loans, household financial liabilities also comprise other accounts payable, which represent financial liabilities due to the time mismatch between the claim and the payment made on a given transaction etc.

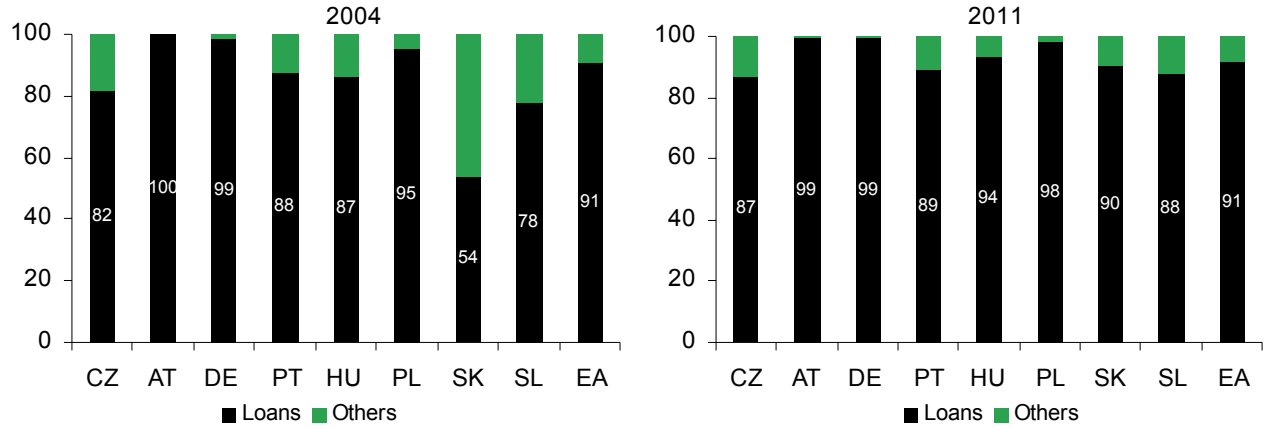
Chart 30: Financial assets of households (%)



Note: The 2011 data are as of Q1.

Source: ECB, CNB, CNB calculations.

Chart 31: Financial liabilities of households (%)



Note: The 2011 data are as of Q1.

Source: ECB, CNB, CNB calculations.

Household debt, as expressed by the loan-to-GDP ratio, has long been increasing in all the selected economies except Germany. In response to the global financial and economic crisis, it dropped only in Germany and slightly in Portugal in 2010, while remaining flat in the euro area. The loan-to-GDP ratio of households stood at 31% in the Czech Republic in 2010, which is comparable with Poland, Slovenia and Slovakia. The household debt ratio in the Czech Republic is around one-half of the euro area average (see Table 16), but the higher household debt in the euro area is accompanied by greater household wealth (see above). A different impact of changes in the monetary policy rate on households' balance sheets and consumption between the Czech Republic and the euro area (especially the possibly higher sensitivity of low-income households to changes in interest rates in the Czech Republic than in the euro area) may represent a risk as regards monetary policy transmission. Moreover, the **gross saving ratio** of households is significantly below the euro area average. In 2009, it was broadly comparable with that in the Central European countries (see Table 17).

Table 16: Household debt (bank and non-bank, % of GDP)

	2004	2005	2006	2007	2008	2009	2010
CZ	14.8	17.7	20.6	24.9	28.1	30.7	31.1
AT	51.2	54.5	55.0	54.2	54.5	56.5	57.2
DE	70.5	69.3	66.9	63.2	61.3	63.4	61.0
PT	77.2	82.4	86.9	89.1	92.1	95.8	95.2
HU	19.8	23.5	26.2	29.8	36.4	37.5	39.1
PL	13.4	15.1	18.5	22.9	30.3	32.3	34.9
SI	16.5	19.1	21.8	24.9	26.0	29.2	30.6
SK	12.4	15.7	17.9	20.7	21.8	24.4	25.9
EA-17	55.5	58.6	60.7	61.7	62.7	66.1	66.1

Source: ECB, CZSO, CNB calculations.

Table 17: Gross saving ratio of households (% of gross disposable income)

	2004	2005	2006	2007	2008	2009	2010
CZ	5.7	8.1	9.5	10.7	10.1	8.9	9.4
AT	14.1	14.4	15.1	16.2	16.5	16.0	-
DE	16.1	16.3	16.4	16.8	17.6	17.2	-
PT	10.0	10.0	8.0	7.0	7.1	10.9	9.8
HU	11.4	11.6	12.4	10.3	8.4	10.9	-
PL	9.4	9.7	9.8	8.5	3.7	9.9	-
SI	15.4	17.4	17.7	15.7	15.5	15.9	-
SK	5.9	6.6	5.8	7.5	6.6	8.1	-
EA-17	14.3	13.8	13.5	13.9	14.1	15.2	13.7

Source: Eurostat, CZSO.

To sum up, some differences persist in the structure of financial assets and liabilities of economic agents between the Czech Republic and the euro area. Compared to the euro area average there is a larger share of trade receivables in Czech corporations' assets and a larger share of currency and deposits in households' assets. The indebtedness of Czech corporations is lower than in the euro area countries under review. However, the lower debt ratio of households in the Czech Republic compared to the euro area average is accompanied by lower wealth and a lower gross saving ratio.[70] The differences in the structure of financial assets and liabilities of corporations and households between the Czech Republic and the euro area may to some extent cause the single monetary policy to have an asymmetric effect. However, they are not fundamental as regards euro adoption.

1.3.3 Effect of monetary policy on client interest rates and new loans

Similar transmission of changes in financial market interest rates to client rates and the volume of loans to non-financial corporations and households is important for symmetric **transmission of the single monetary policy** across economies. The transmission between market and client rates is usually affected mainly by the interest rate elasticity of demand for loans, the degree of competition on the market and the existence of asymmetric information.

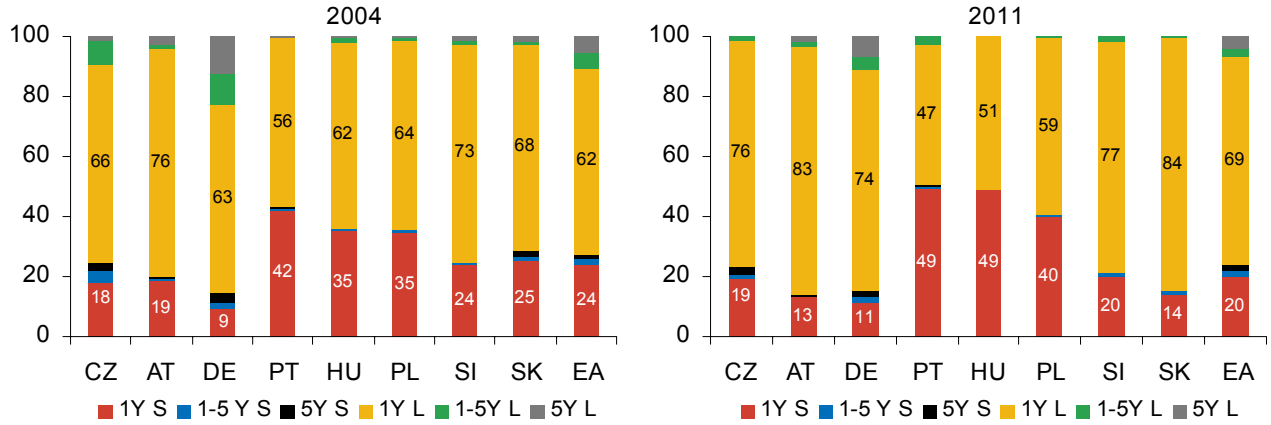
In the Czech Republic, as in the euro area, **client interest rates on new loans** with floating interest rates or rates fixed for up to one year are derived mainly from the money market

[70] The ratio of net financial assets of households to GDP is around 57% in the Czech Republic and 133% in the euro area.

rate.[71] Rates on loans with long fixations are strongly affected by the ten-year government bond yield. The transmission of changes in financial market rates to client rates is relatively fast in the Czech Republic (about 60% of the transmission takes place within one month), but it is full only for mortgage loans. For rates with longer fixations linked to the government bond yield the transmission is slower (longer than one month). The tightening of credit standards recorded in the Czech Republic during the crisis, which slowed the transmission of financial market rates to client rates, has mostly eased recently. Tighter credit standards persist only for small corporate loans (up to CZK 30 million) and for consumer credit owing to its high risk.

The **structure of new loans to non-financial corporations by volume and interest rate fixation** remains similar to that in the euro area. Corporations in the Czech Republic and most of the countries under review draw mainly large loans with short fixations (see Chart 32). Empirical analyses show that large corporate loans have smaller interest margins than small loans.[72] By contrast, Portugal, Hungary and Poland also have a significant proportion of small loans with short fixations. Together with Austria and Slovakia, the Czech Republic is among the countries with relatively high interest rate sensitivity – almost 90% of new loans have floating rates or rates fixed for up to three months. This points to immediate transmission of monetary policy changes to client rates, loans and corporate balance sheets. The said share amounts to around 70% in the euro area and Germany and about 50% in Portugal and Slovenia.

Chart 32: Structure of new loans to non-financial corporations by interest rate fixation (%)



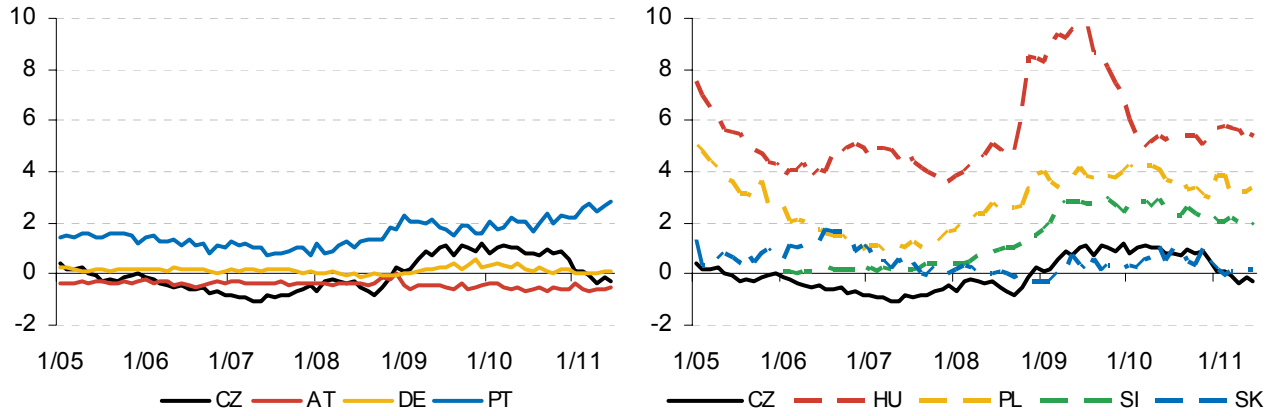
Note: 1Y S and 1Y L stand, respectively, for small and large loans with a floating rate or a rate fixed for up to one year, and the other items in the key denote such loans with longer interest rate fixations. The structure of the euro area total varies according to the current number of euro area member countries. The 2011 data are as of June.

Source: ECB, CNB calculations.

The increased differences in **interest rates on loans to non-financial corporations** compared to the euro area observed during the crisis have declined in most countries since 2010 (see Chart 33). In the Czech Republic, this is due mainly to a decrease in client risk premia and a decline in the short-term market interest rate. In 2011, the difference in rates on corporate loans turned slightly negative as a result of a rise in the monetary policy interest rate and market rates in the euro area. Increased differences vis-à-vis euro area rates persist for domestic currency loans in Poland and Hungary and also in Slovenia and Portugal. In the case of foreign currency loans in Poland and Hungary these differences are considerably smaller, being similar to those in the Czech Republic (which is a net contributor to the macrofinancial problems in these countries – the share of foreign currency loans in total corporate loans is 55% in Hungary and 23% in Poland).

[71] See Horváth and Podpiera (2009) and CNB (2010a).
[72] See Horváth and Podpiera (2009) and CNB (2010a).

Chart 33: Differences in interest rates vis-à-vis the euro area average, loans to non-financial corporations (new business, p.p.)

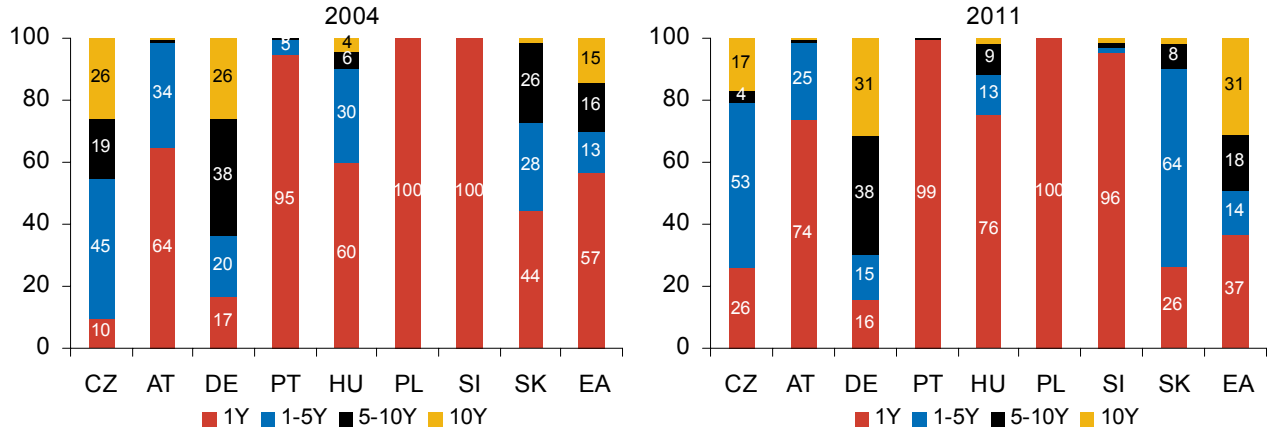


Note: The differences for Poland and Slovakia are calculated from interest rates on loans with fixations of up to one year, while those for the other countries are calculated from the average interest rate on total corporate loans.

Source: ECB, CNB calculations.

The housing loan market remains heterogeneous across the countries under review. This reflects the macroeconomic situation of the individual countries and the structure of loan products. In the Czech Republic, 74% of **new loans for house purchase** are currently being provided with rate fixations of over one year (see Chart 34), while the figure for the euro area is around 10 p.p. lower on average. The share of shorter fixations is higher in the euro area. However, the share of new loans with floating rates or rates fixed for up to one year has risen in the Czech Republic since 2004. Germany and Slovakia also have lower shares of loans with short fixations. By contrast, loans with floating rates or rates fixed for up to one year predominate strongly in Portugal, Hungary, Poland and Slovenia, creating an environment for immediate transmission of changes in monetary policy rates to household balance sheets.

Chart 34: Structure of new loans to households for house purchase by interest rate fixation (%)



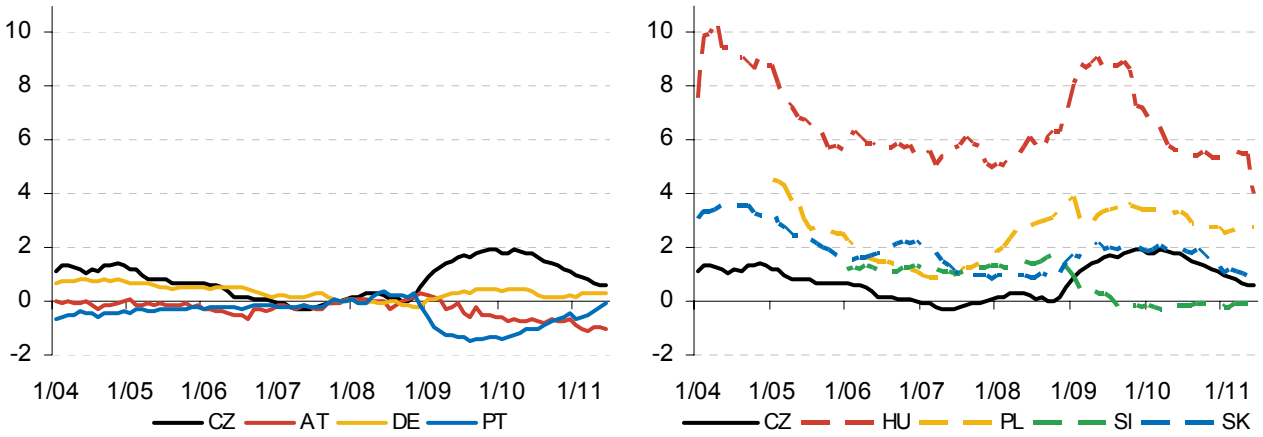
Note: The structure of the euro area total varies according to the current number of countries. The 2011 data are as of June.

Source: ECB, CNB calculations.

The **differences in interest rates on new loans for house purchase** in the Czech Republic vis-à-vis the euro area were close to zero in 2006–2008, rose temporarily during the crisis and

since then have been slightly positive after a partial correction[73] (see Chart 35). Interest rates in this segment of the credit market have been fairly heterogeneous since 2009. The differences in rates in Austria dropped to negative territory throughout the period under review. On the other hand, the negative differences in rates between Portugal and the euro area moderated. There are relatively large differences between rates on domestic currency house purchase loans in Hungary and Poland vis-à-vis the euro area, while for foreign currency loans the differences are smaller, although they are growing for Hungary (owing, among other things, to this factor the share of foreign currency loans in total loans for house purchase is 65% in Hungary and 38% in Poland).

Chart 35: Differences in interest rates vis-à-vis the euro area, loans for house purchase (new business, p.p.)



Note: The differences for Hungary and Poland are calculated from interest rates on loans with fixations of up to one year, while those for the other countries are calculated from the average interest rate on total loans for house purchase.

Source: ECB, CNB calculations.

To sum up, the transmission of changes in financial market interest rates to client rates in the Czech Republic is similar to that in the euro area and so represents no barrier to future euro adoption. Rate transmission is relatively fast in general, but is naturally slower for loans linked to the long-term market rate. The increase in client risk premia in the Czech Republic during the crisis, which was more pronounced than that in the euro area, slowed the transmission of monetary policy rates to client rates, but this effect is unwinding. For corporate loans the structure of rate fixations in the Czech Republic is similar to that in the euro area, whereas for house purchase loans longer fixations are more common in the Czech Republic.

1.3.4 Spontaneous euroisation

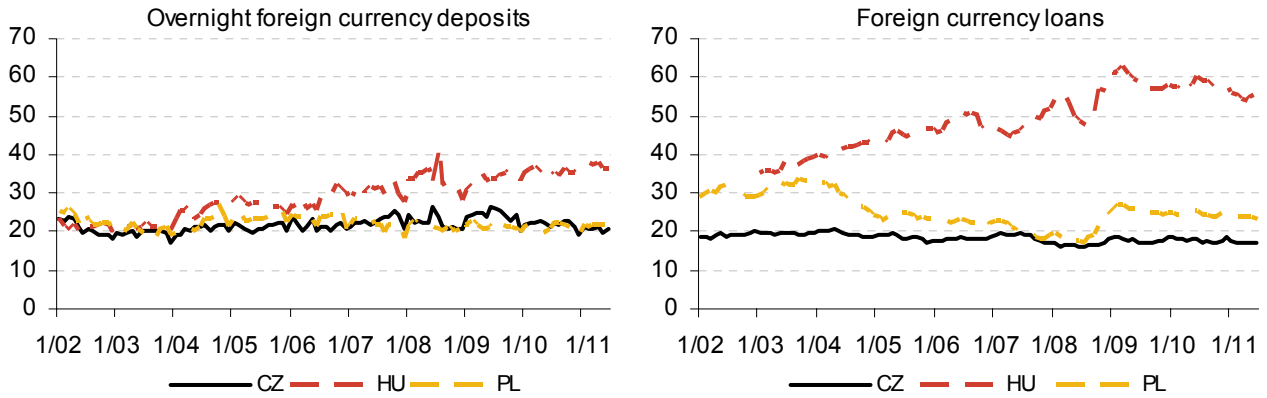
A high proportion of foreign currency in domestic transactions – **spontaneous euroisation** – generally weakens the effect of independent monetary policy on the economy. It is usually accompanied by increased demand among corporations and households for foreign currency financial products.

The degree of use of foreign currency in transactions of non-financial corporations reflects the openness of the Czech economy and is relatively stable over time. The share of foreign currency deposits in overnight corporate deposits and the share of foreign currency loans in total corporate loans are fluctuating around 20% (see Chart 36). Corporate foreign currency

[73] The correction reflected a decline in the client risk premium differential and long-term market interest rates and also a negative difference in monetary policy rates since 2011.

deposits and loans are usually denominated in euros (80–90%); this is related to the dominant position of trading partners from the euro area. In Poland the shares of corporate foreign currency loans and deposits are similar to those in the Czech Republic, while in Hungary the shares of foreign currency instruments are considerably higher (almost 40% of overnight deposits and 50–60% of corporate loans) and increasing over time. Loans drawn by Czech corporations abroad, mostly in foreign currency, are continuing to record annual declines (of 6.4% in 2011 Q1), as opposed to increases before the crisis. Their ratio to domestic loans provided by MFIs is around 36%. These loans, like foreign currency loans from domestic banks, are a natural hedge for corporations, reducing their sensitivity to exchange rate volatility.

Chart 36: Overnight foreign currency deposits and loans of non-financial corporations (shares in total overnight deposits and loans of non-financial corporations with domestic banks, %)

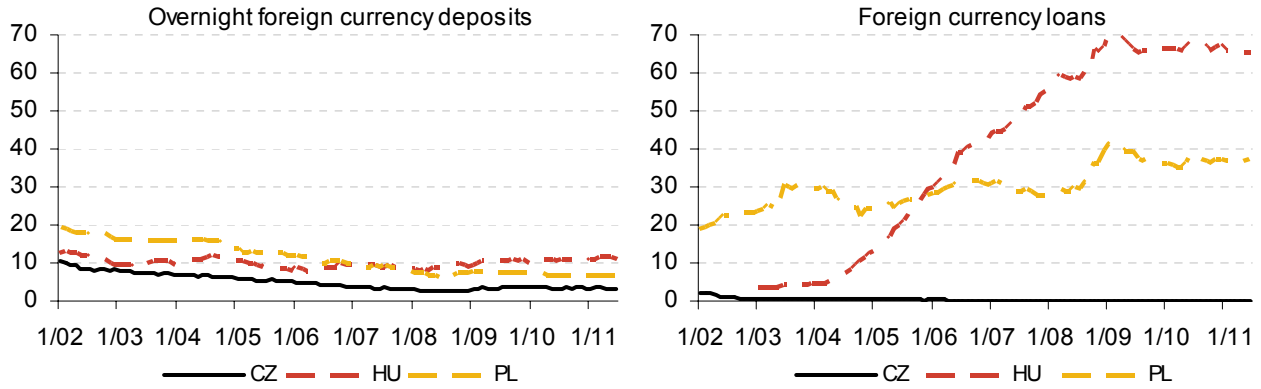


Source: ECB, CNB calculations.

Demand for foreign currency, or the euro, is much lower among Czech **households** than among non-financial corporations. The share of overnight foreign currency deposits of households remains around 3%, which is lower than in Poland and Hungary (see Chart 37). The proportion of household foreign currency loans has long been virtually zero. In Poland, and particularly in Hungary, the proportion of foreign currency loans to households is significant owing to high nominal interest rates on domestic currency house purchase loans, but unlike in the pre-crisis period it has been flat since 2009.[74]

[74] The results of an Oesterreichische Nationalbank (2011) survey suggest that households' perceptions of the exchange rate risk relating to foreign currency loans has increased after the global financial and economic crisis (reflecting the depreciation of the relevant domestic currencies during the crisis). Despite that, foreign currency loans continue to be regarded in some countries as more attractive than domestic currency loans, because of demand and supply factors. A high proportion of loans for house purchase denominated in Swiss francs also persists in Austria.

Chart 37: Overnight foreign currency deposits and loans of households (shares in total overnight deposits and loans of households with domestic banks, %)



Source: ECB, CNB calculations.

To sum up, the use of foreign currency in Czech entities' financial transactions remains concentrated in the sector of corporations, owing to their involvement in foreign trade.[75] Czech households make minimal use of foreign currency in domestic transactions. This is due to economic agents' confidence in the domestic currency, long-term low inflation and low interest rates. In the Czech Republic, consequently, spontaneous euroisation still does not represent a crucial additional argument for euro adoption beyond the framework of high trade integration with the euro area

1.3.5 Financial market integration

Financial market integration has been achieved when financial assets having comparable risk factors and yields are priced identically by the markets no matter which country they are traded in. Fully integrated markets with no barriers (economic, legal, etc.) provide an opportunity for arbitrage, reducing the importance of local, country-specific factors, and in turn allow investors to directly compare prices of financial assets across markets. This simple logic of the law of one price has been applied to measure the integration of the financial markets of selected countries with the euro area. The more the individual segments of the financial markets of countries planning to adopt the euro become integrated with the euro area market, the more asset prices will be affected by common factors rather than by national factors.

The following analysis of the integration of financial markets (money, foreign exchange, government bond and stock markets) applies two methods based on the law of one price: (i) price-based measures and (ii) news-based measures.[76] Price-based measures use the concepts of beta-convergence and sigma-convergence. The concept of beta-convergence enables identification of the speed of convergence of the national market to the euro area, while the concept of sigma-convergence identifies the degree of convergence. The two concepts must be tracked concurrently in order to assess financial integration by means of this method, as financial markets may be either converging (declining sigma) or diverging (rising sigma) at any given speed (beta). News-based measures are based on the assumption that

[75] According to a CNB survey of selected non-financial corporations, the shares of foreign currency payments and receipts in total domestic payments and receipts are currently around 15% and 10% respectively and have long been quite stable. At the same time, the survey shows that about 32% of expected exports of corporations in the coming twelve months will be hedged against exchange rate risk (compared to 36% as of 2011 Q2).

[76] The literature also provides some other approaches to measuring integration which are based not on the law of one price but, for example, on quantitative indicators (quantity-based measures). These entail various surveys of statistical information monitoring change in investor behaviour in the process of financial market integration.

prices of individual national assets respond to common news rather than to local news. The sensitivity of asset prices to global news is measured by gamma, which shows the extent to which asset prices of the countries under comparison respond to news in the same way as euro area asset prices.[77]

The periods examined in this part of the analyses differ depending on the availability of data for the individual markets. The longest series covering the period 01/1995–07/2011. The results of the analysis for the individual financial market segments are shown in Table 18 for beta-convergence, in Chart 38 for sigma-convergence and in Chart 39 for gamma. When interpreting the results of the analysis, we take particular account of the financial crisis period, which was marked by generally high market price volatility.

Table 18: Beta coefficients

	Money market		Foreign exchange market		Bond market		Stock market	
	1/99–7/07	8/07–7/11	1/99–7/07	8/07–7/11	1/01–7/07	8/07–7/11	1/95–7/07	8/07–7/11
CZ	-0.57	-0.37	-0.93	-0.88	-0.73	-0.73	-0.79	-0.79
AT	-	-	-	-	-1.12	-0.92	-0.88	-0.64
DE	-	-	-	-	B	B	-0.78	-0.94
PT	-	-	-	-	-0.81	-0.74	-0.92	-0.98
HU	-0.79	-0.94	-0.87	-0.96	-0.87	-0.64	-0.81	-0.95
PL	-0.68	-0.72	-0.87	-1.01	-0.82	-0.82	-0.82	-0.87
SI	-	-	-	-	-	-	-0.78	-0.82
SK	-0.75	-0,56‡	-1.07	-0,60‡	-0,99‡‡	-0.91	-0.72	-0.95
EA	B	B	B	B	-	-	B	B

Note: The closer the value of the beta coefficient is to -1, the higher is the speed of convergence; the first time interval in the analyses is the period before the outbreak of the financial crisis (up to August 2007); the second is the period containing the impacts of the financial crisis. Other symbols: B – benchmark; "-" – data not available; ‡ – up to 31 December 2008; ‡‡ - from 22 June 2002. All the estimates were statistically significant at the 1% level.

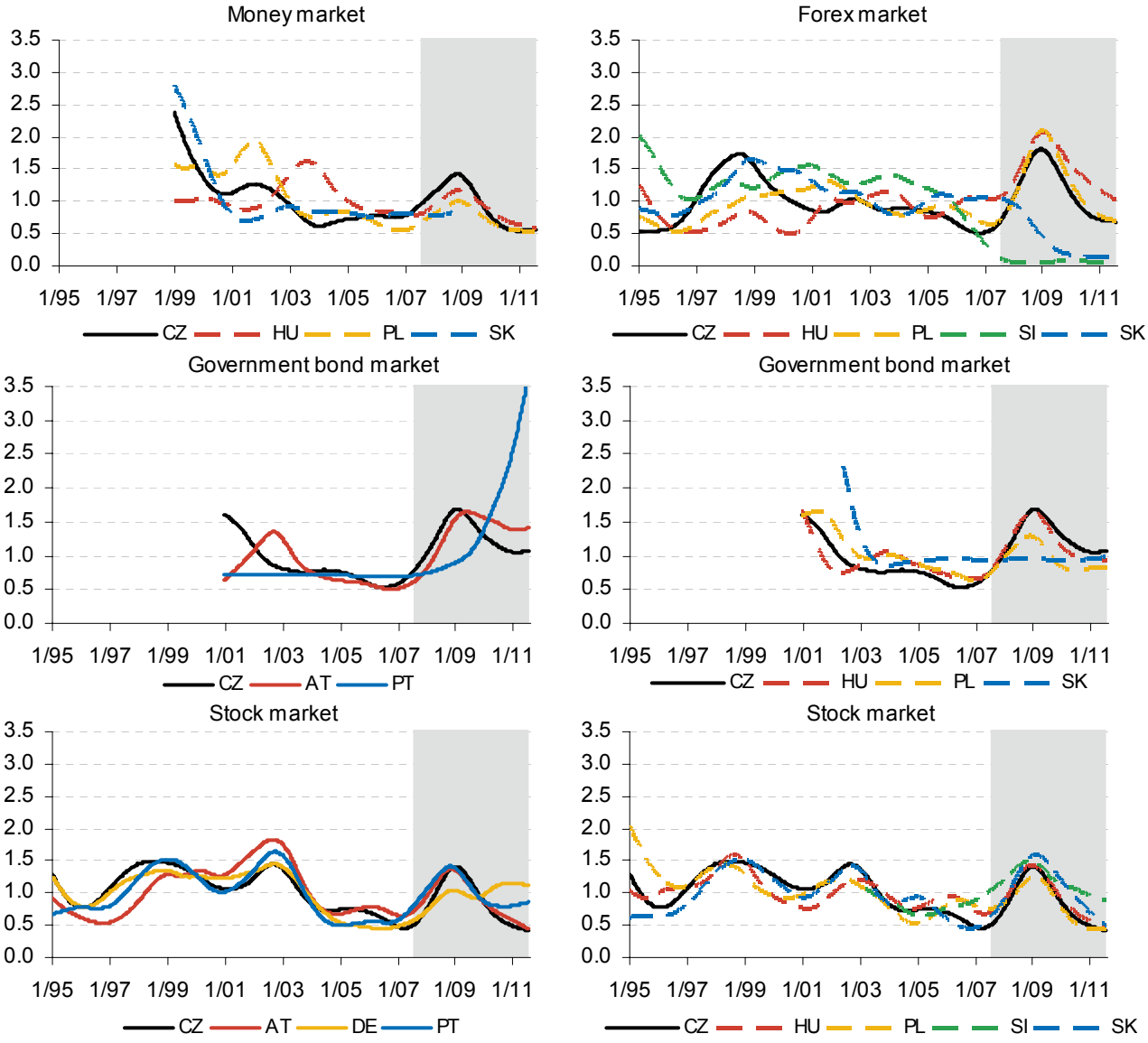
Source: Thomson Datastream, ČNB calculations.

The results of **price-based measures** signal that in the pre-crisis period the speed of price adjustment on the stock, bond and foreign exchange markets of the countries under review vis-à-vis the euro area (or Germany in the case of the government bond market) was relatively high (beta coefficients close to -1; see Table 18) and the level of convergence achieved gradually increased across the countries under review in the case of these markets (declining sigma coefficients; see Chart 38). The results for the Czech Republic in individual markets rank it among the countries with the highest degree of integration, i.e. those with potentially the greatest influence of global factors.

The speed of integration of the money market in the new member countries under review was already lower in the pre-crisis period compared to the other markets. This reflects the relatively strong effect of specific regional factors (national currency or autonomous monetary policy). Among the countries under review, Poland achieved the highest degree of money market integration (as evidenced by the gamma coefficients; see Chart 39). However, the fastest convergence was recorded by the Hungarian money market. The level of integration of the Czech money market has remained broadly unchanged since 2002. The experience of countries with the single currency euro shows the euro candidates that specific regional factors persist until the announcement of euro adoption, after which there is a sharp natural adjustment.

[77] Asset prices are monitored at an aggregate level and it is assumed that euro area assets respond primarily to global news.

Chart 38: Sigma coefficients



Note: Lower standard deviation values (y-axis) correspond to a higher convergence level. The grey area marks the period since August 2007. For presentation in the charts, the standard deviations were first normalised over their entire time period to facilitate comparison across markets and then filtered using the Hodrick-Prescott filter with the recommended weekly time series coefficient λ = 270,400.

Source: Thomson Datastream, CNB calculations.

The results of **news-based measures** indicate that the local factors affecting the national markets were already quite significant in the pre-crisis period (see Chart 39). For the Czech Republic, the highest degree of integration measured using this method was obtained for the government bond market, followed by the stock market. Higher sensitivity to the transmission of global news can be expected for these two markets given the greater influence of foreign investors there. The reaction to common news in the other markets in the Czech Republic, and in the other countries under review, was quite small until 2009. It can thus be concluded from the comparison with the degree of integration measured using sigma-convergence that the koruna market responded to common global news in the same manner as the euro market, and for both markets the response was very weak. Overall, the gamma results show that the

degree of integration was stable in the period between the candidate countries' accession to the EU and the start of the crisis, albeit at rather low levels.

Both methods signal that the **financial crisis** (the grey area) had a significant impact on the financial market integration of all the countries under review with the euro area. Chart 38 shows that the divergence started at the outbreak of the crisis and lasted almost to mid-2009, when the situation on the financial markets started to calm temporarily.[78] Since the outbreak of the financial crisis, there has been a prevalence of asymmetric, country-specific shocks. This is linked with the higher market volatility, the different impact of the crisis on each country under review, and the different crisis resolution methods adopted. The rate of decline in integration was comparable across both the new and original EU Member States. Chart 39 shows, however, that the financial crisis also resulted in a sudden change in national markets' sensitivity to global news. Except for the government bond market, the gamma coefficients increased after the events of September 2008, when it was already clear that the financial crisis had spread to global markets.

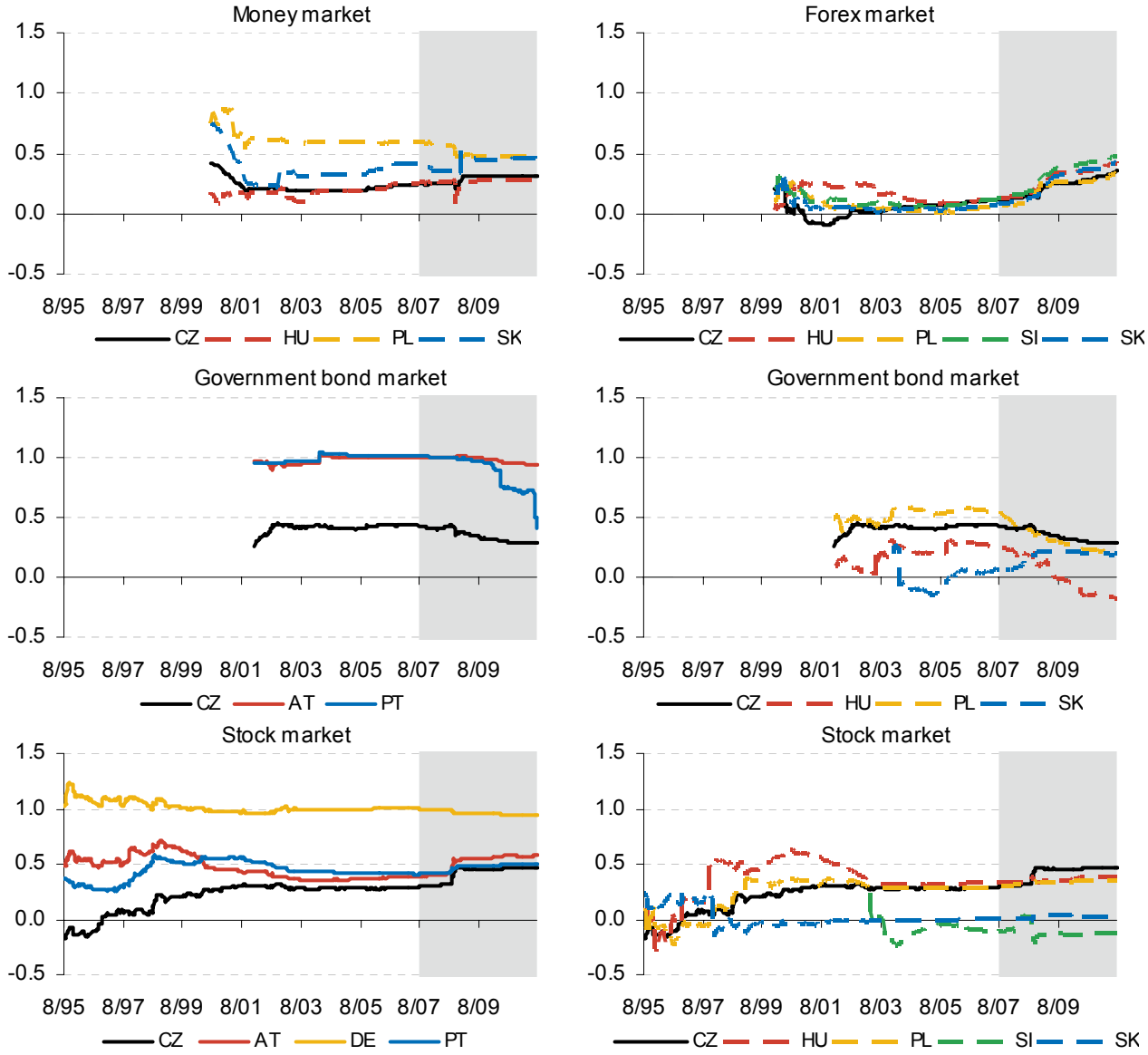
In the Czech Republic, Hungary, Poland and Slovakia, sigma-convergence has returned to the pre-crisis level on the stock, money and foreign exchange markets since 2009 H2. In the euro area member countries, by contrast, the sigma coefficients are signalling divergence for the Austrian and Portuguese government bond markets and for the Portuguese and German stock markets. The continuing divergence on the government bond markets in Portugal and the lower than pre-crisis levels in the other countries (except Slovakia) are linked with concerns about the debt crisis spreading across EU countries and the "flight to quality and certainty" effect. For example, German government bonds are accepted by the markets as highly liquid and high-quality assets, but the same no longer applies to the bonds of the countries on the southern periphery of the euro area and Ireland owing to the gradual downgrading of government ratings and their outlooks.[79] The strengthening effect of local factors and investors' flight to certainty on the government bond market is confirmed by falling gamma coefficients for all countries.

To sum up, the negative impacts of the crisis on financial integration seem to be less unfavourable for countries with stable public finances and a stable financial system as a whole (e.g. the Czech Republic and Austria) which had already achieved an advanced level of financial integration before the crisis. The opposite conclusion can be made for the weak economies on the southern periphery of the euro area (represented here by Portugal), which are tending to recede from the level of financial integration achieved in previous years.

[78] The Slovak forex market recorded "artificial" convergence at the beginning of the crisis, owing to the completion of the euro adoption process.

[79] The divergence on the government bond market is confirmed by developments on the government bond hedging derivatives market (CDS spreads). At the end of 2007, CDS spreads on the Austrian sovereign debt had been the same as in Germany (with Czech and Portuguese spreads being almost three times higher than the German one), whereas at the end of August 2011 the Austrian sovereign CDS spread was the same as the Czech spread and the Portuguese spread had escalated to a level eight times higher.

Chart 39: Gamma coefficients



Note: Positive (negative) gamma values close to one express same (opposite) directional and similarly strong sensitivity to news and therefore a higher degree of integration; values close to zero express low integration. For illustration, the grey area marks the crisis period.

Source: Thomson Datastream, CNB calculations.

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, price and wage elasticity, labour market flexibility and the ability of the financial system to absorb shocks.

2.1 FISCAL POLICY

After the loss of independent monetary policy, the stabilising effect of fiscal policy can to some extent substitute for the missing monetary adjustment mechanisms in the event of asymmetric shocks. By contrast, fiscal policy can itself be a source of economic shocks if the parameters are set or measures chosen inappropriately. 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 Stabilising 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, i.e. via discretionary measures on the revenue or the expenditure side of the public budgets, or indirectly, by creating conditions for optimal functioning of automatic fiscal stabilisers. However, the negative experience of the advanced countries in the 1970s is an argument against the wider application of discretionary measures under activist fiscal policy, since such policy failed to produce the desired and provable results or was counterproductive.[80] This was also reflected in a paradigm shift in theoretical economics, with belief in the effectiveness of discretionary measures 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, relatively stable tax system, consolidated and sustainable public finance and predictable government expenditure based on fiscal discipline. However, numerous discretionary measures of a fiscal nature have been adopted during the financial and economic crisis in 2008–2010, since the real and expected economic decline was so large that the political representation considered automatic stabilisers to be insufficient on their own. Nevertheless, the current assessments of the effectiveness of these discretionary measures signal that, in addition to positive impacts, the growth in fiscal deficits induced by such measures entails costs and risks, especially in countries with a high initial level of government debt.

The EU fiscal rules consider the optimal situation to be a broadly balanced government budget policy over the economic cycle and the free operation of automatic fiscal stabilisers, which can moderate shocks without the need for ad hoc discretionary fiscal measures. In a period of recession, public finances should thus stimulate aggregate demand by means of deficits. By

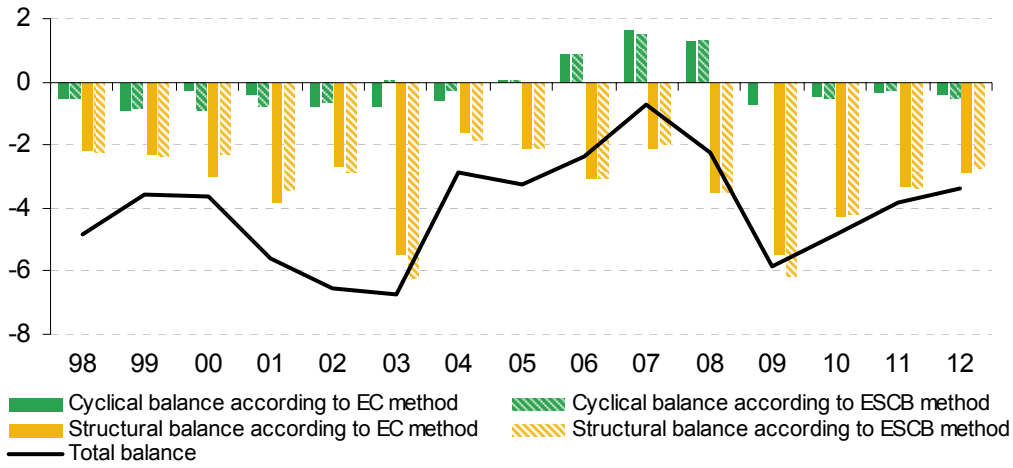
[80] The long and unpredictable lags that arise between the identification of shocks, the implementation of fiscal measures and the effects of those measures, the existence of institutional constraints and the inertia of fiscal decisions are generally regarded as the main causes. A typical example of 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.

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 – except in very exceptional cases – breaches of the maximum agreed deficits, public finance 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 the 3% limit is considered sufficient to allow automatic stabilisers to function freely in the event of a minor, i.e. normal, economic downswing.

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 cyclical component, i.e. the part that results from the business cycle, and the "cyclically adjusted balance", which yields information on how government fiscal policy contributed to fiscal performance. Moreover, for a more precise assessment of the nature of the government's fiscal policy in a given period, the "structural balance" is generally used. In addition to fluctuations caused by the economic cycle, this takes into account the effects of temporary or one-off fiscal measures that are not related to the long-term orientation of fiscal policy.

Chart 40 shows the CNB's current estimates of the **Czech Republic's general government balance broken down into its cyclical and structural components**. The estimates are carried out using both the European Commission method and the ESCB method (see the *Methodological Part*).

Chart 40: The fiscal balance and its cyclical and structural components (% of GDP)



Note: Positive values represent a public budget surplus and negative values a public budget deficit. The sum of the cyclical and structural balance does not equal the total balance since the structural balance is adjusted for extraordinary one-off fiscal measures in addition to the effect of the cycle.

Source: CZSO, CNB calculations (the 2011 and 2012 figures come from the CNB's forecast published in Inflation Report IV/2011).

The assessment of the trend in the structural component and its share in the overall deficit is basically the same in both methods (despite some differences in individual years). The structural balance shown in Chart 40 indicates that the government's fiscal policy was pro-cyclical for most of the period under review, since windfall tax revenues were not consistently employed to reduce the fiscal deficit, but instead tended to be used to generate new public expenditures. Similarly, tax cuts affecting the revenue side were not accompanied by corresponding austerity measures on the public expenditure side, even during years of solid economic growth. Fiscal policy had the desirable counter-cyclical nature in 2009, when government anti-crisis measures were adopted, which led to a widening of the structural deficit. Despite a slight economic recovery in 2010, a public finance consolidation process was launched. The structural deficit was thus reduced considerably by budget austerity measures in

2010. A further marked reduction in the structural deficit is expected this year as a result of fiscal measures adopted by the government in autumn 2010 in connection with the preparation of the state budget. According to the CNB's current estimate, the structural deficit should continue to decline in 2012, thanks mainly to a rise in the reduced VAT rate.

The cyclical component played only a slightly negative role in the total budget balance in 1998–2005. The action of automatic stabilisers, which respond to the business cycle and smooth its fluctuations, was very limited in the Czech Republic in this period. The business cycle did not start to have a major effect until 2006–2008, when favourable economic growth gave rise to extraordinary tax revenues. This was reflected in a positive effect of the cyclical component of the budget balance on the total deficit. However, the cyclical component recorded a change of trend in 2009 owing to the economic slump. According to the CNB's forecast in Inflation Report IV/2011, the cycle will foster an overall general government deficit in 2011–2012.

The assessment of the roles of the structural and cyclical components of the total budget balance in the period under review shows that the Czech general government deficits were due mainly to non-cyclical effects – the total deficit was very close to the structural component over most of the period.

The overall budget deficit in 2009 was well above the reference value of 3% laid down in the Stability and Growth Pact, owing mainly to the government's anti-crisis fiscal policy and the simultaneous action of automatic stabilisers. The excessive procedure was therefore opened against the Czech Republic at the end of 2009. A deadline of 2013 was set for bringing the deficit below the reference value. The European Council also recommended ensuring an average annual decline in the structural deficit of 1% in 2011–2013, specifying measures necessary to correct the deficit within the deadline, and speeding up the reduction of the deficit if economic or budgetary conditions improve. In response to these requirements, but mainly in order to stabilise public budgets, the government adopted numerous revenue and expenditure measures in 2010 to reduce the public finance deficit. It declared a fiscal consolidation objective of a general government deficit of less than 2.9% of GDP in 2013. Moreover, the government wishes to achieve a balanced budget in 2016, which should also ensure that it meets its medium-term objectives (MTOs)[81] of a structural deficit of 1% of GDP. The achievement of these objectives should be aided by fundamental measures adopted by the government this year as part of vital structural reforms of the pension and health insurance system, the social benefit system and the tax system and its administration. Even so, further tangible progress towards achieving the MTO is a key condition for minimising the risks related to future euro adoption in the Czech Republic.

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

Ensuring medium-term balance, or long-term sustainability, of public budgets is a precondition for effective use of their stabilising function and an important condition for the ability of the Czech Republic to fulfil its commitments under the Stability and Growth Pact in the long term. 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 MTO) so that sufficient room is left for stabilising fiscal policy in worse times. Table 19 summarises the estimates for the future in the

[81] 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, future population ageing costs and the prospects for economic growth. Fast growing economies with a low general government debt level may, instead of maintaining balanced public sector accounts, reach a deficit of up to 1% of GDP. This is also the MTO for the Czech Republic. The April 2011 Convergence Programme assumes that this objective will be met in 2016, i.e. beyond the timeframe of the Convergence Programme (2014).

European Commission's September 2011 forecasts regarding the **fiscal balance** of the countries under review. The left-hand side of the table provides information on the total (unadjusted) general government balance, while the right-hand side contains the structural balance calculated according to the Commission's approach. The last line in the table contains the current estimate of the total and structural balance according to the CNB forecast.

Table 19: General government balance, European Commission estimate (% of GDP)

	Total balance					Structural balance				
	2008	**2009**	**2010**	**2011**	**2012**	**2008**	**2009**	**2010**	**2011**	**2012**
CZ	-2.7	-5.9	-4.7	-4.4	-4.1	-4.5	-5.5	-4.1	-3.5	-3.6
AT	-0.9	-4.1	-4.6	-3.7	-3.3	-2.2	-2.9	-4.0	-3.2	-2.9
DE	0.1	-3.0	-3.3	-2.0	-1.2	-0.2	-0.8	-1.9	-1.4	-0.8
PT	-3.5	-10.1	-9.1	-5.9	-4.5	-3.5	-8.8	-9.2	-5.4	-3.1
HU	-3.7	-4.5	-4.2	1.6	-3.3	-4.1	-2.0	-3.1	-5.2	-4.0
PL	-3.7	-7.3	-7.9	-5.8	-3.6	-4.6	-7.4	-7.4	-5.3	-3.1
SI	-1.8	-6.0	-5.6	-5.8	-5.0	-4.6	-3.5	-3.0	-2.9	-3.3
SK	-2.1	-8.0	-7.9	-5.1	-4.6	-4.2	-7.5	-7.3	-4.8	-4.8
EA-17	-2.0	-6.3	-6.0	-4.3	-3.5	-2.5	-4.3	-4.0	-3.0	-2.6
CZ [a)]	*-2.2*	*-5.8*	*-4.8*	*-3.8*	*-3.4*	*-3.5*	*-5.5*	*-4.3*	*-3.3*	*-2.9*

Note: The general government deficit is calculated according to ESA 95 methodology and the "Excessive Deficit Procedure" definition.
[a)] Total balance: data according to the CZSO's notifications (September 2011) for 2008–2010, and the CNB's estimates for 2011 and 2012 from the forecast in Inflation Report IV/2011. The structural balance is calculated under EC methodology. The difference from the European Commission's data for the Czech Republic stems mainly from differences in the GDP forecast and related public budget revenues and expenditures.

Source: European Commission (2011a), CNB.

Following extraordinarily favourable economic developments in 2005–2007, reflected at the peak of the cycle in 2007 in a significant improvement in the total general government balance in all the countries under review, most countries saw a deterioration in 2008 as a result of the financial crisis and the subsequent economic downswing. Table 19 shows that due to automatic stabilisers and discretionary fiscal measures taken to boost the economy, all the countries under review (except Germany) recorded a public finance decline into a deficit significantly exceeding the 3% reference value in 2009–2010. This decline persists in the outlook for 2012 despite moderating somewhat in some countries. This confirmed in practice that positive budget performance based mainly on extraordinary revenues due to cyclical and other temporary factors (including windfalls) and only partly on reform measures is not sustainable beyond the short term and does not create sufficiently stable conditions for the economy. In this respect, the fact that the structural deficit in the countries under review remained relatively high at a time of favourable economic developments and buoyant growth in 2005–2007, except for a slight decline in 2007 due to non-standard factors, is a cautionary tale.

In addition to other effects, the government's room for manoeuvre for the application of stabilising fiscal policy is determined by the nature of fiscal expenditure. While the adoption of a government resolution or a change to a statutory instrument is sufficient to allow a change in some expenditures, changes to other expenditures require time-consuming and politically difficult amendments to laws or international treaties. From the economic perspective, the classification into mandatory, quasi-mandatory and non-mandatory expenditures is therefore a classification of the speed at which the government is able to alter such expenditures if the need arises.[82] 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.

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

Following a decline in the share of mandatory expenditure in total state budget expenditure and revenues in 2007, the share increased again in 2008–2009 (see Table 20) as a result of adverse cyclical effects and the government's budget austerity measures for 2010 and 2011. Moreover, the current data, based on the government's draft state budget for 2012, imply a further rise in the share of mandatory expenditure. As in the past two years, the planned austerity measures rely to a large extent on a reduction of non-mandatory expenditure, leading to an increase in the weight of mandatory expenditure in total expenditure.

Table 20: Shares of mandatory state budget expenditure (%)

	2008	2009	2010	2011	2012
Shares of mandatory expenditure in total SB expenditure	53.7	53.3	54.3	57.1	58.3
Shares of mandatory expenditure in total SB revenue	54.6	63.8	62.8	64.4	64.0

Note: Data for 2008-2010 are actual figures; data for 2011 and 2012 are based on the government's August 2011 draft state budget (state budget compilation methodology).

Source: Ministry of Finance of the Czech Republic (2011), CNB calculations.

The mandatory expenditures of individual countries are not directly comparable, as there is no harmonised definition of the term. However, the structure of general government revenue and expenditure provides some insight (see Table 21). "Statutory" mandatory expenditures consist of social payments (social benefits – pension and sickness insurance benefits in particular – as well as government payments for health insurance) and debt service spending. The Czech Republic ranked among the countries with low figures in the case of debt service spending as a result of its still relatively low level of government debt (in the sample of countries under comparison). The situation was similar for compensation of employees, which represent salaries in budgetary and subsidised organisations and are usually referred to as quasi-mandatory expenditures. Part of expenditure on intermediate consumption and investment in the government sector can be included in mandatory expenditures (but cannot be assigned precisely in the given aggregation).

Table 21: Public revenues and expenditures in 2010 (% of GDP)

	CZ	AT	DE	PT	HU	PL	SI	SK	EA-17
Total revenue	40.5	48.3	43.3	41.5	44.6	37.8	43.4	33.1	44.5
- taxes	18.6	27.4	22.7	22.3	24.6	20.4	22.1	15.5	24.3
- social contributions	15.8	16.4	16.8	12.2	12.0	11.1	15.2	12.5	15.6
Total expenditure	45.2	53.0	46.6	50.7	48.8	45.7	49.0	41.0	50.4
- compensation of employees	8.0	9.7	7.3	12.2	10.7	10.1	12.4	7.9	10.6
- intermediate consumption	6.4	4.6	4.7	5.1	7.7	6.2	6.5	5.0	5.6
- social payments	20.0	25.5	26.2	21.9	18.3	17.1	19.2	19.0	23.6
- gross fixed capital formation	4.6	1.2	1.6	3.3	3.2	5.6	4.3	2.6	2.5
- interest expenditure	1.4	2.7	2.4	3.0	4.0	2.7	1.6	1.3	2.8

Source: European Commission (2011b).

The current stock of, and prospects for, **government debt** through its effect on debt service spending and through its effect on governments' ability to finance budget deficits and to refinance maturing government debt, which has serious macroeconomic impacts, can also become factors limiting the stabilising ability of fiscal policy.[83] Moreover, fiscal policy will have to take into account the fact that in the reform of the Stability and Growth Pact the debt

[83] As the euro area debt crisis has shown, if it is unable to finance its government debt, the state may be forced to take consolidation measures even in an adverse macroeconomic situation.

criterion will gain much greater weight than before, comparable to that of the deficit criterion.[84] Table 22 provides a comparison of the ratio of gross consolidated debt to GDP.

Table 22: Government debt, European Commission estimate (% of GDP)

	2008	2009	2010	2011	2012
CZ	30.0	35.3	38.5	41.3	42.9
AT	63.8	69.6	72.3	73.8	75.4
DE	66.3	73.5	83.2	82.4	81.1
PT	71.6	83.0	93.0	101.7	107.4
HU	72.3	78.4	80.2	75.2	72.7
PL	47.1	50.9	55.0	55.4	55.1
SI	21.9	35.2	38.0	42.8	46.0
SK	27.8	35.4	41.0	44.8	46.8
EA-17	70.0	79.4	85.5	87.9	88.7
CZ [a)]	*28.7*	*34.4*	*37.6*	*40.2*	*42.3*

Note: [a)] Data according to the CZSO's notifications (September 2011) for 2008–2010, and the CNB's estimate from the forecast for 2011 and 2012 in Inflation Report IV/2011.

Source: European Commission (2011a), CNB.

Like the other indicators, future debt (characterised by the gross consolidated debt indicator) has been affected by dramatic changes in the economic situation in 2008–2010. In all the countries under comparison, the slightly declining government debt path observed in the pre-crisis years will be replaced by a more or less sharp increase in line with the growth in deficits and other extraordinary fiscal measures taken by individual countries to dampen the impacts of the financial and economic crisis. Although the Czech Republic with its government debt well below the reference value of 60% of GDP is among the less indebted EU countries, the risk to debt sustainability remains (see section 2.1.3). At the same time, it must be taken into account that the increasing debt is reflected in a rise in mandatory expenditure connected with debt service (see Table 23). The overview shows that the growth rate of debt service costs in the Czech Republic exceeds the levels of most of the countries under review and the euro area average (and, from a broader perspective, the EU average).

Table 23: Debt service, European Commission estimate (% of GDP)

	2008	2009	2010	2011	2012
CZ	1.1	1.3	1.4	1.8	1.8
AT	2.6	2.8	2.7	2.8	3.0
DE	2.7	2.6	2.4	2.4	2.4
PT	3.0	2.9	3.0	4.2	4.8
HU	4.1	4.6	4.0	3.8	3.8
PL	2.2	2.6	2.7	2.8	2.7
SI	1.1	1.3	1.6	1.8	2.0
SK	1.2	1.4	1.3	1.6	1.7
EA-17	3.0	2.8	2.8	3.0	3.2

Source: European Commission (2011b).

A high share of mandatory expenditures defines (and limits) the room for government fiscal policy, but not in a trivial manner. On the one hand, high mandatory expenditures can limit the

[84] See also part D, section 2 *Changes in the economic policy coordination framework and steps taken in connection with the escalation of the euro area debt crisis*.

room for fiscal manoeuvre, especially in the short term. On the other hand, they are a source of stability for the economy over the cycle and can thus have a counter-cyclical effect. However, a problem arises for public finances if (i) the cyclical elasticities of revenues and mandatory expenditures differ significantly, especially when the share of mandatory expenditures is high and/or tax revenues are very sensitive to changes in GDP growth, and (ii) cyclically or structurally driven growth in mandatory expenditures is not offset by a corresponding fall in other expenditures or a rise in revenues.

Since both aforementioned situations are present in the Czech Republic, the high share of mandatory expenditures poses a serious problem for public finance. This is unfavourable from the viewpoint of future euro adoption. The fundamental public finance reforms planned by the government are intended to remedy this fact and thus reverse the further growth in mandatory expenditure recorded in recent years.

2.1.3 Sustainability of public finance

Sustainability of public finance, i.e. a moderate government deficit and debt in the long term, is a key prerequisite for those finances to have a stabilising effect on the economy. Over this horizon, however, 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 age-related government expenditure (mainly on pensions, health care and long-term care) is shown in Table 24.

Table 24: Age-related government expenditures (% of GDP)

	Pensions		Health care		Long-term care		Total	
	2007	2060	2007	2060	2007	2060	2007	2060
CZ	7.8	11.1	6.2	8.4	0.2	0.6	14.2	20.1
AT	12.8	13.7	6.5	8.0	1.3	2.5	20.6	24.2
DE	10.4	12.7	7.4	9.2	0.9	2.3	18.7	24.2
PT	11.4	13.5	7.2	9.1	0.1	0.2	18.7	22.8
HU	10.9	13.9	5.8	7.1	0.3	0.7	17.0	21.7
PL	11.6	8.8	4.0	5.0	0.4	1.1	16.0	14.9
SI	9.9	18.7	6.6	8.5	1.1	2.9	17.6	30.1
SK	6.8	10.2	5.0	7.3	0.2	0.6	12.0	18.1
EA	11.1	13.9	6.7	8.1	1.3	2.7	19.1	24.7

Source: European Commission (2009).

Although the Czech Republic (together with Slovakia) has the lowest levels of age-related expenditure compared to the other selected countries (and also in the broader context of the EU) in the base year, it ranks among the countries with sizeable growth at the forecast horizon. Moreover, it should be borne in mind that the forecast does not (and could not at the time of its production) fully take into consideration the extraordinary developments in the economy in 2008–2010. The alternative economic shock scenarios compiled in parallel by the European Commission thus retrospectively seem more probable. They are close to the current economic situation and indicate a potential increase in age-related expenditure as a percentage of GDP of up to one-third as a result of a deeper and longer decline in economic activity than in the baseline scenario. Such a situation would be unsustainable and would very probably lead to a substantial rise in gross government debt in the absence of fundamental pension and health system reforms. Ensuring public finance sustainability is therefore a key condition (not only) for the future smooth functioning of the Czech economy within the euro area. The reforms of the pension and health systems planned by the government aim to limit

growth in age-related expenditure. As regards public finance sustainability, the increase in the retirement age adopted as part of the "small" pension reform is a clearly positive measure. The impact of the "large" pension reform on public budgets is not clear yet, since, given the opt-out and the voluntary nature of participation in the second, fund pillar that is being introduced, the volume of funds transferred from the state pay-as-you-go system will depend on the number of planholders in the second pillar.

2.2 WAGE FLEXIBILITY 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 and in prices act as an impulse for economic agents to change their behaviour in the direction corresponding to a given shock, or may reflect this change.

2.2.1 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 low unemployment 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 ordinary least squares method (OLS). Table 25 shows a summary of results.

Table 25: Elasticity of wages to the unemployment rate

	1996–2001	2001–2011
CZ	-0.018 *	0.001
AT	-0.090 **	-0.031
DE	-	-0.007
PT	-0.012	-0.013
HU	-0.041 **	-0.035 ***
PL	-0.027 *	-0.001
SI	0.001	-0.036
SK	-0.032 **	0.014
EU-17	-	-0.017

Note: Owing to a data revision, the estimate was updated for the period 2001–2011 The data for 1996–2001 are taken from the 2008 Alignment Analyses.

Source: CNB calculations.

The estimated wage elasticity for the Czech Republic, like those for Austria, Poland and Slovakia, decreased in the latter period under review, becoming statistically insignificant. The estimates for the latter period are statistically significantly different from zero only for Hungary. Real wages in the Czech Republic and most countries under review are thus not likely to have had a stabilising effect at the macroeconomic level in 2001–2011. However, nominal wages responded to the buoyant growth and subsequent sharp downturn in the appropriate

direction, dampening the impact of the recession on the Czech labour market.[85] The absence of real wage flexibility may be linked with lagged changes in wages and the co-movement of inflation, associated among other things with the evolution of world commodity prices. The above-mentioned conclusions thus send out a rather mixed message as regards euro adoption in the Czech Republic.

Box 1: How do firms adjust their wage costs in a situation of rigid base wages?

Apart from changing base wages (which show significant downward rigidity), firms can influence total labour costs by adjusting the more flexible components of remuneration and in other alternative ways. Information about the use of these components is provided by a survey of European firms conducted in late 2007 and early 2008 (for details, see Babecký et al., 2010).

Table 26 shows the use of wage adjustment through base wage freezes and indexation in 2002–2006. The Czech Republic showed the highest use of nominal base wage freezes of all the countries under comparison (more than one-quarter of the firms surveyed), while Slovenia recorded the lowest (2.9%). Automatic indexation, i.e. the linking of base wages to inflation, was most used in Slovenia (23.5%), while its occurrence in the Czech Republic was below average (11.7%). Formal or informal indexation, defined as the linking of base wages to inflation, was most used in Slovenia (60.5%), closely followed by the Czech Republic (59.0%).

One way of cutting costs is to change bonuses and benefits, which account for 11.3% of total wage costs on average (see Table 27). The fact the this share is 20.6% in the Czech Republic suggests greater potential for wage cost adjustment in a situation of rigid base wages. As Table 28 shows, almost one-third of firms took this step in the Czech Republic; bonus reduction is therefore a significant instrument, used more often than on average in the euro area and the individual countries under comparison.

Table 26: Share of firms that froze or indexed wages in 2002–2006

	Wage freezes	Automatic indexation	Formal or informal indexation
CZ	26.5%	11.7%	59.0%
HU	5.9%	11.2%	31.5%
PL	10.0%	6.9%	30.7%
PT	15.0%	9.0%	50.9%
SI	2.9%	23.5%	60.5%
EA	8.2%	20.1%	37.6%
Non-EA	13.4%	8.5%	34.3%
Total	9.6%	16.7%	35.2%

Table 27: Share of bonuses and benefits in total wage bill in 2007

	Share of bonuses and benefits in total wage bill
CZ	20.6%
HU	10.9%
PL	15.5%
PT	32.2%
SI	17.3%
EA	9.6%
Non-EA	16.0%
Total	11.3%

Note: The figures are employment-weighted. Euro area aggregates exclude Germany because the questions were formulated in a different way.

Source: Babecký et al., 2010 (Table 6 and Table A5).

Table 28 shows that firms also used other alternative labour cost adjustment channels to a large extent. At least one of the six strategies was used by 67.9% of firms, which ranks the Czech Republic among the top users of alternative channels among the countries under review. A regression analysis reveals that firms with rigid base wages are more likely to use the said alternative labour cost adjustment channels (see Babecký at al., 2010). This result suggests that flexibility of base wages and flexibility of other labour cost adjustment channels at the firm level are to some extent substitutes, which can be assessed as positive.

[85] See Box 3 in the 2009 Alignment Analyses.

Table 28: Share of firms that used alternative labour cost adjustment strategies in 2002–2006

	Reduce bonuses	Reduce benefits	Change shifts	Slow promotions	Cheaper hires	Early retirement	Use at least one strategy
CZ	32.2%	7.5%	11.1%	1.9%	8.7%	8.9%	67.9%
HU	22.7%	11.9%	38.3%	35.1%	26.5%	10.2%	67.2%
PL	23.6%	16.3%	12.4%	12.8%	23.7%	10.9%	50.5%
PT	13.7%	8.4%	10.7%	14.0%	16.2%	0.0%	39.5%
SI	13.5%	12.8%	9.1%	18.9%	15.8%	8.9%	57.5%
EA	20.5%	14.6%	21.2%	24.6%	38.7%	20.3%	64.5%
Non-EA	26.7%	14.9%	16.3%	13.4%	20.7%	9.7%	60.4%
Total	22.6%	14.7%	19.1%	20.6%	32.3%	16.5%	63.1%

Note: The figures are employment-weighted. Euro area aggregates exclude Germany because the questions were formulated in a different way. "Cheaper hires" refers to the recruiting of new employees at a lower wage level than those who have left the firm (e.g. voluntarily or due to retirement). "Early retirement" refers to the use of early retirement to replace high-wage employees by entrants with lower wages.

Source: Babecký et al., 2010 (Table 1).

2.2.2 Inflation persistence

The ability of the economy to absorb shocks effectively 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 differences in inflation persistence in the countries of a monetary union can result in the single monetary policy having different impacts. According to Angeloni and Ehrmann (2004), the differences in inflation observed between 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 changes or breaks in trend which the model process does not allow for, the inflation persistence estimate is typically biased upwards. Because of the transformation process, accompanied by disinflation, price convergence, gradual price deregulation and changes in monetary policy regime, it is the time series of transition countries that are most 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.

Table 29 summarises the inflation persistence estimates for 1997 Q1–2010 Q2. Inflation persistence in the Czech Republic exhibits the same or lower levels than in the assessment made in last year's Alignment Analyses. It is one of the lowest in comparison with the other

countries under review.[86] Inflation persistence in the Czech Republic therefore presents no major risk in terms of future adoption of the euro.

Table 29: Inflation persistence estimates

	Method 1	Method 2	Method 3
CZ	0.81	0.81	0.38
AT	0.79	0.85	0.40
DE	0.77	0.74	0.44
PT	0.87	0.96	0.45
HU	0.83	0.89	0.84
PL	0.85	0.90	0.46
SI	0.85	1.00	0.54
SK	0.85	1.00	0.41

Notes: Method 1 – non-parametric technique.
Method 2 – sum of autoregression coefficients, constant mean assumed.
Method 3 – sum of autoregression coefficients, time-varying mean assumed.

Source: OECD MEI, CNB calculations.

2.3 LABOUR MARKET FLEXIBILITY

According to the optimum currency area theory, labour market adjustment is one of the most important adjustment mechanisms. Adjustment mechanisms in the labour market (wages, employment and employment structure) can significantly aid in absorbing the negative impacts of asymmetric shocks in a currency area. Labour market flexibility is defined by both labour force flexibility and institutional factors.

2.3.1 Unemployment and internal labour market flexibility

As regards labour market flexibility, it is important to focus on long-term unemployment and regional differences in the unemployment rate. While high long-term unemployment suggests a high structural component of unemployment, regional differences in unemployment may be due to low regional mobility of labour.

Table 30 plots the **long-term unemployment** rate in the countries under review. As in most of these countries, this indicator recorded a gradual decline in the Czech Republic in the second half of the 2000s, falling from levels above 4% to 2%. In 2010, it reflected the impacts of economic recession with a lag and increased to 3%. Growth in long-term unemployment last year is typical of all the countries under review except Germany. Compared to the other countries under review, the Czech Republic, together with Poland, has the second-lowest long-term unemployment rate, behind Austria. Slovakia has the highest long-term unemployment rate.

The share of the long-term unemployed in total unemployment (see Table 31) is logically cyclical. It fell considerably in the Czech Republic in 2009 as a result of a sharp increase in the number of persons newly unemployed, then rose to 41% in 2010 as the duration of unemployment of the newly unemployed exceeded 1 year. A similar situation can be observed in the other selected countries. Slovenia has comparable levels to the Czech Republic, while Germany, Hungary, Portugal and especially Slovakia have higher shares. Austria and Poland

[86] As Method 3 best reflects the transition nature of the Czech economy, it can be assigned the greatest weight when the results are interpreted.

have considerably lower shares of the long-term unemployed in total unemployment than the other countries.

Table 30: Long-term unemployment rate (%)

	1998	2004	2005	2006	2007	2008	2009	2010
CZ	2.0	4.2	4.2	3.9	2.8	2.2	2.0	3.0
AT	1.3	1.4	1.3	1.3	1.2	0.9	1.0	1.1
DE	4.7	5.5	5.7	5.5	4.7	3.8	3.4	3.2
PT	2.2	3.0	3.7	3.9	3.8	3.7	4.3	5.7
HU	4.2	2.7	3.2	3.4	3.4	3.6	4.2	5.5
PL	4.7	10.3	10.3	7.8	4.9	2.4	2.5	3.0
SI	3.3	3.2	3.1	2.9	2.2	1.9	1.8	3.2
SK	6.5	11.8	11.7	10.2	8.3	6.6	6.5	9.2

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

Table 31: Share of the long-term unemployed in total unemployment (%)

	1998	2004	2005	2006	2007	2008	2009	2010
CZ	31	51	53	54	52	49	30	41
AT	30	28	25	27	27	24	21	25
DE	51	56	53	56	57	53	46	47
PT	43	44	48	50	47	47	44	52
HU	50	44	45	45	47	47	42	49
PL	47	54	58	56	51	34	30	31
SI	45	52	47	49	46	42	30	43
SK	52	65	72	76	74	70	54	64

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

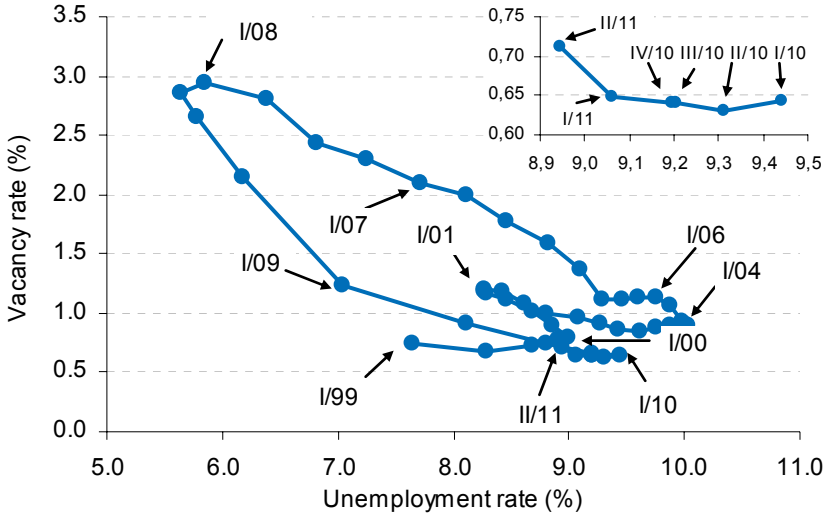
Cyclical and **structural unemployment** can be differentiated by means of the Beveridge curve and with the aid of the aggregate fixed effects of the matching function.[87] The Beveridge curve plots the vacancy rate against the unemployment rate. Decreasing (increasing) unemployment amid a rising (falling) 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 41) shows that cyclical unemployment was decreasing from mid-2004 to early 2008 amid strong demand for labour in the growth phase of the business cycle. Cyclical unemployment then started to rise in mid-2008 owing to the cooling of the economy. The impacts of administrative changes, which resulted in a sharp shift of the monthly Beveridge curve to the right, can be observed in late 2010 and early 2011. This was offset by a shift back towards the horizontal axis in early 2011.[88] In the quarterly data, this

[87] In this section, structural unemployment means the sum of structural and frictional unemployment. Structural unemployment refers to the case where it would be possible with a given of supply vacancies to reduce unemployment by transferring the unemployed between industries, professions or regions (Jackman and Roper, 1987). On the other hand, frictional unemployment reflects the duration of job seeking (the unemployed find a job in the end, so this is not structural unemployment). As the duration of job seeking may change depending on the phase of the business cycle, the presented indicators of structural unemployment may be cyclically conditional.

[88] Horizontal or vertical shifts of the Beveridge curve do not reflect changes in structural unemployment but rather reflect administrative effects on the number of unemployed persons and vacancies. Such shifts occurred probably at

impact manifested itself in broad stagnation of the Beveridge curve between the two last quarters of 2010.

Chart 41: Beveridge curve

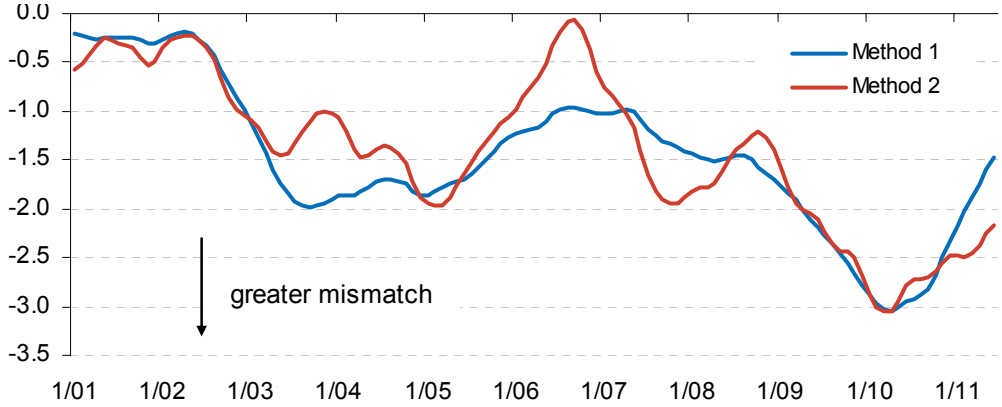


Note: Seasonally adjusted quarterly data.

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

A deteriorating structural mismatch between 2007 and early 2010 is apparent from the aggregate fixed effects of the matching function, which express the mismatch in the filling of vacancies by the unemployed (see Chart 42). Both methods suggest some decline in the mismatch in 2010 and 2011. However, the decline is also partly explained by the cyclical development of the frictional component of unemployment (see footnote 90) and does not necessarily indicate a structural improvement.[89]

Chart 42: Aggregate fixed effects of the matching function (January 2000–June 2011)



Note: Smoothed aggregate fixed effects based on two matching function estimation methods (the methods differ in the set of instruments used for the estimation). More negative values imply worse mismatch in the filling of vacancies by the unemployed. The x-axis gives the end of each 13-month period for which the estimate is calculated.

Source: CNB calculations according to Galuščák and Münich (2007).

the end of 2004 and 2005 in connection with an amendment of the Employment Act and at the start of 2006 in response to tighter conditions for reporting vacancies to labour offices (see the 2006 Alignment Analyses).

[89] For the methodological differences see Galuščák and Münich (2007).

Regional differences in unemployment can be quantified using the coefficient of variation of the unemployment rate for areas (NUTS 2) and regions (NUTS 3). Table 32 shows that the differences in unemployment rates across NUTS 2 areas in 2009 (for which an international comparison is available) were slightly lower in the Czech Republic than in Germany, but higher than in all the other countries. The differences at regional level in 2009 were similar in the countries under comparison (except Germany and Slovakia). In 2008, the peaking business cycle was reflected in a slight increase in regional differences in the Czech Republic; in 2009, by contrast, the transition into recession and a relatively higher rise in unemployment in regions with prevailing lower unemployment resulted in a noticeable decline in differences in the unemployment rate.[90] The coefficients of variation fell further at both area and regional level in the Czech Republic in 2010 in a situation of modest economic recovery. This suggests a slight decline in the regional mismatch between the supply of and demand for labour.

Table 32: Coefficient of variation of the unemployment rate (%)

	NUTS 2 regions								NUTS 3 regions							
	1999	2004	2005	2006	2007	2008	2009	2010	1999	2004	2005	2006	2007	2008	2009	2010
CZ	33	42	46	45	42	44	34	31	42	44	47	46	43	46	35	32
AT	29	41	40	44	45	40	31	-	31	42	41	45	46	41	33	-
DE	42	45	40	39	44	45	37	-	-	49	45	44	50	51	43	-
PT	31	25	22	21	20	18	18	-	37	33	30	29	27	-	-	-
HU	35	28	27	32	39	43	31	-	37	32	30	36	45	48	36	-
PL	23	16	15	12	14	18	20	-	38	25	25	28	39	30	32	-
SK	27	31	37	38	38	41	32	-	31	37	42	43	46	51	38	-

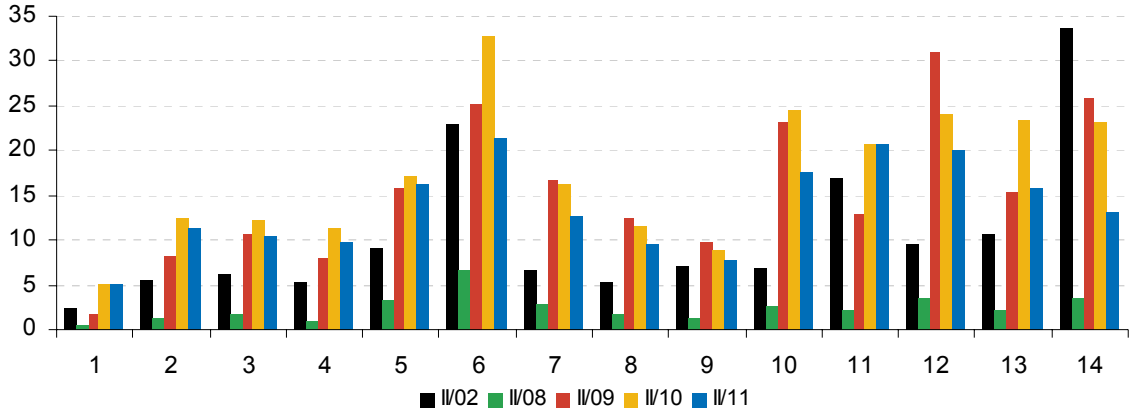
Note: The coefficient of variation is the ratio of the standard deviation weighted by region size to the average unemployment rate (%). Labour Force Survey data. The coefficients of variation depend on the degree of disaggregation.

Source: Eurostat, CNB calculations for CZ 2010.

One of the reasons for the relatively large regional differences in unemployment in the Czech Republic is the gap between households' supply of labour and businesses' demand for labour. This gap can be expressed by the differences in the **number of unemployed persons per vacancy in regions and by profession**. Chart 43 shows that the differences in the number of unemployed per vacancy across regions are large. The highest figures are recorded in the Ústí, South Moravia and Olomouc regions. Although the number of unemployed per vacancy had been declining until 2008, a sharp increase in the indicator was observed in all regions in 2009 owing to the economic crisis. Some regions recorded continued growth in 2010 and 2011. A large gap between the demand for and supply of labour is also apparent in some professions (see Chart 44). Jobs are especially hard to find for persons employed in elementary occupations, service, shop and market sales workers, skilled agriculture, forestry and fishery workers, and clerks. The number of unemployed per vacancy increased in the first two mentioned professions in 2011 Q2 despite a slight year-on-year improvement on the labour market.[91] This suggests a persisting skills mismatch between demand for and supply of labour.

[90] Galuščák and Münich (2003) pointed out that the coefficient of variation of the unemployment rate in the Czech Republic is counter-cyclical.
[91] The average figure for the Czech Republic in 2011 Q2 is roughly 12 unemployed persons per vacancy.

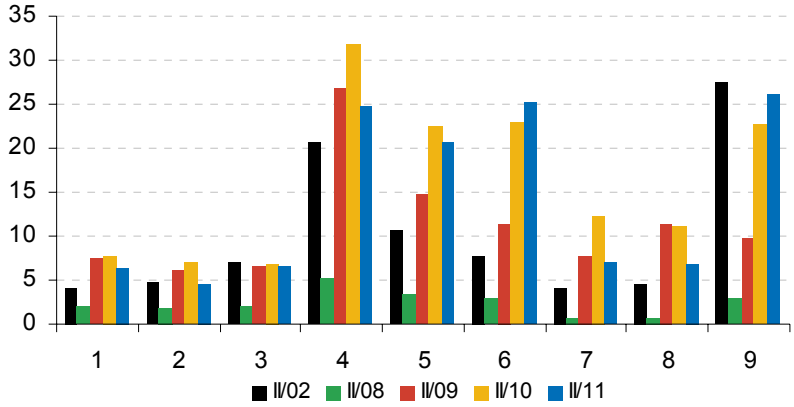
Chart 43: Number of unemployed persons per vacancy in regions



Note: 1 – Prague; 2 – Central Bohemia; 3 – South Bohemia; 4 – Plzeň; 5 – Karlovy Vary; 6 – Ústí; 7 – Liberec; 8 – Hradec Králové; 9 – Pardubice; 10 – Vysočina; 11 – South Moravia; 12 – Olomouc; 13 – Zlín; 14 – Moravia-Silesia.

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

Chart 44: Number of unemployed persons per vacancy by profession



Note: 1 – Legislators, senior officials and managers; 2 – Professionals; 3 – Technicians and associate professionals; 4 – Clerks; 5 – Service workers and shop and market sales workers; 6 – Skilled agricultural and forestry workers; 7 – Craft and related trades workers; 8 – Plant and machine operators and assemblers; 9 – Elementary occupations.

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

Low regional mobility of the population may be one of the causes of the large regional differences in unemployment in the Czech Republic. Although **internal mobility** (see Table 33) in the Czech Republic is greater than in Poland and Germany, it is significantly lower than in Austria and Germany. This indicator recorded a temporary slight increase in the Czech Republic in 2007 compared to the previous period, but edged down in the following years.[92] Sánchez and Andrews (2011) also point to very low population mobility in Slovenia, Slovakia, Poland and the Czech Republic in 2007.

[92] The figures in Table 33 show migration between communities. The data for Hungary and Poland are likely to be overestimated compared to the other countries, as they relate to all changes in permanent residence. The data in Slovenia were lower until 2007 since they covered Slovenian nationals only.

Table 33: Internal migration (per 1,000 inhabitants)

	1999	2004	2005	2006	2007	2008	2009	2010
CZ	20	21	21	22	25	24	24	23
AT	33	35	35	36	37	38	37	-
DE	48	45	44	43	44	44	-	-
HU	21	22	22	25	25	24	21	-
PL	11	11	11	12	13	11	-	-
SI	10	10	11	13	13	43	-	-
SK	15	16	16	17	17	16	15	-

Note: Migration between municipalities (HU, PL – all changes in permanent residence); SI – only Slovenian nationals until 2007.
Source: Statistical yearbooks, Eurostat, CNB calculations.

To sum up, structural problems persist in unemployment and internal labour market flexibility. In particular, a gap between demand for and supply of labour is apparent in the estimates of the aggregate fixed effects of the matching function. Regional differences in the unemployment rate have decreased, but there are still sizeable differences in the number of unemployed per vacancy across regions and also across some professions. Internal geographical and skills mobility remains low by comparison with advanced European countries. Long-term unemployment is similar to that in the other countries under comparison.

2.3.2 Estimate of the structural unemployment rate

Structural unemployment in the economy is a sign of labour market inflexibility, hindering the smooth two-way transition of economically active persons between employment and unemployment. This type of unemployment shows up, for example, in regional differences in unemployment or skills mismatches between unemployed persons and vacancies. It is not linked with the business cycle, but rather has long-term causes in the institutional settings of the labour market and is associated with the interconnection between the education system and the needs of business practice and with the parameters of national social policy.

Changes in structural unemployment are usually estimated by means of changes in the NAIRU, i.e. the unemployment rate consistent with stable inflation, which abstracts from unemployment due to cyclical effects.[93] However, this economic variable is not directly observable and is estimated by filtering time series using an economic model (for details see the *Methodological Part*) A low or falling NAIRU signals a positive trend in labour market flexibility, while a high or rising NAIRU is an adverse phenomenon.

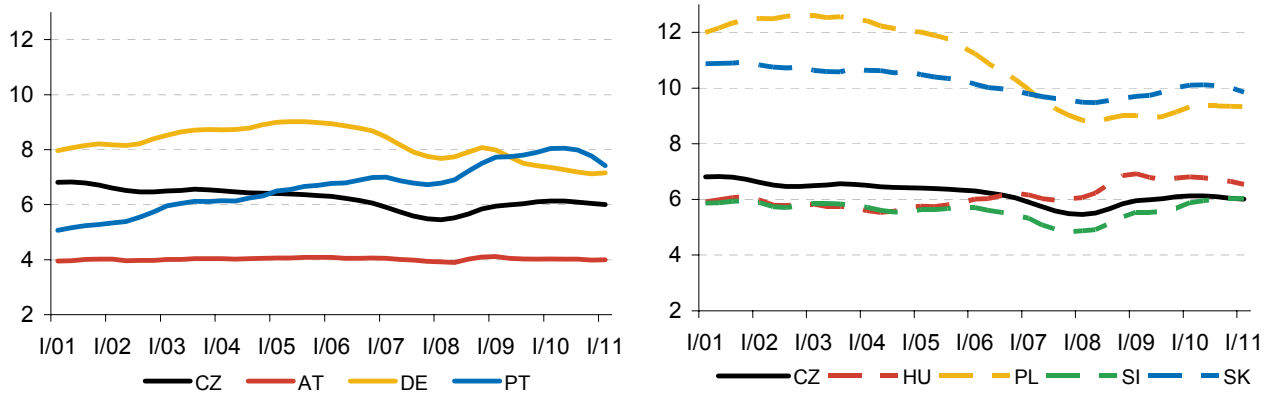
Chart 45 compares the NAIRUs in the countries under review. It shows that the onset of the global economic crisis in 2008 and 2009 was reflected in an increase in the NAIRUs in all these countries. Germany responded particularly flexibly to the impacts of the crisis on the labour market by introducing *Kurzarbeit* (a system of reduced working hours where the government makes up most of the lost wages). The unemployment rate in Germany thus rose only slightly during the crisis and has been falling since 2009 H2 (when adjusted for seasonal effects); this has been reflected in a decreasing NAIRU. In the other countries under review, the impacts of the crisis on the labour market were longer-lasting, with the rise in the NAIRU halting only after the economic situation started to improve in 2010.

The evolution of the labour market in the Czech Republic was similar to that in neighbouring countries. The rise in the NAIRU halted at just above 6% in 2010 H1, and recent estimates

[93] The traditional NAIRU concept was created by Milton Friedman (1968). NAIRU stands for the Non-Accelerating Inflation Rate of Unemployment. Unemployment is defined according to the ILO.

suggest a slight reduction in structural problems on the labour market. The NAIRU estimate for the Czech Republic is among the lowest in the sample of countries under review.

Chart 45: The NAIRU (%)



Source: Eurostat, CNB calculations.

2.3.3 International labour mobility

International labour mobility within a currency area 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.[94]

The degree of international mobility can be assessed by means of the number of immigrants and emigrants (see Table 34). The data on recorded mobility show that the **number of immigrants** to the Czech Republic rose continuously until 2007, but has been declining sharply since 2008. in 2009 it was lower only in Portugal, Hungary, Poland and Slovakia. A similarly sizeable decline was also recorded for the **number of emigrants**. The decline in the number of immigrants to the Czech Republic and emigrants in 2008 and 2009 was probably linked with the global economic and financial crisis (a general decline in vacancies). The situation was similar in most of the other countries under review.

Table 34: Immigration and emigration (number of persons per 10,000 inhabitants)

	Immigration				Emigration			
	2001	2007	2008	2009	2001	2007	2008	2009
CZ	13	101	75	38	21	20	6	11
AT	112	129	132	129	90	89	91	104
DE	107	83	83	54	74	77	90	36
PT	18	44	28	30	10	25	19	16
HU	21	24	37	28	3	4	5	11
PL	2	4	4	5	6	9	8	5
SI	39	145	218	145	24	74	77	87
SK	4	30	16	12	2	7	3	4

Note: The data may be underestimated since they refer only to registered individuals. A substantially higher true number of emigrants can probably be assumed in the case of Poland in particular.

Source: Eurostat, CNB calculations.

[94] See, for example, Mundell (1961) or McKinnon (1963).

International mobility is also evidenced by the data on the **proportion of foreigners in the population** (see Table 35). The share of foreigners in the population in the Czech Republic is similar to that in Portugal and Slovenia and higher in Hungary, Poland and Slovakia. On the other hand, significantly more foreigners live in Austria and Germany. Compared to previous years, there has been an increase in the share of foreigners in the population in the Czech Republic since 2006, owing to significant increases in the number of employed foreigners.

Table 35: Share of foreign nationals in the population (%)

	2001	2005	2006	2007	2008	2009	2010
CZ	1.8	1.9	2.5	2.9	3.3	3.9	4.0
AT	9.6	9.6	9.8	10.0	10.3	10.3	10.5
DE	8.9	8.8	8.8	8.8	8.8	8.8	8.7
PT	2.0	-	2.6	4.1	4.2	4.2	4.3
HU	1.1	1.4	1.5	1.7	1.8	1.9	2.0
PL	0.1	0.1	0.1	0.1	0.2	0.1	0.1
SI	2.1	2.2	2.4	2.7	3.4	3.5	4.0
SK	-	0.4	0.5	0.6	0.8	1.0	1.2

Source: Eurostat, CNB calculations.

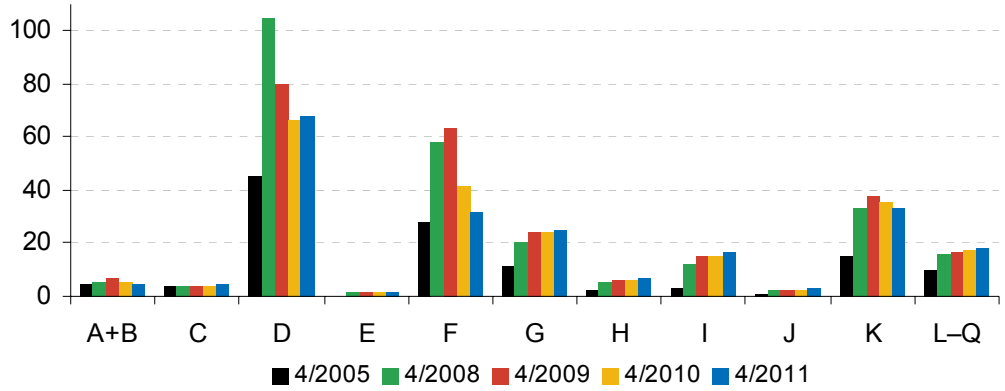
At the end of April 2011, 211,600 foreign workers were registered in the Czech Republic (as against 217,900 a year earlier).[95] Most of these were Slovaks (48%), followed by Ukrainians (18%) and Poles (9%). The number of foreign workers had been increasing very quickly since about the beginning of 2005. A total of 132,300 newcomers had been recorded by the end of 2007. By contrast, their number has been decreasing since 2008 as a result of lower labour demand. Over the past three years it has fallen by 75,800. The main factor of foreign employment in the Czech Republic is 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 46). These industries were also reporting the highest growth in the number of foreign workers in previous years. In 2008, 2009 and 2010, the number of foreign workers in manufacturing declined significantly owing to lower demand for labour. The same applied in construction in 2009, 2010 and the initial months of 2011.

[95] Data from labour offices on the numbers of workers subject to the registration obligation and on the numbers of workers who require a work permit.

[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). The number of foreign workers began to increase 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 was probably related primarily to the high GDP growth and a related increase in demand for labour. This reversed during the crisis as a result of the decline in economic activity.

Chart 46: Foreign employees in the Czech Republic by industry (thousands of persons)

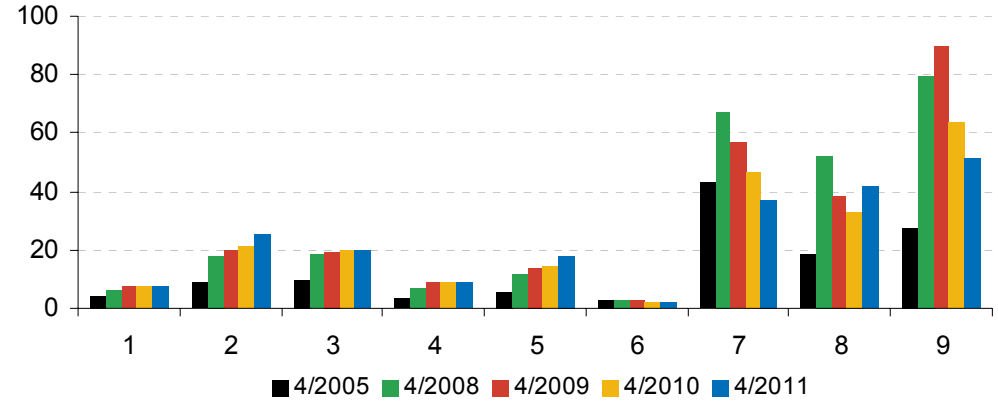


Note: NACE classification of economic activities: A–B – Agriculture, forestry; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade; H – Hotels and restaurants; I – Transport; J – Financial intermediation; K – Real estate; L–Q – Other services.

Source: Ministry of Labour and Social Affairs.

Foreign workers find employment in jobs requiring lower skills (see Chart 47). The largest increase in 2008 was recorded for workers in elementary occupations. In 2009 and 2010 and so far during 2011, the number of foreign workers employed as craft and related trades workers, as plant and machine operators and in elementary occupations has been declining.[97]

Chart 47: Foreign employees in the Czech Republic by occupation (thousands of persons)



Note: ISCO classification of occupations: 1 – Legislators, senior officials and managers; 2 – Professionals; 3 – Technicians and associate professionals; 4 – Clerks; 5 – Service workers and shop and market sales workers; 6 – Skilled agricultural and forestry workers; 7 – Craft and related trades workers; 8 – Plant and machine operators and assemblers; 9 – Elementary occupations.

Source: Ministry of Labour and Social Affairs.

To sum up, according to the data on recorded mobility, international mobility in the Czech Republic is lower than in Austria, Germany and Slovenia. It is also lower than in Portugal in terms of the number of emigrants. The high growth in foreign employment in the Czech Republic from 2005 until the second half of 2008 was due to increasing demand for labour and can be viewed as evidence of an ability to adjust. Similarly, the decline in the number of foreign workers which began as a result of the sharp fall in economic activity during the crisis can be regarded as an adjustment channel. However, the previous inflow of workers from abroad was probably linked with other rigidities on the Czech labour market causing demand

[97] Lower-skill jobs are largely filled by Ukrainian nationals. Slovaks, in addition to these jobs, find employment in skilled jobs, presumably due to the lack of a language barrier.

for labour of workers with lower skills not to be met from domestic sources.[98] 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 in the host country (potential earnings, language barriers, geographical distance, conditions in other countries, etc.). Unexpected changes in foreign employment flows may thus occur despite unchanged domestic conditions.

2.3.4 Institutional environment

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

Trade unions and collective bargaining

Wages carry information about the cost of labour, which influences the allocation of production resources. Setting wages at the company level with regard to corporate labour productivity is an important prerequisite for wage flexibility. If industry (or 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).[99] 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).

The 2010 Alignment Analyses give an international comparison of the **coverage of employees by collective agreements** (in 2006). This shows that the Czech Republic ranked in the middle of the group of countries under review, with coverage of 51%. Almost full coverage was recorded in Slovenia, Austria and Portugal. According to CZSO data, however, the coverage of employees by collective agreements was slightly lower in 2006 and is relatively stable over time (see Table 36).

Table 36: Coverage of employees in the Czech Republic by collective agreements (%)

	2006	2007	2008	2009	2010
Collective agreement yes	48	48	46	47	48
Collective agreement no	28	38	38	35	31
Not specified	23	15	16	18	21

Source: CZSO, Trexima.

Minimum wage

The administrative setting of a minimum wage reduces wage differentiation and wage flexibility for low-wage employees. If the minimum wage is too high, it may reduce demand for less-skilled labour and for graduates and thereby increase the total and long-term

[98] Foreign workers are often hired through employment agencies. This is more flexible for employers than direct employment, since employment agency employees are not subject to the ban on repetition of fixed-term contracts.
[99] 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.

unemployment of people with low skills and unemployment among graduates and school-leavers (OECD, 1998; Gregg, 2000).

In the Czech Republic, the ratio of the **minimum wage** to the average wage was relatively low in the 1990s. Between 1999 and 2006, however, it rose continuously, reaching 39.7%. It then fell gradually to 33.4% in 2010 (see Table 37). The ratio of the minimum wage to the average wage in the Czech Republic is the lowest among the countries under comparison. By contrast, Slovenia has the highest ratio.[100] This implies that the minimum wage in the Czech Republic as a whole probably does not have a stronger impact on wage flexibility at low wage levels than in other countries.[101]

Table 37: Minimum wage (% of the average wage)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
CZ	36.9	38.1	38.4	39.1	39.7	38.1	35.2	34.0	33.4
PT	43.0	40.7	40.0	40.5	40.7	41.6	44.6	43.2	42.8
HU	42.1	42.2	41.2	41.3	41.7	39.8	-	38.6	38.8
PL	33.0	33.9	35.1	33.7	36.1	32.4	35.7	39.7	-
SI	45.3	45.8	45.9	46.2	45.2	43.4	41.0	41.1	47.5
SK	32.4	34.0	34.1	34.4	34.8	-	34.7	36.5	36.6

Note: Until 2008, the monthly minimum wage as a percentage of the average wage in industry and services (excluding public administration). After 2008, the same ratio in industry, construction and services.

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 wage distribution is traditionally high in low-skilled professions (see Table 38). This relation indicates that for 10% of lowest-income persons employed in elementary occupations and as service and shop and market sales workers, the minimum wage made up more than 80% of their earnings in 2010. However, a decline in the minimum wage ratio compared to 2006, when these ratios peaked, can be observed here as well.[102]

Table 38: Minimum wage and gross monthly wage in selected professions (%)

Main employment class	Minimum wage / 1st decile							
	2003	2004	2005	2006	2007	2008	2009	2010
Total for the Czech Republic (business sector)	63.9	66.1	68.0	70.4	67.2	63.2	63.9	63.5
- services and shop workers	87.6	89.2	90.1	91.1	88.8	85.0	85.9	86.5
- skilled agricultural and fishery workers	74.4	74.3	76.3	75.8	70.6	67.2	67.9	65.2
- elementary occupations	84.3	86.3	89.1	90.7	89.8	87.7	88.1	89.1

Note: Besides data for the Czech Republic as a whole, the table only lists the three professions with the highest figures in 2010.

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

[100] No minimum wage has been defined at the national level in Germany. In January 2009, Austria introduced an across-the-board minimum wage of EUR 1,000, which represents about 30% of the average wage.

[101] The Ministry of Labour and Social Affairs is planning to raise the minimum wage by around CZK 400–500 in 2012. The exact amount has yet to be decided.

[102] The minimum wage ratio increased slightly in 2009 and for three professions also in 2010 owing to a decline in the wage in the first decile according to AEIS statistics, while the minimum wage level was unchanged in 2009 and 2010.

Employment protection

Strict legislative **conditions for the recruitment and dismissal of employees** reduce flows on the labour market and increase long-term unemployment (OECD, 2004; OECD, 2010a).[103] The high cost of dismissing individual employees (in particular during the period shortly after an employment contract is concluded and after the probationary period has expired) result in lower job creation, especially for graduates and young people. It is also appropriate to monitor the relative strictness of the legal framework for temporary and permanent employment, as the combination of high costs of dismissing employees with permanent contracts and low regulation of temporary jobs discourages employers from creating permanent jobs.

According to OECD data, the conditions for the dismissal of individual employees were stricter in the Czech Republic in 2008 than in the countries under comparison except Portugal and Slovenia (see Table 39), despite a modest improvement observed since 2006. In the Czech Republic, the cost of dismissing employees is relatively high, especially with regard to short-term contracts (see Chart 48).[104] This institutional set-up may adversely affect job creation and long-term employment in the Czech Republic.

Table 39: Employment protection legislation (EPL) index[a)]

	Permanent employment[b)]			Temporary employment[c)]			Collective dismissals[d)]			Overall index[e)]		
	2003	2006	2008	2003	2006	2008	2003	2006	2008	2003	2006	2008
CZ	3.3	3.3	3.1	0.5	0.9	0.9	2.1	2.1	2.1	1.9	2.1	2.0
AT	2.4	2.4	2.4	1.5	1.5	1.5	3.3	3.3	3.3	2.2	2.2	2.2
DE	2.7	3.0	3.0	1.5	1.3	1.3	3.8	3.8	3.8	2.4	2.4	2.4
PT	4.3	4.2	4.2	3.0	2.8	2.1	2.9	2.9	1.9	3.5	3.4	2.9
HU	1.9	1.9	1.9	1.1	1.1	1.4	2.9	2.9	2.9	1.8	1.8	1.9
PL	2.1	2.1	2.1	1.3	1.8	1.8	4.1	3.6	3.6	2.1	2.2	2.2
SI	-	-	3.2	-	-	1.9	-	-	2.9	-	-	2.6
SK	2.3	2.3	2.5	0.4	0.4	0.4	3.8	3.8	3.8	1.7	1.7	1.8

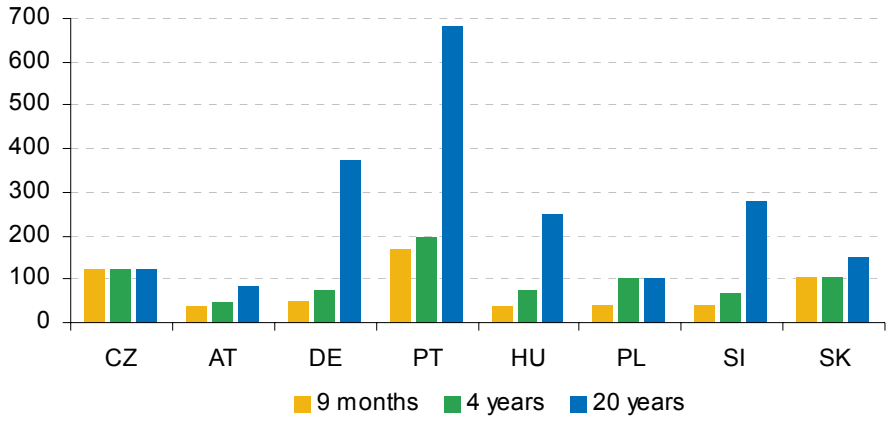
Note: [a)] The indices take values ranging from 1 to 6, a higher value meaning greater employment protection.
[b)] Protection against individual dismissal.
[c)] Fixed-term contracts, temporary work agencies.
[d)] Over and above individual dismissals.
[e)] Weighted average of indicators of permanent employment, temporary employment and collective dismissals.

Source: OECD; a description of the methodology is given in Venn (2009).

[103] Bassanini and Duval (2006) confirm the conclusions of other papers that employment protection, as measured by the EPL index (Employment Protection Legislation; see Table 39), 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.

[104] 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 Chart 48. It is an average of 150 days (i.e. two months of notice and three months of 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 notice on the employee and the start of the period of notice.

Chart 48: Costs of individual termination of an open-ended contract by employment contract duration in 2008 (number of days for which wage is paid)



Note: Sum of data for days of notice, severance pay and delay to start of notice period.
Source: 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 39) 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 except Portugal. However, the costs of termination of short-term contracts are high compared to the other countries.

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 or slightly easier regulation of the labour market in 2008, as compared to the sample.[105] However, one should take into account that there is a disparate intensity of protection of permanent and temporary jobs behind the average figure, which may result in the above issue of labour market duality. Moreover, employment through employment agencies is relatively widely used in the Czech Republic, since employees of employment agencies are not subject to the prohibition of repetition of fixed-term contracts, which gives employers a greater degree of flexibility compared to permanent contracts.

No measures affecting the employment protection index were taken in 2010 (see also OECD, 2011a).[106] Thus, the adverse impact of protection of permanent employment (especially under short-term employment contracts) on job creation and long-term unemployment is still higher in the Czech Republic than in the countries under comparison except Portugal and Slovenia.[107]

Labour taxation

Labour taxation directly affects labour costs, which are an important determinant of job creation. This effect is especially important for persons who are difficult to employ on the labour market due to low skills, or for specific groups of the population, such as women,

[105] However, European labour markets are generally rather inflexible, so the benchmark offers a rather low standard in this case.
[106] A planned amendment to the Labour Code should introduce differentiation of severance payments according to length of employment.
[107] The costs of terminating open-ended contracts fell in Portugal in 2009. This resulted in a decrease in the EPL index for permanent employment compared to the previous year from 4.2 to 3.6.

school-leavers and older people. Moreover, high labour taxation increases the share of the grey economy[108] and can significantly increase unemployment if the minimum wage is high.[109] The taxation of high earners is important in view of international competition, as people with high skills and high incomes have a greater propensity to migrate.

Overall labour taxation in the Czech Republic in 2010 was higher than in Portugal, Poland and Slovakia both at the average wage level and for low-income earners (see Table 40). By contrast, labour taxation is lower in the Czech Republic than in its advanced neighbouring countries – Germany and Austria – and also Hungary. Compared to the previous year, overall labour taxation in the Czech Republic increased slightly.

Table 40: Overall labour taxation

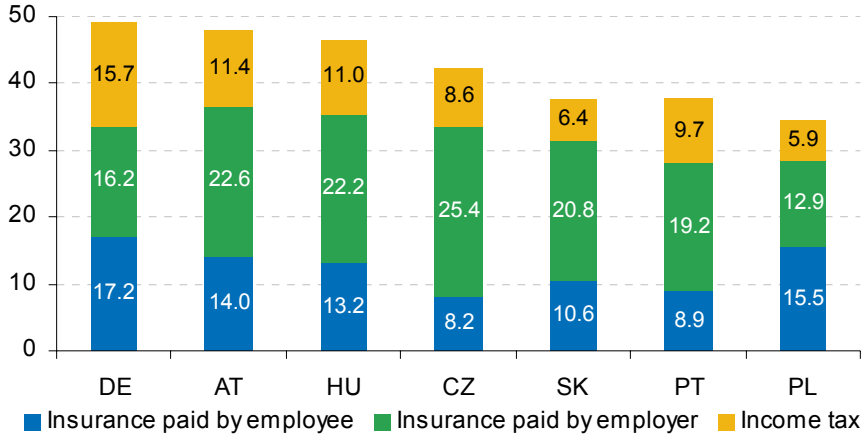
	100% of average wage					67% of average wage				
	2000	2008	2009	2010	Change[a)]	2000	2008	2009	2010	Change[a)]
CZ	42.7	43.4	41.9	42.2	-0.5	41.4	40.0	38.6	38.9	-2.5
AT	47.3	48.8	47.9	47.9	0.6	43.2	44.4	43.3	43.3	0.1
DE	54.0	52.0	50.9	49.1	-4.9	48.6	47.3	46.0	44.9	-3.7
PT	37.3	37.6	37.2	37.7	0.4	33.2	32.9	32.3	32.8	-0.4
HU	54.6	54.1	53.4	46.4	-8.2	51.4	46.7	46.3	43.6	-7.8
PL	43.1	39.7	34	34.3	-8.8	42.0	38.7	33.0	33.3	-8.7
SK	41.7	38.9	37.6	37.8	-3.9	40.5	36.1	34.3	34.5	-6.0

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.
[a)] Differences in p.p. for 2000–2010.

Source: OECD (2011b), CNB calculations.

The data on the components of labour taxation (see Chart 49) show that in all the selected countries health and social insurance affects labour costs to a greater extent than income tax. The level of this insurance in the Czech Republic is similar to that in Germany. Of all the countries under comparison, it is higher only in Austria and Hungary.

Chart 49: Components of labour taxation in 2010 (%)

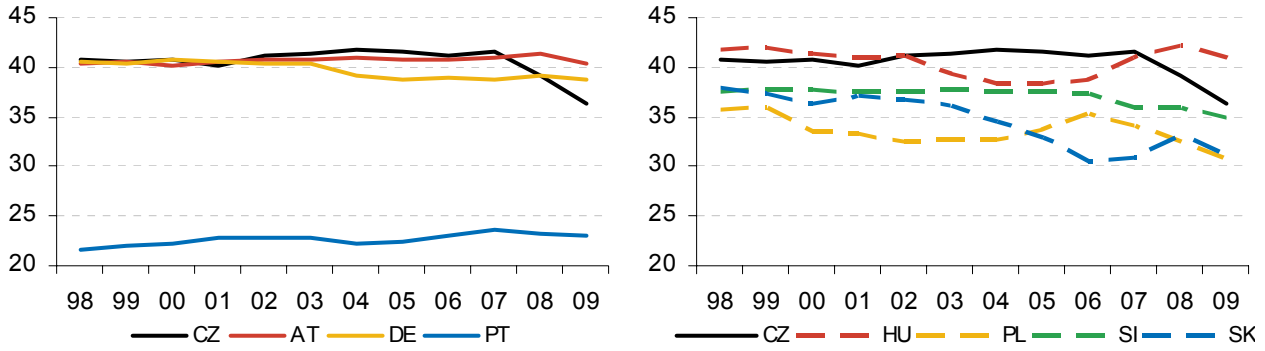


Source: OECD (2011b).

[108] Brandt et al. (2005).
[109] Bassanini and Duval (2006).

The real tax burden in terms of aggregate tax revenues as a percentage of the potential tax base relating to the production factor of labour is described by **implicit tax rates** (see Chart 50). In 2007 the implicit labour taxation rate in the Czech Republic had been the highest of all the countries under review, but in 2008 and 2009 it decreased substantially. This decrease was due to a change in the tax system (a shift to a flat income tax rate calculated from the "super-gross wage") in 2008 and to a reduction in health and social insurance rates and the introduction of a maximum assessment base for both types of insurance in 2009. Even so, the taxation rate in 2009 was still higher than in Slovenia, Slovakia and Poland.

Chart 50: The implicit labour taxation rate (%)



Note: The implicit taxation rate expresses aggregate tax revenues (related to the costs of the production factor of labour) as a percentage of the potential tax base.

Source: Eurostat (2011).

Work-incentive indicators

Taxes affect not only demand for labour, but also, in combination with social benefits, the net income of households and thereby the motivation of unemployed or inactive persons to enter employment (i.e. they affect labour supply). The financial gain from work is measured by the net replacement rate. This 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 41 compares the **net replacement rates** for short-term and long-term unemployment and for two types of households.

Table 41: 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	2007	2008	2009	2001	2007	2008	2009	2001	2007	2008	2009	2001	2007	2008	2009
CZ	59	59	61	75	65	72	71	79	53	42	42	45	92	80	77	75
AT	55	55	55	55	75	73	73	73	55	51	51	51	83	80	80	78
DE	61	59	59	60	81	78	78	81	58	49	48	50	81	80	80	80
PT	78	78	78	78	76	76	77	77	24	24	24	24	72	70	70	70
HU	58	73	73	73	61	80	79	79	28	31	30	32	54	71	70	69
PL	74	69	67	66	69	65	63	62	46	37	35	33	64	59	57	55
SK	67	61	62	60	76	57	60	61	77	29	27	28	121	54	54	61

Note: [a)] The ratio of 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.

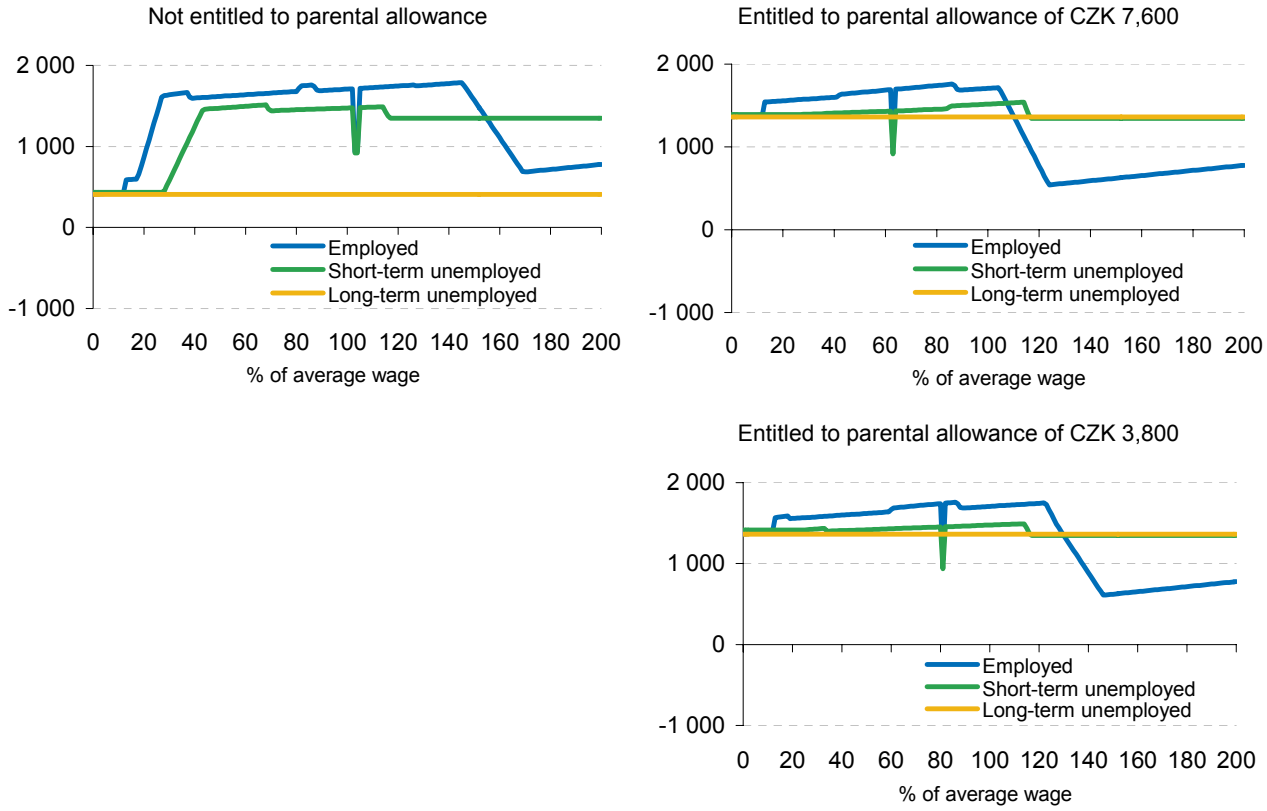
As in previous years, the financial incentives to accept a job in the initial phase of unemployment among childless individuals are highest in Austria. Germany and Slovakia were in second and third place in 2009. Compared to 2008, the net replacement rate in the Czech Republic rose considerably,[110] while in the other countries it was broadly flat. Thus, this rate is now one of the highest among the countries under review. Germany, Austria and the Czech Republic have the highest net replacement rates in the case of long-term unemployment. In Portugal, by contrast, a long-term unemployed person receives only around 24% of potential employment income, the lowest share in the countries under review. In Slovakia and Hungary, the long-term unemployed have similar financial incentives to seek work as in Portugal.

Several legislative changes affecting the incentive to work have been made in the Czech Republic over the last two years. In 2010, the ceiling on the annual base for calculating health and social insurance was increased to 72 times the monthly average wage. This ceiling was left unchanged in 2011. In addition, changes to the legislation governing unemployment benefits took effect on 1 January 2011. In the event of termination of an employment contract by the employee or by agreement with the employer, the unemployment benefit has been reduced to 45% of the previous net wage over the entire support period.[111] Moreover, unemployment benefits by law cannot be paid to an applicant who simultaneously receives severance pay, gratuity or termination settlement. Unemployment benefits will start to be paid after the applicant ceases to receive these funds. So-called "non-clashing" employment was also abolished, which is another change that should increase the incentive to work.[112]

In addition to a rise in the tax discount for children to CZK 11,604 (see the section on labour taxation), normative (deductible) housing expenses, which determine housing benefit, were increased as they are every year. Microsimulations for model types of households using the methodology of Galuščák and Pavel (2007) reveal that the changes are leading to an increase in net replacement rates compared to 2009 (see Chart 51) and so are reducing the incentive to work.[113]

[110] Owing to an increase in normative housing expenses and unemployment benefits (see the 2010 Alignment Analyses).
[111] Employees who prove that they terminated the employment contract for serious reasons are exempt from the reduction in unemployment benefits.
[112] In the case of "non-clashing" employment, unemployed people were allowed to earn up to 50% of the minimum wage (i.e. CZK 4,000) on top of their unemployment benefit.
[113] In 2010, the net income of the household types shown in Chart 51 was increased – in addition to the labour income of employed persons – by housing benefit (as was also the case for other household types). For some households, the housing benefit reduced the share of social assistance benefits (subsistence contributions and housing contributions), which top up households' income to the minimum subsistence level. Similarly, households receiving parental allowance could not claim social assistance benefits in 2009. The effect of the higher tax discount for children on households' net income in 2010 was negligible in all cases.

Chart 51: Change in the net income of households with a non-working partner in 2010 compared to 2009 (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).

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

To sum up, the coverage of employees by collective agreements is essentially stable and does not exceed the level in the current euro area countries. The ratio of the minimum wage to the average wage in the business sector fell slightly. The impact of protection of permanent employment – especially under short-term employment contracts – on job creation and long-term unemployment remains high. Labour taxation in the Czech Republic is declining. However, the incentive to work for households of unemployed people with multiple members remained low in 2010 owing to the configuration of taxes and benefits. On average, parametric changes in taxes and benefits tended to decrease the financial incentive to work.

2.4 PRODUCT MARKET FLEXIBILITY

2.4.1 Administrative barriers to entrepreneurship

High **business start-up costs and barriers** 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.[114] According to Bassanini and Duval (2006), regulation on product markets increases overall unemployment.

According to the OECD index of administrative barriers to entrepreneurship, these barriers were higher in the Czech Republic than in all the countries under comparison except Poland and Hungary in 2008. Several legislative measures were taken in 2009 and 2010 to reduce the administrative burden on entrepreneurs (e.g. electronic tax returns and an amendment of the Trades Licensing Act; see the 2010 Alignment Analyses for details).

Despite the positive reform steps taken in 2009, World Bank data signal that the Czech Republic's world ranking as regards the conditions for starting a business worsened year on year in 2009 (see Table 42). This trend continued into 2010, with the Czech Republic slipping further down the ranking of 183 countries included in the Doing Business database. By contrast, last year saw a marked improvement in the area of closing a business, due among other things to amendments to the Insolvency Act. The conditions for closing a business in the Czech Republic are therefore comparable to those in most of the countries under review, and more favourable than in Hungary and Poland.

Table 42: Conditions for starting and closing a business

	Starting a business			Closing a business		
	2008	2009	2010	2008	2009	2010
CZ	91	113	130	115	116	32
AT	106	122	125	20	20	20
DE	101	84	88	35	35	35
PT	39	60	59	22	22	21
HU	29	39	35	58	58	62
PL	145	117	113	85	85	81
SI	42	26	28	40	40	38
SK	39	66	68	39	39	33

Note: Country rankings for 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 (2010).

The conditions for doing business have recently shown some improvements which are gradually bringing down the still relatively high administrative costs of doing business by international comparison. In 2011, the Czech Republic was ranked 63rd, compared to 82nd in 2010. This is a shift in the right direction, but there remains a need to further increase flexibility in this area.

2.4.2 Tax burden on businesses

The tax burden on businesses significantly affects product market flexibility, since, 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.

As in the previous year, the Czech Republic applies a **corporate income tax** rate of 19% in 2011. Together with Slovakia and Poland, this is the lowest figure among the countries under comparison (see Table 43). Except for Hungary, which had the lowest tax burden on average

[114] Nicoletti and Scarpetta (2004).

for the whole period under review, corporate income tax rates have declined sharply in the countries under comparison since 1998.

Table 43: Highest statutory corporate income tax rate (%)

	1998	2004	2005	2006	2007	2008	2009	2010	2011	Change (p.p.)
CZ	35.0	28.0	26.0	24.0	24.0	21.0	20.0	19.0	19.0	-16.0
AT	34.0	34.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	-9.0
DE	56.0	38.3	38.7	38.7	38.7	29.8	29.8	29.8	29.8	-26.2
PT	37.4	27.5	27.5	27.5	26.5	26.5	26.5	29.0	29.0	-8.4
HU	19.6	17.6	17.5	17.5	21.3	21.3	21.3	20.6	20.6	1.0
PL	36.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	-17.0
SI	25.0	25.0	25.0	25.0	23.0	22.0	21.0	20.0	20.0	-5.0
SK	40.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	-21.0

Note: Changes in p.p. for 1998–2011.

Source: Eurostat.

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 Table 44). The implicit tax rate in the Czech Republic fell significantly in 2009, becoming the third lowest behind Poland and Hungary. The implicit tax rate also declined in the other countries except Slovakia and Hungary.

Table 44: Implicit corporate income taxation rate (%)

	1998	2004	2005	2006	2007	2008	2009	Change (p.p.)
CZ	27.8	29.8	25.5	25.5	25.7	23.8	19.9	-7.9
AT	29.4	26.2	23.7	23.1	24.3	25.2	25.0	-4.4
PT	19.1	19.3	20.5	22.3	-	-	-	3.2
HU	22.7	17.4	18.3	15.5	18.3	18.9	19.1	-3.6
PL	42.7	18.6	21.0	19.0	20.4	20.3	14.7	-28.0
SI	19.0	23.0	33.8	30.5	30.5	28.3	23.8	4.8
SK	52.7	22.6	23.3	20.3	19.8	22.0	23.4	-29.3

Note: The implicit taxation rate expresses aggregate corporate tax revenues as a percentage of the potential tax base. Changes in p.p. for 1998–2009. Data on the implicit taxation of corporate income are not available for Germany.

Source: Eurostat.

2.5 THE BANKING SECTOR AND ITS SHOCK-ABSORBING CAPACITY

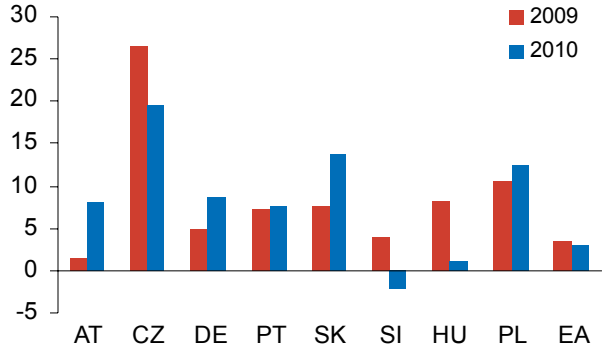
The banking sector is one of the stabilisation mechanisms that can help absorb negative asymmetric shocks in the event of euro adoption in the Czech Republic. As the largest segment of the financial sector, the banking sector currently seems stable. This increases the probability of it performing its adjustment mechanism function well. It displays very good profitability, capitalisation and liquidity and very limited dependence on foreign financing.[115] Although the increased risk of a global economic slowdown could affect household balance sheets in the

[115] Data from international comparisons are only indicative, as calculation and consolidation methods can differ across countries (with the exception of non-performing loans, the IMF FSI data for the Czech Republic are always consolidated); moreover, data revisions occur in some cases. The charts show end-of-period data where available; otherwise they show the last available value in the given year.

form of further growth in non-performing loans, banks' capitalisation and ability to generate sufficient income even in bad times currently provide sufficient room for absorbing loan impairment losses. The Czech banking sector is not a source of shocks and should be able to absorb fluctuations emanating from the domestic economy or from abroad.

The domestic banking sector maintained high profitability even during the crisis, far exceeding the figures both for the euro area and for the other non-euro-area countries under review (see Charts 52 and 53). However, despite continued growth in interest income and fee and commission income, which represent a significant proportion of banks' profits, return on equity in the banking sector recorded a year-on-year decrease on a consolidated basis.[116] This significant decrease notwithstanding, return on equity was almost 20% in 2011 and may be one of the factors underlying the observed entry of new investors to the domestic banking market, which could lead to growth in bank intermediation and in the availability of credit to households and corporations in the future.

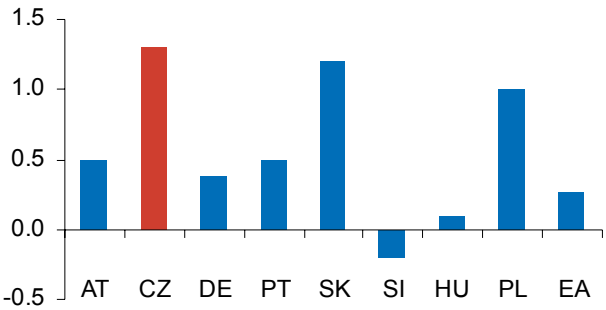
Chart 52: Return on equity (RoE, %)



Note: EA represents the average of the euro area member countries.

Source: IMF FSI.

Chart 53: Return on assets (RoA, %, 2010)



Note: EA represents the average of the euro area member countries.

Source: IMF FSI.

The quality of banks' loan portfolio deteriorated during 2010. At the end of 2010, non-performing loans (NPLs) represented 6.2% of total bank loans in the Czech Republic, almost double the 2008 figure (see Table 45). A similar trend can be observed in the other countries under review. Higher rates of deterioration of loan quality were recorded, for example, by Slovakia, Poland and above all Hungary, where the NPL ratio reached almost 10%. The marked increase in NPLs in Hungary was due in part to still relatively high unemployment and a strong Swiss franc in the case of loans denominated in that currency. In the Czech Republic, the ratio of NPLs to total loans stabilised in 2011 H1, fluctuating around 6.3%.

However, banks have a relatively strong capital buffer, consisting mainly of retained earnings, to cover the increased credit risks. The capital adequacy ratio of the domestic banking sector, which exceeds 15%, is the third highest among the countries under review, behind Germany and Austria (see Chart 54). Thanks to their sufficient capitalisation and operating profits, domestic banks should be able to withstand relatively large credit losses without being forced to request additional capital.

[116] The decrease was due mainly to lower profit from other activities, which comprises valuation differences, gains (losses) on derecognition of assets other than held for sale and other net operating income.

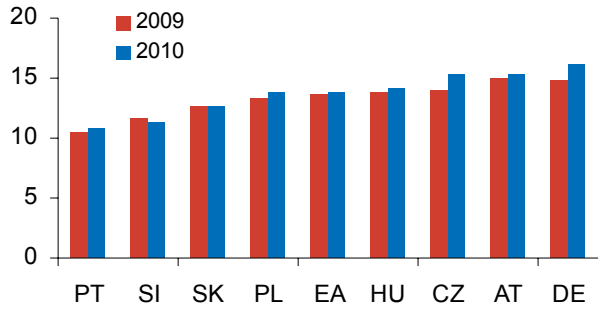
Table 45: Non-performing loans, NPLs (% of total bank loans)

	2008	2009	2010
CZ	3.2	5.2	6.2
AT	1.9	2.3	2.8
DE	2.9	3.3	-
PT	1.8	2.8	3.3
SK	2.5	5.3	5.8
SI	1.8	2.3	3.6
HU	3.0	6.7	9.7
PL	4.5	8.0	8.8
EA	2.6	4.1	4.7

Note: The table does not contain the figure for Germany in 2010 owing to data unavailability. EA represents the average of the euro area member countries.

Source: IMF FSI, CNB.

Chart 54: Capital adequacy ratio (%)

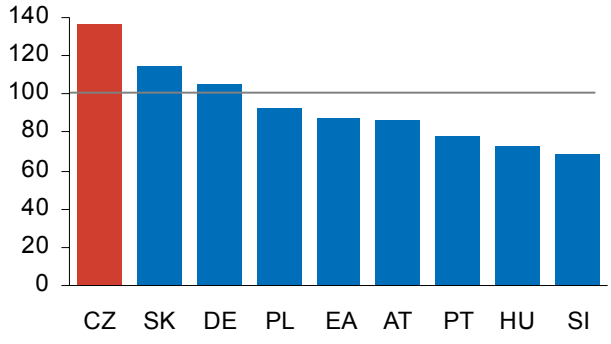


Note: EA represents the average of the euro area member countries.

Source: IMF FSI.

Domestic banks focus largely on a very conservative banking business model that involves accepting deposits and providing loans. Deposits of residents exceed loans to residents by 37 percentage points, while more than 80% of residents' deposits and loans are denominated in the domestic currency (see Chart 55). The domestic banking sector is not dependent on funds from abroad and has long been a net creditor, with positive net external assets of 6% of GDP (see Chart 56). Its exposure to highly indebted euro area countries is very low (less than 1% of assets) and a rapid drop in its value should not have a significant effect on the banking sector as a whole. This conservative business model is based on the fact that banks are affected mainly by the real economy and have only limited links to foreign financial markets. Moreover, the relatively high excess of funds over loans creates room for banks to further expand their lending while maintaining sufficiently high liquid asset holdings without being forced to seek funding on interbank markets or abroad.

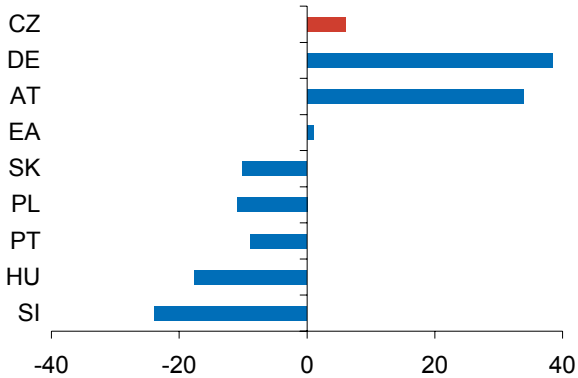
Chart 55: Ratio of deposits to loans in selected EU countries (%)



Note: Data as at the end of 2010; deposits/loans to non-residents. EA represents the euro area.

Source: ECB.

Chart 56: Net external position of banking sector (net external assets in % of GDP, 2010)



Note: 2009 data are shown for Austria due to unavailability of 2010 data.

Source: IMF IFS, central banks.

The Czech banking sector therefore displays very good levels of traditional macroprudential indicators, so it should be able to act as an adjustment mechanism in the event of adverse

economic shocks and partly dampen such shocks so that the impact on the domestic real economy is as low as possible.

The CNB conducts stress tests to assess the impacts of highly adverse and implausible future macroeconomic scenarios on the resilience of the domestic banking sector. The stress tests of the Czech banking sector – performed using the data available as of 30 June 2011 and focused on the following two years – show that the sector's capital adequacy would stay above the 8% regulatory threshold even in an extreme stress scenario. The results thus confirm that the Czech banking sector is suitably resilient to potential negative shocks.

The ***Baseline Scenario*** corresponds to the CNB's macroeconomic forecast published in Inflation Report III/2011. This scenario assumes a slight slowdown in economic activity this year and in early 2012, due to fiscal consolidation in the Czech Republic and in euro area countries. Inflation temporarily increases above 3% in 2012 owing to a planned increase in VAT. However, monetary-policy relevant inflation (i.e. inflation adjusted for the effects of tax changes) remains close to the inflation target of 2% at the two-year horizon. The exchange rate is modestly appreciating and short-term interest rates are initially stable and start rising gradually in late 2011/early 2012.

The ***Recession*** stress scenario assumes a drop in economic activity as a result of a renewed recession in the Czech Republic's main trading partner countries, escalation of the euro area fiscal crisis and increased financial market volatility. The unfavourable developments lead to a depreciation of the koruna and a rise in government bond yields. The drop in economic activity is also reflected in a marked decline in property prices of more than 30%. This scenario assumes impairment of the Czech banking sector's exposures to five heavily indebted EU countries and revaluation of those exposures in banks' balance sheets from CZK 28 billion to zero. This scenario thus describes highly adverse economic developments.

Table 46 presents the evolution of the key macroeconomic variables of the stress scenario compared to the baseline scenario.

Table 46: Evolution of key macroeconomic variables in the scenarios used

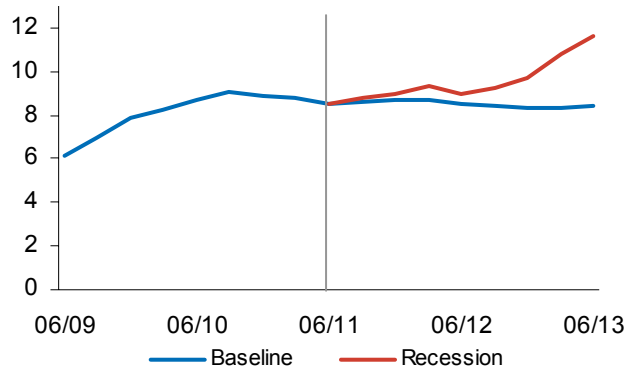
	Baseline		Recession	
	2011	2012	2011	2012
GDP (y-o-y in %)	2.1	2.2	1.2	-3.6
Exchange rate (CZK/EUR)	24.1	23.1	24.5	26.6
Inflation (%)	2.0	3.2	2.0	4.1
Unemployment (%)	8.9	8.6	8.9	10.3
3M PRIBOR (%)	1.2	1.7	1.4	4.4

Source: CNB.

In the *Baseline Scenario*, the ratio of NPLs to total loans in the non-financial corporations sector is stable, ranging between 8.3% and 8.7% at the two-year horizon. The NPL ratio in the household sector increases slightly next year in the *Baseline Scenario*, reaching levels close to 5.8%. The NPL ratios estimated in the stress scenarios are much higher owing mainly to the weaker assumed economic activity (see Charts 57 and 58).

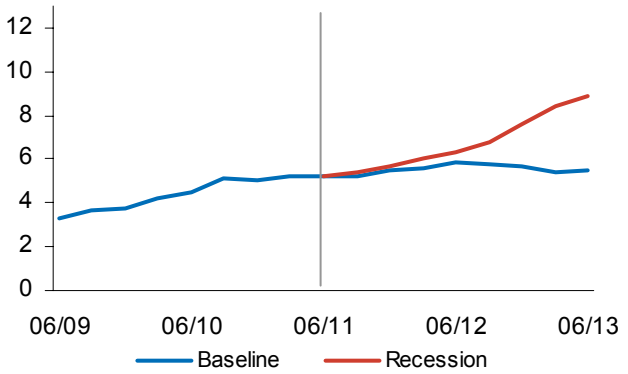
In the adverse *Recession* scenario, the increase in NPLs is reflected in relatively high loan impairment losses. This is exacerbated by losses caused by a decline in prices of Czech government bonds due to market interest rate movements and also by losses on exposures to the heavily indebted southern euro area states.

Chart 57: NPL ratio: non-financial corporations (%)



Source: CNB.

Chart 58: NPL ratio: households (%)

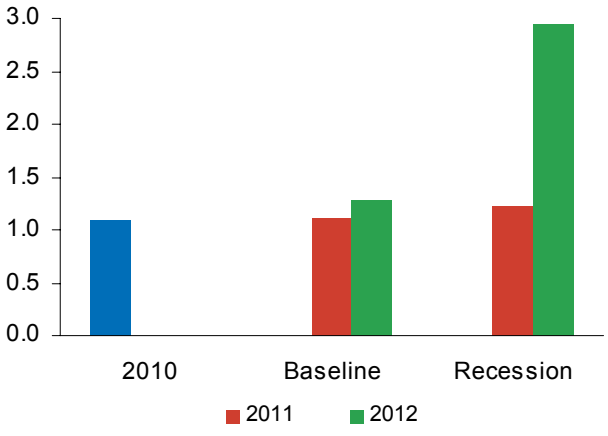


Source: CNB.

While the baseline scenario assumes that operating profit generation in the period ahead will remain roughly the same as last year, the estimate of operating profits in the *Recession* stress scenario is roughly 40% lower. In the stress scenario, some banks might thus get into a loss-making situation, which will immediately cause regulatory capital to decline.

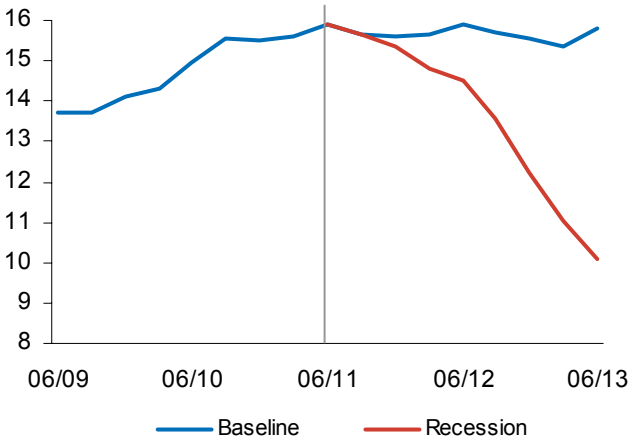
The increase in the credit risk parameters (PD, LGD) in the stress scenario leads to quite a significant rise in credit losses and therefore a rise in provisions to cover such losses. The risk costs of the banking sector, as measured by the amount of new provisions relative to total non-defaulted loans, would increase significantly under the stress scenario from 1.1% in 2010 (see Chart 59).

Chart 59: Risk costs of the banking sector (provisioning relative to non-defaulted loans in given year, %)



Source: CNB.

Chart 60: Capital adequacy ratio (%)



Source: CNB.

Despite the relatively high credit and market losses, however, the banking sector as a whole remains stable in both macroeconomic scenarios and its aggregate capital adequacy stays constantly above the regulatory minimum of 8% (see Chart 60). This result is achieved despite the conservative settings of many of the assumptions of the individual scenarios. The reasons

include the high capital adequacy ratio of the banking sector in the second half of 2011 (15.9%).

In the *Recession* stress scenario, several banks could get into a situation of insufficient capital adequacy. To make up their capital adequacy to the regulatory minimum of 8%, banks having their registered offices in the Czech Republic (i.e. excluding foreign bank branches) would have to increase their regulatory capital by just under CZK 13.4 billion (i.e. around 0.4% of GDP); this is an insignificant figure relative to the size of the sector.

Based on the standard soundness indicators and the stress test results, the Czech banking sector can therefore be assessed as stable and resilient to external shocks. Its characteristics confirm that the sector itself is not a source of shocks; moreover, it dampens rather than amplifies shocks emanating from the real economy.

3 SUMMARY OF RESULTS OF ANALYSES

Analysis Method / Category	Section	The most recent value of the indicator compared in the document from the given year. Unless stated otherwise, the data are for the previous year. The underlined segments are not comparable to the previous values owing to data revisions or changes in calculation or methodology.						Commentary
		2006	2007	2008	2009	2010	2011	

Cyclical and Structural Alignment

Direct alignment indicators

Real economic convergence								
GDP per capita, PPP, EA=100	1.1.1	68.5	72.1	74.1	74.1	73.4	73.9	Czech convergence process interrupted (probably temporarily). Indicator above levels of PT, HU, SK and PL, lower than SI.
Price level of GDP, EA=100	1.1.1	55.0	57.8	59.8	67.9	64.6	67.4	Convergence temporarily halted in 2009. Large lag in price level behind AT, DE, PT and SI.
Real exchange rate against euro, 1998=100	1.1.1	123	129	133	151	143	149	Real annual rate of appreciation 3.4% on average so far. Real appreciation of koruna against euro at average rate of 1.8-2.4% a year can be expected over next five years.
3M real interest rates	1.1.1	0.4	0.2	0.1	-2.1	1.6	0.2	Low level of real rates means smaller adjustment need in future.
3M real rate outlook for following five years given no change in exchange rate and risk premium (min/max)	1.1.1	-	-	0.5 -0.6	0.5 -1.7	-0.2 -1.6	0.0 -0.6	Czech Republic would face negative real interest rates, which could mean risk of economic disequilibrium.

Correlation coefficients of real economic activity									
Method 1: year-on-year difference; Method 2: quarter-on-quarter (or month-on-month) difference. Value for 2006 (2001 Q1–2006 Q1), 2007 (2002 Q1–2007 Q1), 2008 (2002 Q1–2008 Q1), 2009 (2002 Q1–2009 Q1), 2010 (2002 Q1–2010 Q1), 2011 (2004 Q1–2011 Q1)									
GDP	Method 1	1.1.2	0.29	0.62	0.73	0.88	0.92	0.92	High correlation is visible for all countries compared in recent years and is affected by financial and economic crisis.
	Method 2	1.1.2	0.26	0.33	0.34	0.84	0.71	0.80	
GDP (dyn. correlation, avg. for cycle length considered)		1.1.2	0.33	0.70	0.80	0.89	0.94	0.93	
IPI	Method 1	1.1.2	0.77	0.77	0.74	0.90	0.92	0.95	Statistically significant correlation according to both methods.
	Method 2	1.1.2	0.41	0.25	0.31	0.35	0.32	0.42	
Total exports	Method 1	1.1.2	0.64	0.63	0.63	0.76	0.85	0.88	Statistically significant correlation according to both methods.
	Method 2	1.1.2	0.00	-0.04	0.36	0.47	0.52	0.64	
Czech exports to EA vs. EA GDP	Method 1	1.1.2	0.42	0.38	0.38	0.56	0.78	0.65	Statistically significant correlation according to both methods.
	Method 2	1.1.2	0.24	0.30	0.27	0.49	0.48	0.34	

Analysis Method / Category	Section	The most recent value of the indicator compared in the document from the given year. Unless stated otherwise, the data are for the previous year. The underlined segments are not comparable to the previous values owing to data revisions or changes in calculation or methodology.						Commentary
		2006	2007	2008	2009	2010	2011	
Analysis of cyclical alignment using the Taylor rule								
Average square of deviations from implied euro area rates	1.1.3	-	-	above-average alignment				Czech value currently at historical low. Has long been lower than in other new member states (low values mean greater alignment).
Synchronisation of demand and supply shocks								
Demand shocks	Structural vector auto-regression, correlation	1.1.4	asymmetry				weak sym.	Weak correlation of demand-side shocks between Czech Republic and euro area. Similar occurrence of supply-side shocks in recent years.
Supply shocks		1.1.4	asymmetry		symmetry			
Structural similarity of Czech economy and EA-16 economy (EA-12 until 2008)								
Landesmann index	1.1.5	0.15	0.15	0.16	0.15	0.17	0.20	Czech Republic has highest structural dissimilarity among countries compared, owing to higher share of industry and lower share of services (financial intermediation among others).
Convergence of interest rate differential								
Difference in three-month, five-year and ten-year interest rates	1.1.6	convergence			slight divg.	stabilisation		Sustained low interest rate differentials, Slight rise in 2009. Markedly lower than in HU and PL.
Convergence of exchange rates to euro								
Bivariate GARCH	1.1.7	high correlation			fall in corr.	high correlation		After temporary decline in 2008 and 2009, correlation of koruna and euro rates against dollar is again high at 0.85–0.95.
Exchange rate volatility (exchange rate to euro, annualised, in %)								
Historical volatility (daily returns for period of six months)	1.1.8	<5 (2006)	4 (2007)	5–8 (2008)	13–16 (2009)	6–7 (2010)	4 (2011)	Growth in volatility due to uncertainty in world financial markets is gradually subsiding. Volatility still lower than in PL and HU.
Implied volatility (options)	1.1.8	<5.5 (2006)	4 (2007)	5–7 (2008)	9–19 (2009)	6–10 (2010)	6–7 (2011)	

Analysis Method / Category	Section	The most recent value of the indicator compared in the document from the given year. Unless stated otherwise, the data are for the previous year. The underlined segments are not comparable to the previous values owing to data revisions or changes in calculation or methodology.						Commentary
		2006	2007	2008	2009	2010	2011	

Effect of international economic relations

Share of foreign trade with euro area in total foreign trade								
Exports, %	1.2.1	59.3	58.4	57.1	67.9	67.4	66.4	High level of trade links. Increase compared to 2008 value reflects inclusion of SK in euro area total.
Imports, %	1.2.1	52.9	58.4	59.1	61.3	61.8	60.1	

Ratio of direct investment from/to euro area to GDP								
Inflow of direct investment, % (stock)	1.2.1	38 (2004)	42 (2005)	43 (2006)	48 (2007)	49 (2008)	53 (2009)	High level of ownership links, particularly on FDI inflow side.
Outflow of direct investment, % (stock)	1.2.1	1 (2004)	1 (2005)	1 (2006)	2.3 (2007)	4.1 (2008)	5.2 (2009)	

Share of intra-industry trade								
Grubel-Lloyd index	1.2.2	0.8 (2004)	0.8 (2005)	0.8 (2006)	0.4 (2009)	0.4 (2010)	0.5 (2011)	High share of intra-industry trade (only AT and DE have higher shares) remains broadly unchanged. Fall in 2009 due to change in method.

Financial market

Financial sector								
Financial system assets (% of GDP)	1.3.1	135	133	142	146	153	156	Ratios of financial system assets to GDP and private sector debt to GDP are substantially lower than in AT, DE and PT, slightly lower than in SI and HU and slightly higher than in SK.
Private sector debt (% of GDP)	1.3.1	-	-	-	-	54	56	

Conditions for transmission of monetary policy changes to firms and households						
Structure of financial assets and liabilities of corporations and households	1.3.2	-	-	differences exist		Difference apparent mainly in relatively high share of trade receivables in corporate balance sheets and in household asset structure.
Effect of monetary policy on client interest rates	1.3.3	-	-	-	similarity	Effect of money and financial market rates on client rates is broadly similar in Czech Republic as in euro area.
Spontaneous euroisation	1.3.4	-	-	low		Use of euro by Czech corporations is consistent with openness of Czech economy. Czech households make minimal use of euro.

Analysis Method / Category	Section	The most recent value of the indicator compared in the document from the given year. Unless stated otherwise, the data are for the previous year. The underlined segments are not comparable to the previous values owing to data revisions or changes in calculation or methodology.						Commentary
		2006	2007	2008	2009	2010	2011	
Financial market integration Speed of convergence of yields with yields in euro area (beta-convergence coefficient, since 08/2007)								
Money market	1.3.5	-	-0.6	-0.6	-0.39	-0.38	-0.37	Financial and economic crisis led to decline in speed of adjustment on markets analysed. However, gradual return to pre-crisis levels was visible during 2010.
Foreign exchange market	1.3.5	-	-0.9	-0.8	-0.89	-0.90	-0.88	
Bond market	1.3.5	-	-0.9	-0.8	-0.73	-0.69	-0.73	
Stock market	1.3.5	-0.9	-0.9	-0.9	-0.84	-0.77	-0.79	

Adjustment Mechanisms

Fiscal policy

General government balance CNB estimate % of GDP, ESA 95	2.1.2	-3.5 (2006)	-3.5 (2007)	-1.0 (2007) -0.8 (2008)	-2.1 (2008) -6.0 (2009)	-5.9 (2009) -5.7 (2010)	-4.7 (2010) -4.4 (2011)	Latest developments reflect impacts of recession and of anti-crisis measures adopted. Deficit significantly exceeds Maastricht convergence criterion.
Government debt CNB estimate % of GDP, ESA 95	2.1.2	30.6 (2006)	30.5 (2007)	28.9 (2007) 27.6 (2008)	30.0 (2008) 35.7 (2009)	35.4 (2009) 39.8 (2010)	38.5 (2010) 41.3 (2011)	Total government debt is rising. Ratio of government debt to GDP remains below Maastricht convergence criterion, but risk to its sustainability remains.

Wage elasticity and inflation persistence

Rate of adjustment of real wage growth to unemployment rate								
Phillips curve	2.2.1	-0.008	-0.019	-0.030	-0.009	0.003	0.001	Real wage flexibility remains low in Czech Republic, as in other countries compared. However, nominal wages are showing signs of flexibility.
Inflation persistence								
Method 1 (non-parametric)	2.2.2	0.93	0.92	0.79	0.79	0.81	0.81	Inflation persistence in Czech Republic is low compared to HU, PL, SI and SK.
Method 2 (sum of AR coefficients, constant mean)	2.2.2	-	0.74	0.83	0.82	0.91	0.81	
Method 3 (sum of AR coefficients, time-varying mean)	2.2.2	-	0.45	0.32	0.32	0.38	0.38	

Analysis Method / Category	Section	The most recent value of the indicator compared in the document from the given year. Unless stated otherwise, the data are for the previous year. The underlined segments are not comparable to the previous values owing to data revisions or changes in calculation or methodology.						Commentary
		2006	2007	2008	2009	2010	2011	

Labour market flexibility

Long-term unemployment								
Long-term unemployment rate, %	1.3.2	4.2	3.9	2.8	2.2	2.0	3.0	Long-term unemployment is reflecting lagged impacts of recent economic crisis and has been rising since second half of 2009. Growth observed in all countries under review except Germany.
Long-term unemployment as % of total unemployment	1.3.2	53	54	52	49	30	41	
Regional differences in unemployment								
Coefficient of variation in unemployment rate (at regional level, NUTS-3)	1.3.2	44 (2004)	47 (2005)	47	45	35	32	Regional differences in unemployment rate have decreased in last two years owing to stronger unemployment growth in regions with lower unemployment.
Population mobility								
Internal migration – per 1,000 inhabitants	1.3.2	21	22	25	24	22	23	Internal migration lower than in AT and DE.
Structural unemployment								
NAIRU structural unemployment rate, %	2.3.2	-	-	-	5.9	6.1	6.0	Structural unemployment rate among lower ones of countries compared.
International migration								
Immigrants – per 10,000 inhabitants	2.3.3	59	66	101	75	38	-	International mobility was rising until 2007, but has been falling sharply since 2008.
Institutional environment								
Trade unions and collective bargaining Coverage of employees by collective agreements, %	2.3.3	minor impact		51 (2006)	51 (2006)	46	48	Coverage of employees by collective agreements is stable. Practice of extending binding nature of higher collective agreements is not very common in Czech Republic.
Minimum wage as % of average wage in industry and services	2.3.3	38.8 (2004)	39.1 (2005)	38.1 (2007)	38.1 (2007)	35.0 (2008)	33.4	Falling since 2007. Level in Czech Republic is lowest among countries compared.
Employment protection legislation index – perm. employment (OECD)	2.3.3	3.3 (2003)	3.3 (2006)	3.2 (2007)	3.1	3.1 (2008)	3.1 (2008)	Very low index value for temporary jobs and high protection of permanent jobs indicates risk of labour market duality. Value for 2008 is CNB estimate.
Employment protection legislation index – temp. employment (OECD)	2.3.3	0.5 (2003)	1.1 (2006)	1.1 (2007)	0.9	0.9 (2008)	0.9 (2008)	

Analysis Method / Category	Section	The most recent value of the indicator compared in the document from the given year. Unless stated otherwise, the data are for the previous year. The underlined segments are not comparable to the previous values owing to data revisions or changes in calculation or methodology.						Commentary
		2006	2007	2008	2009	2010	2011	
Overall labour taxation (persons on average wage, %)	2.3.3	43.8	42.6	42.9	43.4	41.9	42.2	Overall labour taxation in Czech Republic is higher than in PT, PL and SK and lower than in DE, AT and HU.
Overall labour taxation (persons on two-thirds of average wage, %)	2.3.3	42.1	40.1	40.5	40.0	38.6	38.9	
Ratio of net household income when breadwinner is unemployed and employed, %	2.3.3	81 (2004)	74 (2006)	74 (2006)	80 (2007)	77 (2008)	75 (2009)	Low financial incentive to work for long-term unemployed (unemployed after five years, potential income 67% of average wage, second person inactive, children four and six years old).

Product market flexibility

Regulatory barriers to entrepreneurship								
Conditions for starting a business (ranking, WB)	2.4.1	-	-	86 (2008)	86 (2008)	113	130	Conditions in Czech Republic are worst among countries compared.
Conditions for closing a business (ranking, WB)	2.4.1	-	-	113 (2008)	113 (2008)	116	32	Conditions worse than in AT and PT, similar to SK.
Taxation rate								
Implicit corporate taxation rate	2.4.2	-	-	23.4 (2006)	24.1 (2007)	25.7 (2008)	19.9 (2009)	Implicit tax rates higher than in HU and PL, lower than in AT, SI and SK.

Flexibility and shock-absorbing capacity of banking sector

Non-performing loans/total loans, %	2.5	3.9	3.7	2.8	3.3	5.3	6.2	Increase due to economic recession, as in other countries compared.
Capital adequacy of banks, %	2.5	11.9	11.4	11.5	12.3	14.1	15.3	Highest capital adequacy ratio behind DE and AT among countries compared.
Capital adequacy of banks after stress tests, %	2.5	10.2	9.9	10.8	12.0	12.1	10.1	Sufficient level.
Deposit-to-loan ratio, %	2.5	-	-	-	-	138	137	Sufficient deposit financing sources ensure relative independence of Czech banks on both Czech interbank market and foreign financial markets.

F METHODOLOGICAL PART

D *Economic (mis)alignment of euro area countries*

The economic alignment of the euro area countries was analysed using simple descriptive statistics of macroeconomic fundamentals – GDP per capita, real GDP growth, unemployment, the inflation rate and long-term interest rates. The individual descriptive statistics were calculated across countries, i.e. with no weight adjustment for the size of the given economy or the population of the given country. In addition to unweighted values, the charts show values for the euro area as a whole.

In the charts, therefore, the standard deviation at time t is calculated using the formula $\sqrt{\frac{\sum_{i=1}^{n}(x_{i,t}-\overline{x_t})^2}{(n-1)}}$, where $x_{i,t}$ is the value of the macroeconomic variable for country i, $\overline{x_t}=\frac{\sum_{i=1}^{n}x_{i,t}}{n}$ is the arithmetic (unweighted) mean of the variable across countries at time t and n is the number of countries under review. In addition to standard deviation and the mean, the median is analysed. It indicates the value of the variable lying in the middle of the set sorted by magnitude. This means that one-half of the countries have values above the median.

The relative alignment of the variables in the euro area (see Chart 7) is depicted using their normalised standard deviations. The standard deviations were normalised by subtracting the mean and dividing the difference by the standard deviation of the series of standard deviations. The y-axis therefore shows the relative deviation from the long-term mean, where the standard deviation of the series is the unit. A negative value means that alignment is above the long-term mean.

E *Alignment analyses for the Czech Republic*

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. The annual rate of real appreciation is calculated as the geometric mean of the appreciation since 1998.

The outlook for future real appreciation for the next five years 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 36 European countries between 1995 and 2010 (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:

$$P_{C,t} = 24.36 + 0.78\ GDP_{PPP,t} + 0.88\ \mathrm{AR}(1)_t,$$

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-17 = 100) and $\mathrm{AR}(1)_t$ is the first-order autoregressive term. The simulations of the future pace of equilibrium real exchange rate appreciation take as their starting point the estimates of GDP and the price level for 2011 based on European Commission and Eurostat forecasts for real GDP growth, nominal exchange rates and inflation in the individual countries in 2011. They also assume beta-convergence of GDP towards the level of the EA-17 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 0.85–0.91).

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 probably be more appropriate from the economic point of view, but the differences compared to the three-month rates are small on average (around 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 money market 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 future equilibrium real appreciation for each of the countries (see above) is subtracted, corresponding to the future expected inflation differential vis-à-vis the euro area average.

The wage level data are taken from the OECD database. The average gross annual wage is converted to the equivalent for an employee working full-time all year.

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**,[117] which allows this requirement to be met, was therefore

[117] Croux, Forni and Reichlin (2001).

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 co-spectrum, 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.

The total export data for some countries (Greece and Slovenia) are available only in USD from the IMF database, so they had to be converted into national currencies. Average monthly exchange rates according to the IMF were used for the conversion. Similarly, data on exports to the euro area are available only in USD from the IMF database, so they were converted into national currencies using average quarterly exchange rates.

Time series are expressed in logs, seasonally adjusted and detrended. As the literature[118] 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 of seasonally unadjusted (logarithmed) time series:

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

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, Hungary and Portugal, 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.

[118] E.g. Frankel and Rose (1997). The features of the individual methods are described in Canova (1998).

Given the requirement to assess 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 Q1–2004 Q1 and 2004 Q2–2011 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–April 2004 and May 2004–June 2011 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 Q1–2004 Q1 and 2004 Q2–2010 Q4 for quarterly data, and January 1997–April 2004 and May 2004–December 2010 for monthly data. The choice of intervals was motivated by maximum possible unification to make the results mutually comparable.

1.1.3 Analysis of cyclical alignment using the Taylor rule

The implied monetary policy interest rate for the countries under comparison and the euro area is estimated using the classic Taylor rule (Taylor, 1993).[119] In contrast to the more complicated variants, the advantage of the basic version 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 over the medium term and at the same time being highly robust.

Implied monetary policy rates for country X are derived from the Taylor rule as:

$$\mathrm{X\_TR}_{\mathrm{t}} = \pi_{X,t} + \frac{1}{2} y_{X,t} + \frac{1}{2}\left(\pi_{X,t} - \pi_X^*\right) + r^{eq},$$

where π_t is the inflation rate, y_t the output gap derived using the Hodrick-Prescott filter,[120] π_t^* the inflation target and r^{eq} equilibrium real interest rates.

The time series of seasonally adjusted GDP, three-month money market rates[121] 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. As in Taylor (1993), equilibrium real interest rates and the inflation target are 2%. The comparison therefore assumes that the equilibrium rates and the inflation target are the same in all countries. Although the inflation targets in some non-euro area countries are different (usually higher), the assumption of a common target is motivated by the prospect of their adopting the single ECB monetary policy in the future.[122]

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

[119] Estimating the reaction rules of central banks is a complex task. The more sophisticated reaction functions are forward-looking, but are rather difficult to estimate. Although a simple backward-looking rule (like the Taylor rule) is cruder, it can be directly interpreted as an indicator 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 administered 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).

[120] When interpreting the results, we must bear in mind that the HP filter is merely an approximate and imperfect method of estimating the output gap.

[121] The analysis also presents the deviation of the actual rate from the implied euro area rate. The annualised 3M EURIBOR rate is used to proxy for the actual rate.

[122] The common inflation target for the euro area can implicitly mean a different inflation target for each economy according to its specific rate of equilibrium real appreciation.

$$S_X = \sum_t \left(X\_TR_t - EU\_TR_t\right)^2 .$$

The deviations are calculated in percentage points from the euro area implied rates.

It follows from this relationship that $S_{EA} = 0$. To follow developments over time, S_X is calculated for six different periods: 1999 Q1–2011 Q1, 2001 Q1–2011 Q1, 2003 Q1–2011 Q1, 2005 Q1–2011 Q1, 2007 Q1–2011 Q1 and 2009 Q1–2011 Q1.

1.1.4 Synchronisation of economic shocks

A procedure based on a bi-variate structural vector autoregressive (SVAR) model 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 EU and euro area countries (the Czech Republic, Hungary, Poland, Slovakia, Slovenia, Germany, Portugal and Austria) are the inputs for the VAR model. The source of the data is Eurostat and the data cover the period 1996 Q1–2011 Q1.

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 can then be 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 EA-17 indicates the degree of asymmetry of shocks vis-à-vis the euro area.

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-17). 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:

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

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 source of the data is Eurostat. 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.[123] The modified coefficient takes values in the range of [0;1]. The closer the coefficient is to zero, the more similar in structure are the economies.

1.1.6 Interest rate convergence

The simple method of a chart showing the interest rate differentials vis-à-vis the euro area is used to analyse the convergence of interest rates in the Czech Republic, Hungary, Poland, Slovenia and Slovakia.[124] Eurostat data (three-month money market rates) and Bloomberg data (five-year government bonds) were used to measure the interest rate differentials between three-month and five-year rates in the euro area and these countries. The euro area comprises 11 countries until the end of 2000, 12 countries until the end of 2006, 13 countries until the end of 2007, 15 countries until the end of 2008, 16 countries until the end of 2010 and 17 countries from January 2011.

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, February 2002 for Slovakia and August 2005 for Slovenia. The time series terminate in June 2011 for both three-month rates and five-year rates. The source is Bloomberg (Euro Generic Government Bond time series).

The time series "EMU convergence criterion bond yields" from the New Cronos database (Eurostat), compiled for the purposes of assessment of the Maastricht convergence criterion on long-term interest rates, 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 June 2011 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.[125] 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 higher probability of participation in the EMU.

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.

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[123] $$SL = \sum_{i=1}^{n} \sqrt{\left(I_{sh_A^i}.100 - I_{sh_B^i}.100\right)^2 . \left(\frac{I_{sh_A^i}.100}{100}\right)} = 100 \sum_{i=1}^{n} \sqrt{\left(I_{sh_A^i} - I_{sh_B^i}\right)^2 . I_{sh_A^i}} = 100 . I_{SL}$$

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

[124] 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.

[125] The same method is used in Castrén and Mazzotta (2005).

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

$$corr_t = \frac{\mathrm{cov}\left(X/USD, EUR/USD\right)_t}{\sqrt{\mathrm{var}\left(X/USD\right)_t * \mathrm{var}\left(EUR/USD\right)_t}}$$, where *X* 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 2 September 2011 and uses daily data from Thomson Datastream and Eurostat.

1.1.8 Analysis of exchange rate volatility

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

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

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 annualised form:

$\sigma_{ann} = \sigma\sqrt{N}$, where N = 252 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.

1.2 EFFECT OF INTERNATIONAL ECONOMIC RELATIONS

1.2.1 Integration of the economy with the euro area

The data for the calculation of the shares of exports to 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 (1998 annual data) and from the Eurostat (1999–2011 H1 monthly data).

The source of the data for the analysis of the euro area's share in direct investment is the Eurostat database, for the Czech Republic the CNB, for Austria the OeNB, for Germany the Bundesbank, for Hungary the MNB and for Slovakia the NBS.[126] Data on the inflow of foreign direct investment (FDI) from euro area countries and the outflow of direct investment (DI) to

[126] The data for Slovakia are preliminary.

euro area countries were used. The presented time series does not start until 2002 owing to the availability and quality of the data compared. The GDP data are from the Eurostat.

1.2.2 Intra-industry trade

The Grubel-Lloyd (GL) index was used to analyse intra-industry trade:

$$GL_t = 1 - \frac{\sum_k \sum_i \left| X_{it}^k - M_{it}^k \right|}{\sum_k \sum_i \left| X_{it}^k + M_{it}^k \right|}$$

GL_t is the ratio of the absolute value of intra-industry trade to foreign trade turnover. X^k_{it} and M^k_{it} denote exports to and imports from the k-th country of the i-th commodity at time t. The index takes values ranging from 0 to 1. A value of 0 means that all trade is inter-industry trade and that there is specialisation in different commodities. By contrast, a value of 1 indicates that all trade is intra-industry trade (Flek et al., 2001).

The GL index is calculated using data on exports and imports to and from the euro area in the countries under review.[127] To calculate the index, foreign trade is broken down on the basis of the SITC and CN8 classifications (the commodities i are thus given by SITC groups at the one- to five-digit level and CN8 at the eight-digit level). The data source is the Eurostat COMEXT database. Mirror trade flows were used for 1998, i.e. data on imports (exports) of euro area countries from (to) the monitored countries were used for exports (imports) of the monitored countries to (from) euro area countries.

The value of the GL index depends, among other things, on the level of detail of the branch breakdown. The breakdown according to the one- or two-digit SITC is a rather broader sector breakdown which may put together in one category branches whose output is not closely related[128], resulting as expected in a higher value of this indicator for all countries (see Chart 25 in section E). Although the qualitative message of the analysis is relatively independent of the degree of aggregation selected, the cross-country differences are largest when using the eight-digit (most detailed) breakdown.[129]

The Gruber-Lloyd index for horizontal and vertical intra-industry trade is calculated on the basis of the following formulas and using the methodology described in Fontagné and Freudenberg (1997) and Fontagné et al. (2006):

$$GL_t^H = 1 - \frac{\sum_k \sum_i \left| X_{it}^{H,k} - M_{it}^{H,k} \right|}{\sum_k \sum_i \left| X_{it}^{H,k} + M_{it}^{H,k} \right|} \qquad GL_t^V = 1 - \frac{\sum_k \sum_i \left| X_{it}^{V,k} - M_{it}^{V,k} \right|}{\sum_k \sum_i \left| X_{it}^{V,k} + M_{it}^{V,k} \right|}$$

where H and V represent categories of goods defined as horizontal and vertical. In other words, the ratio of intra-industry trade in goods of similar (different) quality to total trade in goods of similar (different) quality was used to calculate the GL index for horizontal (vertical) intra-industry trade. Unit values are used to proxy for the quality of goods. Trade for a given category of goods is considered horizontal if the share of the unit value of exports (UVX^k_{ij}) in the unit value of imports (UVM^k_{ij}) for this category does not exceed 25%, i.e.:

[127] As the trade balances of euro area countries can take either positive or negative values, it is recommended to calculate the aggregated Grubel-Lloyd index using bilateral export and import flows.
[128] This is particularly so in SITC 7 (Machinery and transport equipment).
[129] The simplest calculation of the Gruber-Lloyd index, using SITC 1, is based on 10 categories. According to the CN8 classification, however, the Czech Republic imported around 8,600 categories of goods from the euro area in 2010 and exported more than 7,900 categories of goods.

$$\frac{1}{1.25} \leq \frac{UVX_{it}^{k}}{UVM_{it}^{k}} \leq 1.25$$

Otherwise, trade is regarded as vertical. As the data used to calculate the unit values need to be as detailed as possible, the eight-digit CN8 classification and data on trade with individual euro area countries were used. One-way trade is excluded from the identification of horizontal and vertical trade as a result of the definition used.

The share of a given type of trade in total trade with the euro area is calculated as the sum of exports and imports of goods included in horizontal (vertical) trade relative to total exports and imports (values listed in the "TOTAL" line in the Eurostat database). The difference between total foreign trade turnover and the sum of horizontal and vertical trade consists of one-way trade and measurement errors.

1.3 FINANCIAL MARKET

1.3.1 Financial sector

Depth of financial intermediation (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 (forfaiting 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.

Indebtedness of the private sector (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. Usually, the more advanced the market, the larger this ratio, but an excessively high value may reflect overleveraging of the private sector.

1.3.2 Structure of financial assets and liabilities of corporations and households

Financial accounts data published by 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 distinguishes 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.

1.3.3 Effect of monetary policy on client interest rates and new loans

Interest rate sensitivity of new loans to non-financial corporations and loans for house purchase – this indicator shows the degree of structural similarity of new loans in terms of interest rate fixation between the Czech Republic, the euro area average and the countries under review. For the single monetary policy to operate effectively, it is important that the interest rate sensitivity of these loan types to changes in market and client interest rates is similar, thereby eliminating some asymmetry in the event of economic shocks.

Convergence of interest rates on loans to non-financial corporations and loans for house purchase – a chart showing the interest rate differential vis-à-vis the euro area is used to analyse convergence of interest rates in the Czech Republic and the countries under review to the euro area average. The differential shows the difference between interest rates on loans to non-financial corporations and loans for house purchase in the Czech Republic and in the countries under review and analogous average rates for the two loan types in the euro area. Average weighted interest rates on new business, which reflect the rates agreed for all new business during the month, were used in the calculation.

Interest burden – the degree of alignment of the effects of interest rate changes on the financial situation of non-financial corporations and households was identified using an indicator showing the interest burden on these two sectors, i.e. what proportion of profit or gross disposable income is used to pay interest. From the viewpoint of the monetary policy transmission mechanism, a higher debt burden is usually accompanied by a higher interest burden, which increases the risk to debt sustainability in the event of negative shocks to income and interest rates. This can ultimately have a negative effect on the consumption and investment expenditure of economic agents. Some trend synchronisation of this indicator in the Czech Republic with the euro area average is important to enable the single monetary policy to influence the balance sheets of corporations and households effectively.

1.3.4 Spontaneous euroisation

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 (spontaneous) euroisation can be distinguished. This analysis is concerned with 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, and an assessment of the initial effects of the escalating financial crisis on the degree of euroisation were performed using a survey on the cash holdings and savings deposits of households conducted by Oesterreichische Nationalbank and published in 2011.

1.3.5 Financial market integration

Price-based measures

These measures use the concepts of beta-convergence and sigma-convergence (Adam et al., 2002).[130] The concept of beta-convergence enables identification of the speed at which differences in yields are eliminated on individual financial markets (selected against the benchmark). A negative beta coefficient signals the existence of convergence. The closer the value of the beta coefficient is to -1, the higher is the speed of convergence. To quantify beta-convergence, common regression analysis or the panel estimation 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[131] and a selected reference territory (a benchmark, B) at time t, Δ is the difference operator, a_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. The β coefficient can take values ranging from -2 to 0. The closer the value of the β coefficient to 1, the higher the speed of convergence. If β = 0 or β = -2, no convergence is observed. β values from -1 to 0 indicate monotonous convergence, while oscillating convergence occurs for values from -2 to -1.

The concept of sigma-convergence focuses on the dispersion of the yields on identical asset types in different countries at a given moment in time and thus identifies the degree of integration vis-à-vis the benchmark country achieved at that moment in the individual selected financial market segments. Sigma-convergence increases as the sigma parameter falls to zero. To quantify sigma-convergence, a calculation is used of the (cross-section) standard deviation (σ), according to the formula:

$$\sigma_t = \sqrt{\left(\frac{1}{N}\right)\sum_{i=1}^{N}\left[\log\left(Y_{i,t}\right) - \log\left(\overline{Y_t}\right)\right]^2}$$

where Y is the asset yield, $\overline{Y_t}$ is the mean value of the yield over time t and i stands for the individual countries (i = 1, 2, …, N). For the purposes of this analysis, we use N = 2, i.e. we explore the evolution of sigma-convergence over time between the euro area and one of the countries under review.[132] σ takes only positive values in theory. The lower is σ, the higher is the level of convergence. In theory, full integration is achieved when the standard deviation is

[130] 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).
[131] $Y_{i,t}$ = [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.
[132] For pairs of countries, the calculated values in each period are essentially equal to half the square of the yield differential.

zero,[133] while high (several digit) values of σ reflect a very low degree of integration. For graphical illustration, the results were normalised over the whole time period and filtered using the Hodrick-Prescott filter with the recommended weekly time series coefficient λ = 270,400.

News-based measures

This method (Baele et al., 2004) assumes that potential local shocks, which get more alike with increasing integration, can be diversified in an integrated region by investment in other comparable assets. In line with these assumptions, the price movements of a benchmark asset should reflect all relevant common (global) news. So, in a fully integrated market, the price changes of an asset in a single country should not be systematically higher or lower than the price changes of the benchmark asset. Quantification of the degree of shock integration can be estimated (as in Baele et al., 2004) for the money, foreign exchange and government bond markets using the following regression:

$$\Delta Y_{i,t} = \alpha_{i,t} + \gamma_{i,t}\Delta Y_{b,t} + \varphi_{i,t}$$

where $Y_{i,t}$ represents individual asset yields in country i at time t, and b denotes the benchmark country (Germany for the government bond market, otherwise the euro area). $\alpha_{i,t}$ is a specific constant for each country, Δ denotes the difference operator and $\varphi_{i,t}$ is a random term. An increase in this type of integration requires α to converge to zero, γ to converge to one and the proportion of the variance of coefficients γ (for benchmark and national assets) to be close to one. The time-varying parameters γ were estimated using recursive estimation.

To quantify the degree of stock market shock integration between the countries under review and the euro area, the above equation must be adjusted for the impact of the US stock market on the monitored markets and the euro area market. This is due to the lower comparability of the individual national stock indices relative to the other monitored assets (exchange rates, money market rates and government bonds). The modified equation for the stock market has the following form:

$$\Delta Y_{i,t} = c_{i,t} + \gamma_{i,t}^{b}\Delta Y_{b,t} + \gamma_{i,t}^{US}\Delta Y_{us,t} + \upsilon_{i,t}$$

The magnitude of parameters γ expresses the degree of identical response of an asset of a selected country and a comparable benchmark asset to certain news.

Data

The calculations for both measures of financial integration were carried out using weekly data (daily data averages) from Thomson Datastream, covering the period January 1995 to July 2011 for the foreign exchange and stock markets, January 1999 to July 2011 for the money market and January 2001 to July 2011 for the bond market. 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 (see Table F.1). The relevant time series were adjusted for exchange rate effects.

[133] This occurs on the money and foreign exchange markets for countries entering the euro area on a given date.

Table F.1: Data sources

	Money market	Foreign exchange market	Bond market	Stock market
	1999–2011	1995–2011	2001–2011	1995–2011
CZ	PRIBK3M	PRUSDSP	BMCZ05Y-(RY)	CZPXIDX
AT	-	-	BMOE05Y-(RY)	ATXINDX
DE	-	-	BMBD05Y-(RY)[B)]	DAXINDX
PT	-	-	BMPT05Y-(RY)	POPSI20
HU	HNIBK3M	HNUSDNB	BMHN05Y-(RY)	BUXINDX
PL	POIBK3M	POUSDSP	BMPO05Y-(RY)	POLWIGI
SI	-	SJUSDSP	-	SLOESBI
SK	SXIBK3M	SXUSDSP	SXGOVT1-(RY)[a)]	SXSAX16
EA-16	BBEUR3M[B)]	USECBSP[B)]	-	DJES50I[B), b)]
USA	-	-	-	S&PCOMP

Note: Thomson Datastream codes.
[B)] – benchmark.
[a)] data from 2002 onwards.
[b)] DJES50I consists of stocks from euro area member countries with the following weights: France 34.6%, Germany 28.0%, Spain 16.7%, Italy 11.0%, the Netherlands 5.6%, Finland 2.5% and Luxembourg 1.7%.

2 ADJUSTMENT MECHANISMS

2.1 FISCAL POLICY

2.1.1 Stabilising function of public budgets

There are two main approaches to determining the cyclical component of the budget balance. The first is based on the methodology used by the European Commission and other international institutions (OECD, IMF), which assumes a direct relationship between the output gap and revenue/expenditure budgetary items which are subject to cyclicality. The second approach, used by the ECB and central banks within the ESCB, is based on the relationship between individual revenue and expenditure budgetary items and their macroeconomic bases.

Of key importance in the computation of the cyclically adjusted balance using the output gap approach are the estimation of potential product, i.e. the identification of the phase of the economy, and the determination of the sensitivity of budgetary items to change in the output gap. In this approach, the cyclical changes in economic activity in a given year are fully reflected in the computation of the cyclical component of the budget balance.

By contrast, the ECB's approach works not with potential output, but with the trends in relevant macroeconomic variables linked to the revenue and expenditure components of the budget ("macroeconomic bases"). Specifically, these bases comprise compensation of employees, employment, household consumption and operating surplus in the corporate sector. The first step in the computation of the cyclically adjusted balance by this method involves determining the cyclical positions of the individual macroeconomic bases on the basis of the difference between the actual value and the trend value obtained using the Hodrick-Prescott filter. The second step involves quantifying the effect of the cyclical position on the relevant budget variable by means of the tax/expenditure elasticity estimated in advance and then summing the individual cyclical components. It is important to note that three of the five macroeconomic bases used are labour market variables and that economic shocks affect the labour market with a time lag and hence do not reflect changes in GDP immediately. In this

approach, therefore, changes in economic activity – especially when they are sharp fluctuations – show up in the cyclical component of the budget balance only partially or with a lag.

The two approaches naturally provide somewhat different results. When interpreted correctly, however, they are sufficient to identify the basic characteristics of fiscal policy and the main trends in public budgets.

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 and unsuccessful arbitrations.

In addition to the aforementioned mandatory expenditures, there are also so-called *quasi-mandatory* expenditures, which include, for example, wages to 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 finance

The extrapolation of sustainability was taken from the publication "Public Finance in EMU 2010" (European Commission, 2010).

2.2 WAGE FLEXIBILITY AND INFLATION PERSISTENCE

2.2.1 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 Babecký, 2008).

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

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 HICP 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 if the coefficient c_3 is close to one. The rest of the variation in wage costs (e.g. as a result of changes in productivity and growth in import prices) is included in the constant c_1. The source of the data (quarterly, seasonally adjusted time series) is Eurostat New Cronos. Since Eurostat has migrated to the new NACE2 classification, the wage cost data needed are only available from 2000. To assess its evolution over time, wage cost elasticity is now calculated for the period 2001 Q1–2011 Q1. The data for 1996–2001 are taken from the 2008 Alignment Analyses, where the same methodology was used for the calculation.

2.2.2 Inflation persistence

Inflation persistence is measured by three different methods. Quarterly data on HICP inflation (annual HICP changes) from 1997 Q1 to 2011 Q2 are used for the calculation. The source of the data is OECD MEI.

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 time-varying mean inflation value and T is the number of observations. The time-varying mean inflation value 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 1998 Q1 to 2010 Q4 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 time-varying mean 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 independently divided white noise processes, 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 market flexibility

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.

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 Münich, 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).

Aggregate fixed effects of the matching function are an indicator of the degree of mismatch in filling vacancies. The matching function was estimated in the form

$$\log o_{it} = \beta_1 \log U_{i,t-1} + \beta_2 \log V_{i,t-1} + \gamma_1 \log u_{it} + \gamma_2 \log v_{it} + \alpha_i + \varepsilon_{it}$$

where o_{it} is the number of persons leaving the labour office register in district i in period t, $U_{i,t-1}$ and $V_{i,t-1}$ are the numbers of unemployed persons and vacancies, u_{it} is the number of newly registered job seekers, v_{it} is the number of newly reported vacancies and α_i are regional fixed effects. The equation is estimated in first-order differences using instruments for $U_{i,t-1}$ and $V_{i,t-1}$ (Galuščák and Münich, 2007). The two estimation methods differ in the set of instruments used. Aggregate fixed effects are obtained by aggregation weighted by district size.

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 **skills and regional mismatch between labour demand and labour supply** is expressed by the number of unemployed persons per vacancy in regions and by profession. Data on the number of unemployed people and vacancies are from the 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 Structural unemployment

The NAIRU analysis presented in the main part of the text focuses on the medium-term NAIRU concept,[134] which defines the NAIRU as the equilibrium rate towards which unemployment converges in the absence of temporary supply shocks once the dynamic adjustment of inflation to previous shocks is completed. A semi-structural approach using the Kalman filter is applied (Richardson et al., 2000; Szeto and Guy, 2004).

The estimate of the NAIRU as an unobserved variable is based on the assumption that stable inflation (i.e. inflation equal to inflation expectations) means, *ceteris paribus*, a rate of unemployment equal to the NAIRU. However, rising (falling) inflation indicates a shift in the unemployment rate below (above) the NAIRU. The basic model equation captures the relationship determined by the Phillips curve, modelling inflation as a function of lagged inflation, the deviation of unemployment from the NAIRU and two variables helping to explain short-term supply shocks. The next equation specifies the process generating the NAIRU time series, which is assumed to follow a random walk process. Inflation expectations are not modelled endogenously. Lagged inflation was used to proxy for inflation expectations. Short-term supply shocks are captured using import prices and oil price developments. These two variables help explain short-term movements in inflation, which allows us to estimate the NAIRU compatible with non-rising inflation in the absence of such temporary supply shocks.

[134] The OECD distinguishes three different NAIRU concepts according to their time frame. Short-term and long-term NAIRU concepts exist in addition to the medium-term NAIRU. The short-term NAIRU is the rate of unemployment consistent with stabilising the inflation rate at its current level in the next period. The long-term NAIRU is the equilibrium rate of unemployment corresponding to a long-term steady state, once the NAIRU has fully adjusted to long-term and short-term supply shocks and economic policy influences.

The unemployment gap, i.e. the difference between the unemployment rate and the NAIRU, can be regarded as representing demand pressures in the equation.

$$(\pi_t - \pi_t^e) = \alpha(L)(\pi_{t-1} - \pi_{t-1}^e) + \beta(L)(u_t - u_t^*) + \gamma(L)\Delta x_t + \varepsilon_t, \qquad \varepsilon_t \sim N(0, \sigma_\varepsilon^2),$$

$$u_t^* = u_{t-1}^* + \nu_t, \qquad \nu_t \sim N(0, \sigma_\nu^2).$$

In these equations π_t is inflation, π_t^e is expected inflation, u_t^* is the NAIRU, $(u_t - u_t^*)$ is the unemployment gap, x_t represents short-term supply shocks and *L* is the lag operator.

Determining the volatility of the NAIRU is an important part of the estimation. The smoothness of the estimated NAIRU series is determined by the variances of the residuals in the two equations above (Phillips curve, random walk) and the relationship between those two variances. The larger is the ratio of the NAIRU variance to the inflation variance, the more volatile is the estimated NAIRU series, i.e. the unemployment gap explains almost the entire variance in inflation. By contrast, a low ratio of the variances means that the estimated NAIRU changes very little over time. The ratio of the estimated standard deviations is roughly 1:5.

2.3.3 International labour mobility

International migration and the proportion of foreigners in the population. 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.

2.3.4 Institutional environment

Trade unions and collective bargaining

The relevant indicators in the area of institutional arrangements for collective bargaining include the degree of coverage by collective agreements. Working with Trexima, the CZSO publishes the shares of employees covered by collective agreements.

Minimum wage

The relationship of the minimum wage to the average wage and to the wage in the first decile of the wage distribution. The data used are from Eurostat and the Average Earnings Information System (Ministry of Labour and Social Affairs).

Employment protection

The **Employment Protection Legislation (EPL) Index** is taken from OECD and relates to 2003, 2006 and 2008. 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.

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 – includes the number of days of notice, severance pay and the delay to start of notice.

Labour taxation

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 (2011b).

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 ESA 95 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 (2011).

The **components of labour taxation** give the decomposition of labour costs into income tax and the contributions paid by employees and employers. The source of the data is OECD (2011b).

Work-incentive indicators

The data on **net replacement rates (NRRs)** are taken from OECD tax and 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 for the Czech Republic are calculated using a micro-simulation tax and benefit model (Galuščák and Pavel, 2007). The calculations have been updated using the parameters valid in 2010.

Net replacement rates measure the extent to which the combination of taxes and benefits affects the financial gain from work and thereby the incentive for 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 unchanged 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 the OECD Product Market Regulation Database, where it is a part of a broader OECD indicator assessing the degree of regulation on product markets. The index consists of individual 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, antitrust exemptions for public enterprises, barriers in network sectors, and barriers in services).

The **rankings of countries in the area of starting or closing a business** are taken from the World Bank's Doing Business database. 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.

2.4.2 Tax burden on businesses

The highest **statutory tax rates** are taken from Eurostat. **Implicit tax rates on corporate income**, defined as the ratio of total tax revenues to the potential tax base (national accounts data under ESA 95 methodology), are an additional indicator. The potential tax base is approximated using national accounts output and income statistics. 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.

2.5 THE BANKING SECTOR AND ITS SHOCK-ABSORBING CAPACITY

The **ratio of deposits to loans provided** (deposits/loans to residents) expresses the extent to which loans provided are financed by private sector deposits. Values of this indicator above 100% indicate that banks have a sufficient volume of deposits relative to the volume of loans provided and their long-term financing is thus less dependent on other sources.

The **external position of the banking sector** (net external assets in % of GDP) represents the difference between the external assets and liabilities of the domestic banking sector, indicating its degree of dependence on foreign sources.

Return on equity (RoE, %) and **return on assets (RoA, %)** can be regarded as measures of profitability of the banking business, assessing its economic efficiency. They aggregate the results of the extent and diversification of banks' activities and the business risks undertaken.

Non-performing loans (NPLs)/total loans (%) – NPLs ("loans in default" in Czech accounting terminology) in gross book value 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 (%) – expressed as the ratio of a bank's capital to the corresponding coverage of potential losses from the risks it undertakes – assesses the outlook for the bank's financial situation and indicates its ability to cover potential future losses with capital. 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.

Stress testing

Stress testing is used by central banks, regulators and commercial financial institutions to test the resilience of institutions or the entire sector to adverse developments in the economic environment. Alternative macroeconomic scenarios serve as the starting point for stress testing. The scenarios are designed using the CNB's official prediction model supplemented with an estimate of the evolution of some additional variables, which are not directly generated by the model (e.g. default rate, credit growth,).

The stress scenarios are constructed based on the identification of risks to the Czech and foreign economy in the near future. To compare the stress outcome with the most probable outcome, the stress tests use a baseline scenario based on the current official macroeconomic prediction of the CNB. These seriously unfavourable scenarios, with strong impacts on banks portfolios, are constructed to estimate potential losses and the related necessary level of capitalisation of banks in response to asymmetric shocks from the financial markets.[135]

[135] For details on the stress testing methodology, see Financial Stability Report 2010/2011 (CNB 2011b).

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