

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

2012

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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 the mainly 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 2012 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. As in the previous year, this year's document reacts to recent developments in the euro area and contains a 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 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: 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 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 international economic relations. 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 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 have since last year included a 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 recession during the global financial and economic crisis. The impacts of the escalating debt crisis in the euro area in 2012 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 continued to tighten macroeconomic and budgetary supervision. Rescue mechanisms for the euro area countries have also been bolstered. 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 means an 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 includes **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 has manifested itself through frequent use of base wage freezes and bonus cuts by corporations in response to the fall in demand in 2009. 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 administrative barriers 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**. 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 (converted using purchasing power parity), the Czech Republic is at a higher absolute level 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, but was renewed in 2010 and 2011. The public finance deficit has deteriorated markedly as a result of the economic slump and the anti-crisis fiscal measures adopted. A public finance consolidation process has been under way since 2010, but in 2011 the total budget deficit was 3.3% of GDP and total government debt grew to 40.8% of GDP. The implemented and planned austerity measures will result in a reduction in the public budget deficit in the near future. Fundamental reforms focused on the long-term challenges relating to population ageing have yet to be completed. The impacts of the previous economic downturn are also being reflected in a persisting elevated level of 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**. This group includes the flexibility of the Czech labour market. Its weak spots include persisting large regional differences and high overall labour taxation.

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 and slightly also in late 2011, as the economies were hit by recession in different quarters and to different extents. By contrast, the unemployment rate was initially converging, but in recent years unemployment has risen much more strongly in some countries. 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 **public finance situation** in many euro area members is currently putting the functioning of the euro area under big pressure. At present, only three countries (Estonia, Finland and Luxembourg) meet the fiscal criteria laid down in the Treaty on the Functioning of the EU and detailed in the protocols annexed to it. In 2011, eleven 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 is changing the view of the economic benefits and costs of joining. In addition to the primary objective of fiscal consolidation, EU countries' economic policies have recently been aimed at fostering a recovery in economic growth. The process of assessing macroeconomic imbalances has started, and plans are being prepared to create a banking union covering financial market supervision at the European level. The lending capacity of the rescue mechanisms has been further increased, with funds expected to go mainly to Greece and Spain. The EFSF and the ESM are, in addition, supposed to purchase bonds of problem countries on primary and secondary markets. The European Central Bank will potentially also buy bonds under a new programme (OMT). However, these bond purchases may strongly affect the quality of the ECB's balance sheet and exert pressure to increase its capital 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. 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 halted in 2009 as a result of the

financial and economic crisis. In recent years, GDP per capita has been 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 the last two years, however, this level has increased again, reaching 70% of the euro area price level in 2011, although it remains below the level corresponding to the performance of the economy. The wage level in the Czech Republic in 2011 was roughly 40% of the average euro area level when converted using the exchange rate and about 60% when converted using purchasing power parity. The real exchange rate of the koruna (on an HICP basis) appreciated on average by 2.6% a year between 2002 and 2011, 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 1.6–2.1% a year can be expected over the next five years. Continuing real appreciation of the exchange rate following euro area entry would therefore mean an 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 in recent years; the same goes for activity in industry and export activity. However, the rise in the monitored correlations, including supply shock correlation, should be assessed in the context of the global economic crisis, the subsequent gradual recovery in economic activity, and later also the impacts of the deepening debt crisis 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. In addition, the differences in the structure are widening further. 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 interest rates was close to zero for a long time is favourable from this perspective. Short-term interest rates showed a slightly positive interest rate differential in 2009 and 2010, but this closed gradually, temporarily turning negative in 2011 H2. Government bond yield differentials against Germany peaked at the start of 2009 and also showed a slight and temporary increase in 2012 H1 due to the euro area debt crisis. However, Czech long-term interest rates have long been much lower than those in the other countries under review.

Another indicator of the appropriateness 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. It 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. A temporary modest decline in correlation was also observed in 2012 H1.

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 64% of Czech exports and 60% of Czech imports, a level comparable to, or even higher than, that in the other non-euro area countries under review. The share of intra-industry trade is relatively high. 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 2010, foreign direct investment from the euro area was 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. For corporations, the difference is particularly visible in a higher weight of shares in the net debtor position, due to lower ownership links. By contrast, the share of debt is lower than in the euro area. Corporations in the Czech Republic are showing higher liquidity, although liquidity growth has also been visible in the other countries under review in recent years. The maturity of corporate liabilities is longer and debt financing is lower and more stable. Czech households have a higher share of currency and deposits in their assets and a lower debt ratio than euro area households. The household sector's net creditor position is still about half that in the euro area.

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 a temporary slowdown in transmission of monetary policy interest rates to the Czech economy owing to some client risk premia. The structure of interest rate fixation on new loans to non-financial corporations is similar to that in the euro area. The degree of **spontaneous euroisation** in the Czech Republic is low and is due to economic agents' high trust 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 towards the euro area 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 on all markets under review except the

government bond market. However, slight divergence was apparent at the start of 2012, due to the escalation of the euro area 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 general government deficits in past years were due mainly to non-cyclical effects – until recently, 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 had the desirable counter-cyclical nature 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 and 2011, when a fiscal consolidation process was commenced and the structural deficit was considerably reduced, albeit at the cost of procyclical restrictive fiscal policy. According to the current estimate, the structural deficit should narrow further in 2012 and 2013 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 expenditures (this effect is mitigated by an increase in the retirement age adopted within the "small" pension reform) and health care system expenditures also poses a risk to public finance sustainability.

The **labour market** is another important mechanism through which the economy can cope with shocks within the euro area. The Czech labour market is not significantly less flexible compared to other European economies, but its weak spots include persisting large regional differences, high overall labour taxation and low financial incentives to seek a job, particularly for the short-term unemployed and low-income households with children.

The Czech labour market situation reflects the impacts of the previous economic downturn. Long-term unemployment started rising in 2009 H2, although in 2011 it fell slightly. Structural unemployment is hovering around 6%. This is one of the lower figures among the countries under comparison. The Czech Republic still has relatively large differences in unemployment across regions.

Wage flexibility can enhance the economy's ability to absorb shocks to which the single monetary policy cannot respond. Nominal wages in the Czech Republic 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. According to the results of econometric analyses, however, real wage flexibility is not statistically significant. 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 average among the countries under comparison.

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. A reduction in the cost of dismissing an employee during the period shortly after the employment contract is signed or after the probationary period has ended can be considered a positive change as from 2012, which should result in higher job creation, especially for graduates and young people. Overall labour taxation in the Czech Republic is relatively high, and has increased slightly further in recent years. The implicit taxation rate, expressing the average effective tax burden, decreased in 2008 and 2009, but increased slightly in 2010. The financial incentives to seek and accept a job are weak in the Czech Republic, particularly for the short-term unemployed and low-income households with children.

In the area of **product market flexibility** the situation is showing some positive changes. The conditions for doing business have improved compared to the other countries. 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 corporations is one of the lowest among the countries under review.

Stability and effectiveness of the financial sector is a precondition for the sector to be able to assist in absorbing economic shocks. By contrast, an unsound financial sector can create shocks and propagate them to the real economy. It can also cause problems in the fiscal area, as the recent experience of some euro area countries 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 31 March 2012 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, application 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 joining the euro area by the new EU Member States.

Generally, economists agree on the set of fundamental benefits and costs of the single currency, although the significance of the individual arguments may change over time or depending on the specific features of the respective economies. The main benefits are improved functionality of money and reduced trade costs (including, for example, greater usability of the single currency, easier-to-compare prices, lower transaction costs and the elimination of exchange rate risk including 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, stronger 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 due to the loss of independent interest rate policy (and potentially also exchange rate policy) upon transition to the single currency. The reason is that the single monetary policy cannot respond sufficiently to shocks which affect only a small part of the currency area's economy. The costs of the loss of independent currency depend on the extent to which the exchange rate 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 then 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.

³ Mundell (1961), McKinnon (1963) and Kenen (1969) are regarded as the cornerstones of this theory. A survey of literature can be found, for example, in Mongelli (2002), De Grauwe (2003) or Horváth (2003). A recent notable paper by Dellas and Tavlas (2009) describes the history of the optimum currency area theory over the last fifty years. Summarizing the modern empirical literature this paper shows, among other things, that pegged exchange rates tend to be associated with higher GDP volatility.

⁴ The enhanced macroeconomic stability should facilitate low and relatively stable interest rates 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, etc. 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 related to the 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).

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 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 unambiguously identify and 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 possible sources of macroeconomic imbalances associated with entering the monetary union and to assess the economy's ability to benefit from membership. Factors that contribute to the benefits of the single currency (compared to a free nominal exchange rate) 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 reduces 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 headings 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 arguing not only that the risks of unbalanced developments in a monetary union and the ability to benefit from a monetary union can be affected by appropriate reforms, but also that large shifts towards an optimum currency area seem to result from the very introduction of the single currency (the "endogeneity hypothesis"; Frankel and Rose, 1998).⁹ The endogeneity paradigm was 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. Agenor and Aizenman (2011) find that the benefits from joining a

⁷ Micco, Stein and Ordóñez (2003) 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 pioneering article, Rose (2000), finds effects of hundreds of per cent, while Micco, Stein and Ordóñez (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). This is particularly true for small open economies. 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 the causality between monetary union participation and cycle alignment exists only if the convergence in institutional structures and the symmetry of shocks are sufficient.

currency union depend on the efficiency of the domestic financial sector, and in particular on its ability to expand into other countries of the currency area.

The conclusions of empirical analyses for the euro area have evolved over time. The review article by De Grauwe and Mongelli (2005) finds support primarily for the endogeneity hypothesis, i.e. that the similarity of economic shocks probably increases with greater 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 characteristics of countries with historically higher volatility in economic activity and lower business cycle correlation with the euro area average persist. 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 always 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 (2010a). 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 financial market integration (Kalemli-Ozcan et al., 2012) and 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. 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 either. A recent article by Eickmeier and Ng (2011) shows that global financial and demand shocks have a very similar effect in euro area countries and European non-euro area countries, indicating a high degree of alignment of European financial markets.

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. Different transmission of the single monetary policy in different currency area countries can also be a significant source of asymmetric shocks – Havránek and Rusnák (2012) show that monetary transmission is faster in countries with more developed financial markets.

Based on an assessment of experience of the functioning of the euro area, number of papers point to 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 since 1999 had been lower than what could have been predicted on the basis of historical experience and US observed developments. At the same time, the cross-correlations of member countries' business cycles had not changed, hence the endogeneity theory has not been confirmed in this respect. Hankel et al. (2010) likewise 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 note 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. Hurník et al. (2010) also point to an absence of the expected benefits for the real economy (2010).

A large body of literature (e.g. De Grauwe, 2010b; 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 a textbook example of an asymmetric shock, but he also claims that during a crisis, small European countries are better off inside the euro area than outside.

D ECONOMIC ALIGNMENT OF EURO AREA COUNTRIES

The global financial and economic crisis have 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. 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

In connection with the current debt crisis, the opinion is strengthening 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 euro area countries over time on the basis of simple descriptive statistics of key macroeconomic indicators.

1.1 CONVERGENCE OF REAL AND NOMINAL VARIABLES

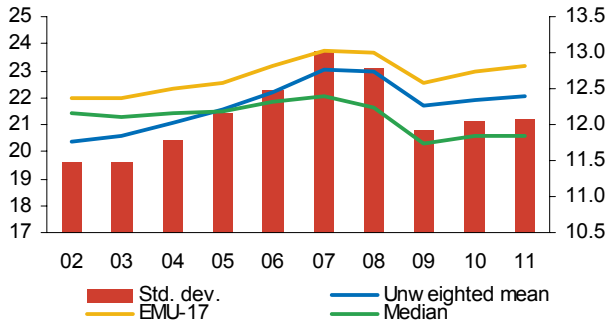
The pursuit of a single monetary policy requires economies to be aligned in terms of their business cycles. Such alignment is aided by the similarity of structural variables, in particular GDP and structural unemployment.

Chart 1 illustrates the evolution of the weighted and simple average of real GDP per capita in euro area countries and its standard deviations in individual years (see the *Methodological Part* for details). 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 in 2009. The dispersion increased again slightly in 2010 and 2011, as some countries recovered faster from the crisis-related contraction while the performance of other countries (notably those hit hardest by the debt crisis) decreased further.

In the past ten years, there was only one change in the relative level of economic activity per capita – Slovenia overtook Portugal. On the other hand, some degree of (beta-)convergence occurred; Chart 2 shows that poorer countries tended to outperform wealthier ones in this period. 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 periods and to different extents. A similar increase was recorded in 2010 H2, reflecting the above-mentioned differences in the post-crisis evolution of the economies.

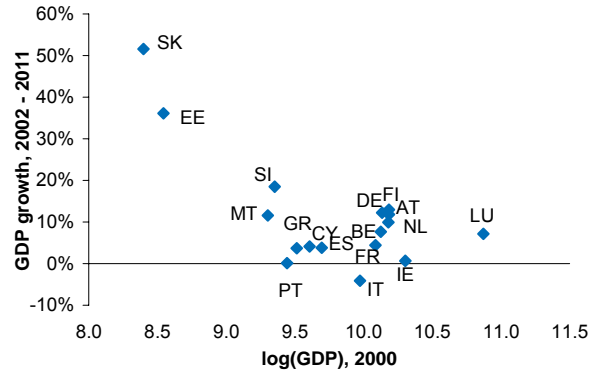
Chart 1: Real GDP per capita in euro area countries (EUR thousands)



Note: GDP at 2000 prices. 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.

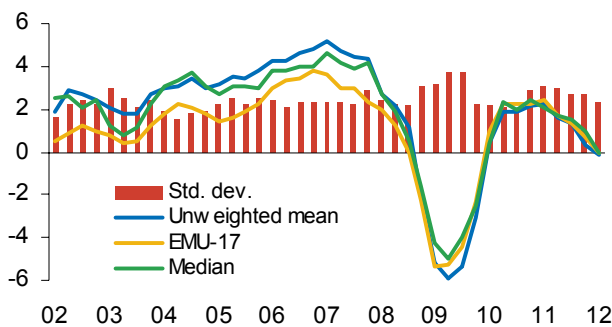
Chart 2: Beta-convergence of real GDP in euro area countries



Source: Eurostat, CNB calculations.

By contrast, the unemployment rate is following a trend (see Chart 4). 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 substantial increase of the mean above the median and widening misalignment between countries. This continued to increase in 2011 and during 2012, when unemployment rose mainly in the countries hit hardest by the debt crisis.

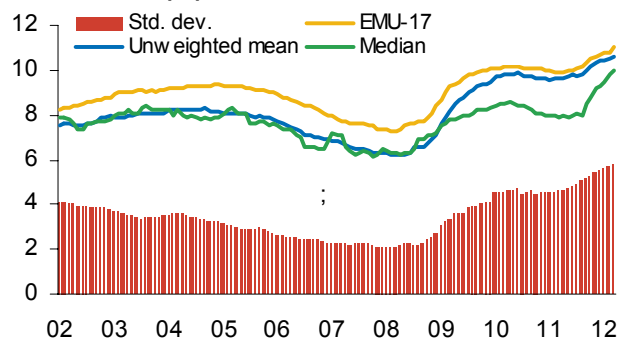
Chart 3: GDP growth in euro area countries (y-o-y, %)



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.

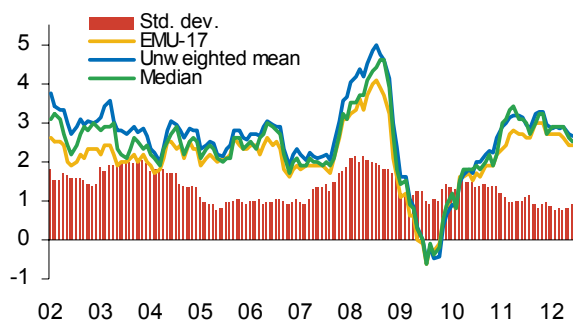
Source: Eurostat, CNB calculations.

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 followed a trend towards relative alignment after euro adoption, but the crisis years saw a temporary increase in misalignment. Average inflation is currently at slightly elevated levels, but this is due to similar factors (primarily commodity prices), so the

standard deviation of inflation has not increased. Long-term interest rates recorded a partly similar trend, i.e. gradual convergence in the pre-crisis years (see Chart 6). Here, however, the increase in misalignment has been very significant in recent years and still persists. It 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 of long-term interest rates.

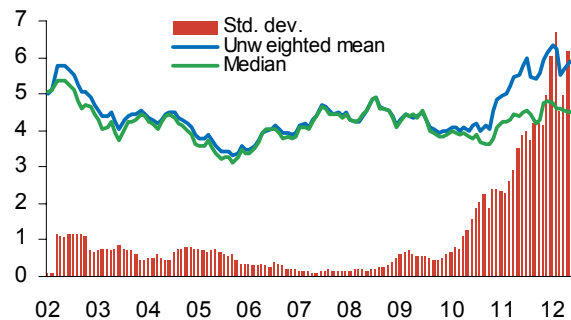
Chart 5: The inflation rate in euro area countries (y-o-y, %)



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 (%)

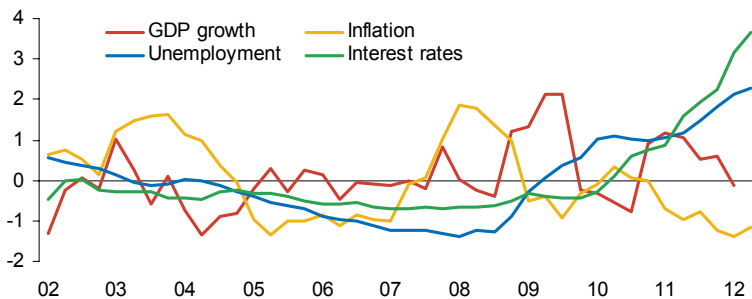


Note: Bond yields for the convergence criteria. March 2002 data (rates for Slovenia are not available before this date). The bond maturity is about ten years. Estonia is not included in the chart because a sufficiently long time series is not available.

Source: ECB, CNB calculations.

In sum, the degree of alignment of euro area economies can be shown using normalised standard deviations (see Chart 7) of key macroeconomic variables (GDP growth, the unemployment rate, the inflation rate and interest rates). Negative (positive) values indicate that the dispersion of a variable is below (above) the long-term average. Most variables – except for GDP growth – saw increasing relative alignment (the standard deviation of the variable was decreasing) until the financial crisis broke out. 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 its long-term average. 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, in particular the unemployment rate.

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



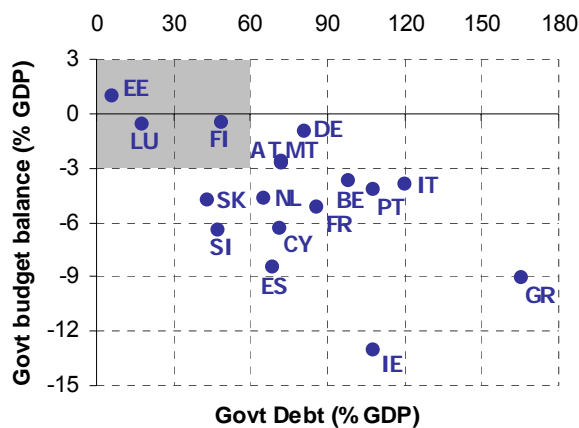
Note: The individual series in the chart depict the normalised standard deviations of the variables under review.

Source: ECB, Eurostat, CNB calculations.

1.2 FISCAL POSITIONS IN THE EURO AREA

The evolution of the euro area countries' fiscal positions also illustrates the degree of alignment and points to the perils stemming from the fiscal indiscipline of individual 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. Five others are at least compliant with one 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 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. It can be seen that fiscal imbalance persistent, but has grown significantly since the crisis broke out and is the main source of the euro area's current problems.

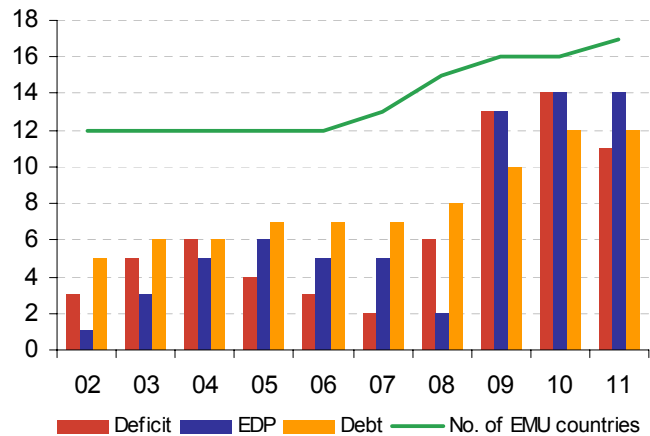
Chart 8: Fiscal positions in the euro area



Note: 2011 data. Countries compliant with the Stability and Growth Pact lie in the grey area (see Chart 9).

Source: Eurostat.

Chart 9: Non-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 economic policies of EU countries last year were focused on combining fiscal consolidation with efforts to restore macroeconomic stability and economic growth. The process of major reform of the main pillars of the functioning of the euro area in the economic policy area continued, albeit at a slower rate and to a lesser extent. These reforms are moving further away from the situation that existed when the Czech Republic entered the EU and committed to adopt the euro. As the text below shows, the new form of economic and political

organisation of the euro area changes the balance of economic costs and benefits of membership for the Czech Republic.¹⁰

Recent developments in the **macroeconomic and fiscal surveillance** area stem from previously agreed changes and reforms. The second European semester (for more details on the European semester see last year's issue of Analyses) started in November 2011 with the issuing of the Annual Growth Survey, in which the European Commission set out public finance consolidation and promoting growth in EU countries as its primary objectives. It also put forward five priorities¹¹ and proposed measures to achieve them. The wording of the Annual Growth Survey and related documents is clearly softer than the previous relatively uncompromising recommendations of European institutions focused primarily on public finance consolidation.¹² This year, the Commission for the first time issued in-depth reviews of twelve Member States (the Czech Republic was not one of them) as part of an assessment of macroeconomic imbalances. The Commission also stated that Member States were adopting measures to correct public finances, but these measures were not sufficiently growth friendly. This year's Ecofin recommendations to the euro area as a whole include a proposal to strengthen the working methods and powers of the Eurogroup¹³ to allow it to take responsibility for the aggregate economic policy stance in the euro area. The Eurogroup is also supposed to safeguard euro area stability and fiscal discipline and strengthen national and regional institutions.¹⁴

In the **economic governance** area, the package of six legislative measures known as the Six Pack was definitively approved. These measures are intended to significantly enhance budgetary and macroeconomic surveillance in the EU. The new measures include the activation of an expenditure rule (linking the rate of growth of general government expenditure to medium-term nominal GDP growth) within the preventive arm of the Stability and Growth Pact and the activation of a debt criterion within the corrective arm. Another new measure is the introduction of a reverse voting mechanism on financial sanctions against euro area countries. Other important elements include the introduction of surveillance of macroeconomic imbalances and the strengthening of national budgetary frameworks.

In November 2011, the European Commission published two new legislative proposals (known as the Two Pack) focused exclusively on euro area countries and based on their agreement to proceed with the integration of economic and fiscal policies without the need to change primary legislation. The draft regulations are intended to introduce effective budgetary surveillance of euro area countries, with enhanced surveillance for those which are subject to an excessive deficit procedure and those which need financial assistance. Last but not least, the aim is to codify and unify the rules for submitting draft budgetary plans for the following year before euro area Member States submit them to their national parliaments for approval, as well as the rules governing adjustment programmes for countries experiencing financial difficulties. This will increase the EU institutions' powers of budgetary and macroeconomic

¹⁰ This section follows on from the relevant section of last year's issue of Analyses and describes the situation as of 19 October 2012.

¹¹ The Commission's priorities are pursuing differentiated, growth-friendly fiscal consolidation, restoring normal lending to the economy, promoting growth and competitiveness, tackling unemployment and the social consequences of the crisis, and modernising public administration.

¹² Specifically, those Member States which have more fiscal room are now being encouraged to make use of this room in economic bad times and not to try to stick to the deficit and debt-cutting path at any cost.

¹³ The Eurogroup (which acquired legal personality upon the adoption of the Lisbon Treaty) consists of euro area finance ministers. Preparatory meetings are held at lower working levels in the same format.

¹⁴ The remaining recommendations include, for example, bringing forward the implementation of the directive on national budgetary frameworks to the end of 2012 and further strengthening fiscal governance, in particular by introducing rules for balanced budgets in structural terms and automatic correction mechanisms into national legislation. Euro area countries are also supposed to take action to improve the functioning and stability of the financial system and accelerate the steps towards a more integrated financial architecture, comprising joint supranational banking supervision and cross-border crisis resolution.

surveillance of euro area countries in difficulty. The European Parliament submitted several major revisions within the ordinary legislative procedure in June, so the two legislative proposals are still under negotiation.

The **Treaty on Stability, Coordination and Governance** (TSCG) was signed at the March meeting of the European Council. The treaty was concluded outside the framework of the treaties establishing the EU, but its provisions are to be incorporated into EU law within five years after the treaty's entry into force. The TSCG includes a requirement for budgets to be in balance or in surplus. States will be obliged to incorporate the balanced budget rule into their national legal systems, preferably at constitutional level, and will face financial sanctions for incorrect or incomplete transposition. The EU Court of Justice will (be able to) verify compliance with this obligation. The TSCG also requires the parties to report their public debt issuance plans to the European Commission and the Council and to coordinate major economic policy reforms with EU institutions.¹⁵ Although the TSCG is intended primarily for euro area countries, other EU countries can sign it as well. It will be binding on them only upon euro adoption, unless they decide to implement (individual provisions of) the treaty at an earlier date. The TSCG will enter into force once it has been ratified by at least 12 euro area Member States, which is expected to happen by the end of 2012. It was not signed by the United Kingdom and the Czech Republic, but it will be open to accession by both countries at a later date.

At the June European Council, the Presidents of the European Council, the European Commission, the Eurogroup and the European Central Bank submitted a report on ways of improving the functioning of the euro area as a "**genuine Economic and Monetary Union (EMU)**". The report contains four key building blocks: an integrated financial framework (the "banking union", an integrated budgetary framework, an integrated economic policy framework, and strengthened democratic legitimacy and accountability. According to the report, centralised multinational supervision (probably headed by the ECB) should be strengthened in the future, to the detriment of national supervisors, and the deposit insurance system in the euro area should be unified and centralised. The ESM should also be allowed to be involved in direct recapitalisation of banks. The October European Council confirmed the intention to proceed in this direction and called for the legislative framework for the proposals to be completed by the end of 2012 and implemented in the course of 2013.

The **rescue mechanisms for safeguarding the financial stability of the euro area** saw further development this year. A permanent euro area rescue facility, the ESM, started up in October (its launch had been dependent on a review by the German Constitutional Court, which ruled in September that the ESM and the aforementioned TSCG were not in contradiction with the German constitution). In the first phase, the overall lending capacity of the ESM together with the EFSF will be EUR 700 billion, of which EUR 200 billion comprises already approved liabilities of the EFSF. The decision-making within the ESM will be based on the weights of the contributions of the individual countries. The Eurogroup decided in July that the ESM will not have preference over other creditors in the event of bankruptcy of a debtor, as this would have an adverse effect on standard bonds. The ESM will be able to borrow in the markets and directly finance the recapitalisation of banks in difficulty (it will therefore not lend to the state in which the bank is located and thereby increase its debt). However, this is conditional on the creation of integrated banking supervision in the euro area. The two euro area rescue funds – ESM and EFSF – should be functioning fully in parallel for about one year. After July 2013, the EFSF will not participate in any new programmes (except for any agreed

¹⁵ The treaty also introduces more automatic implementation of the excessive deficit procedure (reverse qualified majority voting). Countries that are subject to an excessive deficit procedure will have to put in place a budgetary and economic partnership programme including a detailed description of structural reforms to ensure durable correction of the excessive deficit. These programmes will have to be submitted to the Council and the Commission for endorsement.

before this date) and will serve only to manage funds it has lent and finance existing loans (for Spain, Ireland and Portugal). Besides this, it had already been proposed at the December 2011 European Council that the EU should provide bilateral loans to the IMF within the framework of assistance granted to euro area countries. According to this requirement, the EU Member States should increase the IMF's funds by a total of EUR 200 billion.¹⁶

As regards **bailouts** of certain euro area countries, the following developments have occurred in 2012. A meeting of euro area finance ministers held at the start of July pledged to provide assistance of EUR 30 billion to **Spain** to rescue its banks. A subsequent review of the situation by the European Commission, the ECB and the IMF concluded that the assistance should be provided by the EFSF/ESM. According to expert estimates, the financing needs could run to EUR 100 billion. The agreed funds will be paid to the Spanish Fund for Orderly Bank Restructuring (FROB). The assistance will be conditional, among other things, on the implementation of reforms and restructuring in the financial services area. The IMF is expected to be involved in an advisory capacity only. The Eurogroup also agreed to extend the deadline for compliance with the 3% budget deficit limit in Spain by 12 months, i.e. to 2014.

After lengthy negotiations, representatives of the Troika (the ECB, the European Commission and the IMF) approved a second rescue package of EUR 130 billion for **Greece** at the start of 2012. In addition, the country managed to negotiate with private sector creditors an exchange of its existing bonds for new lower-value bonds (private sector involvement – PSI). This means a de facto financial loss for investors of about 70% of the value of the bonds. The main rating agencies responded to the debt swap by downgrading Greece's rating to selective default. The new Greek government resulting from early parliamentary elections in June announced its intention to keep the euro in Greece and immediately opened negotiations with European institutions to ease the conditions of the current rescue programme.

The progress of the economic adjustment programmes of the other countries that have received EU assistance, i.e. **Ireland and Portugal**, can be assessed as positive. In recent months and weeks, by contrast, there have been signals that **Cyprus** (strongly affected by the situation in Greece) is having problems repaying its general government debt, and the Eurogroup has promised to help. Similar problems are also possible in **Slovenia**. Investors have also been closely monitoring events in **Italy** for some time now.

The above developments have also been reflected in the ratings of other euro area countries. In the first two months of this year, Standard & Poor's and Moody's reacted to the still unfavourable debt situation in Europe by **downgrading their ratings of euro area countries**.¹⁷ Then, at the end of July, Moody's decreased its rating outlooks for Germany, the Netherlands and Luxembourg to negative. Standard & Poor's lowered Spain's rating by a further two notches in October. This was mainly due to growing uncertainty about the resolution of the euro area debt crisis and the related additional potential financial demands on its core countries. The amount of assistance needed could increase significantly, especially given the size of Spain and Italy. Moreover, according to Moody's, German banks weakened by the current economic situation have only a limited ability to absorb further financial losses associated with their relatively large exposures to the indebted South European countries.

In addition to the aforementioned steps taken by euro area countries and EU institutions, the **policy of the European Central Bank** (ECB) has played an important role in the response to the continuing debt crisis in the euro area in the last year. The ECB has continued to pursue an accommodative monetary policy in 2012 by lowering interest rates (the key rate to 0.75%),

¹⁶ A bilateral loan of EUR 3.34 billion was initially set for the Czech Republic. Following a detailed analysis, the government approved a bilateral loan to the IMF of EUR 1.5 billion.

¹⁷ Both agencies cut their ratings of Italy, Malta, Portugal, Slovakia, Slovenia and Spain; S&P also downgraded its ratings of France and Austria and changed its outlook for the other euro area countries to negative. The EFSF's rating subsequently worsened as well.

relaxing its requirements for collateral accepted against the loans it provides to commercial banks, and conducting liquidity-providing longer-term refinancing operations.¹⁸ In September the ECB decided to introduce a new programme of Eurosystem purchases in secondary government bond markets (outright monetary transactions, OMTs). These measures are aimed at easing financial market tensions, tackling the expected economic downturn in the euro area this year and preventing a reduction in the flow of credit to the euro area economy. However, purchases of bonds of countries with excessive debt problems may have a significant adverse effect on the quality of the ECB's balance sheet and pose a risk of pressure to increase its capital in the future.

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 create an adequate crisis resolution mechanism. At the end of 2011, the European Council agreed to increase the Core Tier 1 capital ratios of the 71 largest banking groups in EU countries (including those to which the largest Czech banks belong) to 9%, including provisions for losses arising from holdings of government bonds of countries with debt problems. In a joint effort coordinated by the European Banking Authority (EBA), banking groups were supposed to comply with this new requirement by June 2012 in a manner which would not lead to excessive restriction of the general availability of loans. To ensure that the private sector would be involved in the resolution of potential future problems in banks, the European Commission presented a draft directive establishing a framework for the recovery and resolution of banks and investment firms (the Crisis Management Directive, CMD). The Capital Requirements Directive (CRD IV) and the relevant regulation of the European Commission (CRR) transposing Basel III into European law will be gradually implemented from 2013 onwards.

3 CONCLUSION

The continuing process of changing the institutional architecture of the euro area is changing the economic benefits and costs of the Czech Republic's membership of this monetary union. There is no doubt that the euro area is now at a crossroads and its future direction is not entirely clear.

The recent proposals by top EU and euro area representatives for quite a radical change in the political, economic and financial set-up of the euro area towards deeper economic integration going far beyond the present framework (see, for example, the plan to create a "genuine EMU") are, however, problematic from the Czech Republic's point of view. Some aspects of the proposed banking union are disadvantageous for the Czech Republic. The proposed changes in the set-up of the European banking system are not just euro area matters. Given the cross-border links within banking groups, the principles of functioning of the internal market of the EU as a whole, which should remain a long-term priority, could be disrupted. Direct recapitalisation of financial institutions from ESM funds may mean the removal of the main lever motivating the governments of EU Member States to undertake structural reforms to stabilise their economies. This solution may ultimately lead to a further increase in the risk of moral hazard. Direct recapitalisation of banks might also weaken the pressure on poorly managed banks to restructure their liabilities and take other necessary recovery steps. The Czech Republic also views the potential unification of the deposit insurance system as problematic, as it would give rise to a risk of transmission of the consequences of irresponsible behaviour from risky regions or banks to responsible entities.

¹⁸ Two three-year refinancing operations (LTROs) totalling EUR 1 trillion were conducted in December 2011 and February 2012. A three-year liquidity-providing operation conducted at the start of March amounted to EUR 529 billion in gross terms. The ECB then decided to continue its three-month liquidity-providing operations at a fixed rate and with full allotment.

The assessment of the situation in the euro area from the perspective of the Czech Republic's future entry cannot be clear-cut at present, as it will take some time to evaluate the impacts of the measures taken, and the fact that new reform steps are constantly being added may make it more difficult to identify the effects of each measure.¹⁹ However, one can sum up that, on the one hand, concrete steps continue to be taken to resolve problem areas, and this should lead to a desirable improvement in the economic performance and functioning of the euro area. On the other hand, though, the measures being adopted imply a sizeable increase in the (potential) financial costs associated with adopting the euro overall. The heavy new workload is making economic policy coordination in the EU more difficult from the organisational point of view, and the demands on national and EU resources are increasing.

It does not seem that the euro area reform process is over yet, and so other major proposals, or the elaboration of existing ones, can be expected. The considerable uncertainty about the future form of the basic economic, political and institutional architecture of the euro area is still a major obstacle to assessing the benefits and costs to the Czech Republic of joining the euro area. Moreover, this uncertainty has increased further compared to last year.

¹⁹ A quantitative assessment of the impact of structural reforms on economic growth (Babecký and Campos, 2011; Babecký and Havránek, 2012) shows the importance of maintaining a time gap, without which it is impossible to identify the significant positive 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 the similarity of two economies. A low degree of real convergence with the euro area may indicate numerous challenges as regards euro adoption, as has been confirmed by the developments in the monetary union countries in the last few years. The real convergence process is often associated with convergence of price levels 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 economic policies that will move the economy away from equilibrium.²⁰ 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 real 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 of many converging economies with fixed exchange rates in recent years shows, they can contribute to creating major macro-financial imbalances (Ahrend et al., 2008; Taylor, 2009; Martin, 2010).

²⁰ 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 – may be willing to 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.

As Table 1 shows, the convergence process of **GDP per capita at purchasing power parity** has not renewed yet. The level of Czech economic activity has thus been close to 75% of the euro area average since the outbreak of the global financial and economic crisis and the subsequent debt crisis. It is therefore still comparable with the least advanced countries of the monetary union,²¹ some of which, however, have been facing serious economic problems in recent years. Portugal, Slovenia and Slovakia are the most similar to the Czech Republic in terms of this indicator. It also still holds true that the Czech Republic has higher GDP per capita 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)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CZ	66.1	69.7	71.6	72.7	73.3	76.1	74.3	75.7	73.5	73.8
AT	114.5	116.2	117.4	115.1	115.5	113.6	114.3	114.9	116.7	119.6
DE	103.1	105.3	105.9	106.1	105.8	106.3	106.6	106.7	109.1	111.1
PT	72.2	71.9	70.8	73.1	72.5	72.1	71.7	73.7	73.9	72.0
HU	55.1	57.0	57.6	58.0	57.8	56.6	58.8	59.6	59.8	61.3
PL	43.6	44.3	46.6	46.9	47.7	50.0	51.8	56.1	58.0	60.5
SI	74.4	75.9	79.7	80.0	80.2	81.3	83.5	80.4	78.4	77.5
SK	48.9	50.4	52.1	55.1	58.1	62.1	66.5	66.7	67.8	67.9

Source: Eurostat, CNB calculations.

Table 2 illustrates the **price level of GDP**. The long-term convergence in this indicator has renewed in the last two years after being temporarily halted by exchange rate depreciation in 2008 H2 and 2009. Despite this, the Czech price level in 2011 still lagged well behind not only Austria and Germany, but also Portugal and Slovenia. By contrast, Slovakia, and particularly Hungary and Poland, had a lower price level in 2011.

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

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CZ	53.6	50.5	51.5	56.0	59.6	61.0	70.8	66.0	69.7	70.4
AT	103.4	101.4	100.5	103.3	103.1	105.3	105.6	106.1	105.8	105.8
DE	108.7	105.1	103.0	101.1	100.9	100.9	100.6	100.9	100.6	100.1
PT	81.8	80.9	82.3	79.8	79.7	80.2	80.4	79.7	79.3	79.0
HU	54.5	54.5	57.7	60.4	58.5	63.4	63.8	56.7	58.6	58.4
PL	54.7	47.9	47.2	54.1	57.0	59.2	65.5	54.0	58.0	56.7
SI	72.0	72.2	70.4	71.3	73.2	76.4	78.6	79.9	79.7	79.1
SK	43.0	46.2	49.6	51.5	54.0	59.1	63.7	64.4	64.6	66.0

Source: Eurostat, CNB calculations.

An analysis of the empirical relationship between the price level of GDP and GDP per capita at purchasing power parity for 36 European countries (see the *Methodological Part*) reveals that the Czech price level in 2011 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 7 percentage points higher in relation to the euro area price level. However, this deviation is smaller than in the past.

²¹ Except for Estonia, which entered the euro area in 2011 and, with GDP per capita at purchasing power parity of 62% of the euro area average, is clearly less advanced than the Czech Republic.

Table 3 presents the **evolution of the real exchange rate** vis-à-vis the euro. Between 2002 and 2011, the real exchange rate of the koruna appreciated by more than 25%, i.e. at an average rate of 2.6% 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.²² The Hungarian forint appreciated less in real terms than the Czech koruna, while the Polish zloty was roughly flat in real terms.

Table 3: Real exchange rate against the euro (HICP deflated; 2002 = 100; average annual rate in %)

	Basic index									Avg. annual rate	
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2002-2011	Outlook ^{a)}
CZ	95	95	101	106	109	125	118	123	126	2.6	(1.6 ; 2.1)
AT	99	99	99	98	98	98	98	99	99	-0.1	(0.4 ; 1.4)
DE	99	99	98	98	98	98	97	97	97	-0.4	(0.7 ; 1.2)
PT	101	101	101	102	102	102	101	100	101	0.1	(0.0 ; 0.2)
HU	98	103	106	102	113	116	108	113	113	1.3	(2.4 ; 3.2)
PL	86	85	96	98	101	110	93	102	100	-0.1	(3.1 ; 4.1)
SI	100	99	99	100	101	103	104	104	104	0.4	(0.9 ; 1.1)
SK	109	119	124	131	145	157	164	163	165	5.7	(1.6 ; 2.1)

Note: a) Interval estimate of the average rate of equilibrium real appreciation for the next five years (see the *Methodological Part*).

Source: Eurostat, CNB calculations.

The real exchange rate displays significant fluctuations around its long-run appreciation trend. Some of these fluctuations may generate macroeconomic shocks (such as the two episodes of sharp appreciation of the Czech koruna in 1998 and in 2001–2002; see Šmídková, ed., 2008), while others may help to absorb them, as in the case of the koruna exchange rate since 2007.

According to numerous studies,²³ continued equilibrium real appreciation can be expected for the currencies of the converging countries. 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 1.6–2.1% and is higher than for most current euro area members. Only the estimates for Slovakia are the same as those for the Czech Republic. For countries outside the euro area, i.e. Hungary and Poland, the estimates are higher than those for the Czech koruna, reflecting their lower GDP per capita and stronger nominal and real depreciation of their currencies in recent years. The above range corresponds to the average inflation differential vis-à-vis the euro area which could be expected in the Czech Republic if the euro were to be adopted within the next five years. Assuming average euro area inflation of 2%, inflation in the Czech Republic could therefore increase to about 3.6–4.1% during the initial years following euro area entry. 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 to some extent can be viewed as a proxy for equilibrium rates).

²² The price levels of Germany and Austria are thus below the level corresponding to their GDP per capita in international comparison. For this reason, the estimates presented in Table 3 predict 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 now undergo a price and wage adjustment process. One such example among the countries under review is Portugal, whose price level is above the level corresponding to its GDP per capita and whose outlook thus does not suggest any real appreciation.

²³ For example, Cihák and Holub (2003; 2005). For more details, see the *Methodological Part*.

Short-term real money market interest rates could be even negative in the Czech Republic and in the other converging countries. In the Czech Republic, the real three-month²⁴ interest rate would be -0.3–0.2% on average. On the other hand, the Czech Republic has had low real rates since 2004, so euro adoption would not generate a strong economic shock in this respect.

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

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average ^{a)}	Outlook ^{b)}
CZ	2.1	2.3	-0.2	0.4	0.2	0.1	-2.1	1.6	0.1	-0.9	0.4	(-0.3 ; 0.2)
AT	1.6	1.0	0.2	0.1	1.4	2.0	1.4	0.8	-0.9	-2.1	0.5	(0.4 ; 1.1)
DE	1.9	1.3	0.3	0.3	1.3	2.0	1.8	1.0	-0.3	-1.1	0.8	(0.6 ; 1.1)
PT	-0.3	-0.9	-0.4	0.1	0.0	1.8	1.9	2.1	-0.6	-2.1	0.2	(1.6 ; 1.8)
HU	3.8	3.7	4.3	3.6	2.8	0.0	2.5	5.0	1.4	2.5	3.0	(-1.4 ; -0.6)
PL	6.9	4.9	2.5	3.0	2.9	2.1	2.1	0.4	1.2	0.6	2.7	(-2.3 ; -1.3)
SI	0.5	1.0	1.0	1.5	1.0	0.5	-0.9	0.4	-1.3	-0.7	0.3	(0.7 ; 0.9)
SK	4.1	-2.1	-2.6	0.1	0.1	2.4	0.2	0.3	0.1	-2.6	0.0	(-0.3 ; 0.2)

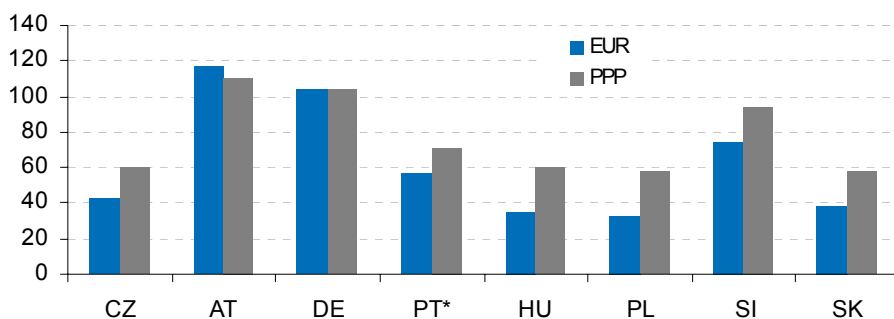
Notes: ^{a)} Average for 2002–2011.

^{b)} Estimated “equilibrium” 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 a zero money market risk premium and an equilibrium real interest rate in the euro area of 1.8%.

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 2011. The purchasing power of wages on the domestic market is described by the purchasing power parity (PPP) indicator, while the euro data converted using the market exchange rate reveal the external purchasing power and wage competitiveness of the economy. The chart shows a persisting large difference between the average wage level in the euro area as a whole and in Germany and Austria (and partly in Slovenia) 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 40% of the average euro area wage level when converted using the exchange rate (compared to 27% in 2002) and roughly 60% using purchasing power parity data (up from 51% in 2002). Similar data apply to Hungary, Poland and Slovakia, particularly in the PPP-based comparison. 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.

²⁴ 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*).

Chart 10: Average annual wage in 2011 (EA-17 = 100)

Notes: * Data for Portugal are for 2009.

Source: Eurostat, 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, convergence of the price level renewed in 2010–2011. Going forward, there is still 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, due to higher inflation and low or even negative real interest rates.

1.1.2 Correlation of economic activity

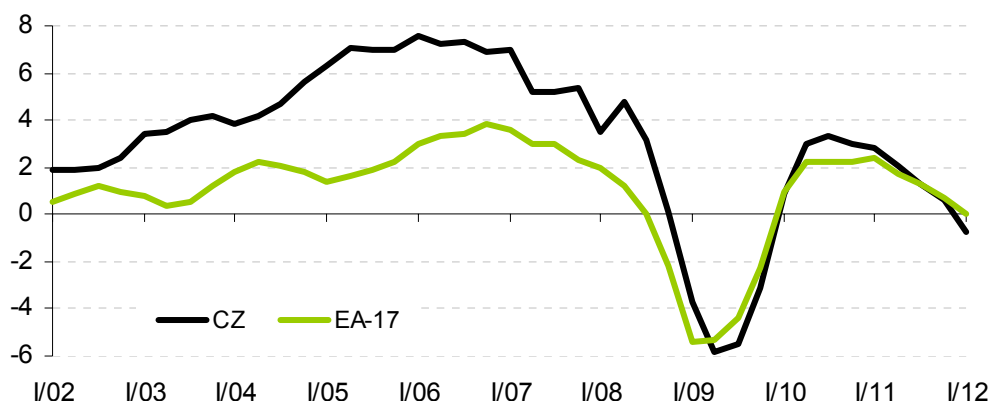
Upon euro area entry, domestic monetary policy decision-making independence will be replaced by the implementation of a single monetary policy responding to economic developments at the monetary union level. For a country that is in a different phase of the business cycle than the euro area average,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

To measure the cyclical alignment of economic activity in the selected countries 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 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 collapse of US investment bank Lehman Brothers. This event is referred to as the start of the global financial crisis. The division into these two periods was motivated by the possibility of isolating the effect of the financial crisis. Supplementary information on the time development of the correlation of economic activity is provided by an analysis of the correlation in moving five-year time periods (rolling correlation). The analysis deals first with the overall economic activity of the countries under review as characterised 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. 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 growth 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. In approximately mid-2009, both the Czech economy and the euro area started recovering gradually, with annual growth turning positive in both economies in 2010. Then, starting 2011, economic growth in both economies slowed again levelled in 2012. This was due to the effects of the next phase of the financial crisis in the form of debt problems in some euro area countries.

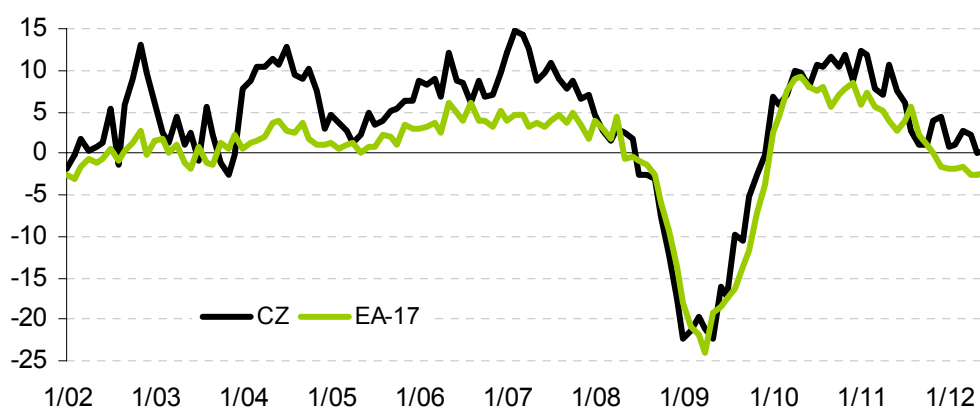
Chart 12 illustrates the annual changes in the **industrial production index** of the Czech Republic and the euro area. This chart also indicates the strong effect that the concurrent recession, subsequent recovery and renewed slowdown in both economies has recently had on the measured correlation.

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



Source: Eurostat, CNB calculations.

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



Source: Eurostat, CNB calculations.

Table 5 summarises the results of the **simple correlation analysis** for GDP and the IPI.²⁵ In the first period the correlation of Czech and euro area GDP shows statistically significant values of 0.6–0.7 according to both methods. The values for the second period increased further, to around 0.8–0.9. The increase in correlation can be attributed to some extent to rising cyclical alignment, but in the second period the significant effect of the common negative shock should be taken into account. This shock was reflected in a sharp economic slump and subsequent recovery, which was again followed by a downswing in economic activity. The correlation coefficients for all the countries under review increased substantially in the second period. Statistically significant and relatively high GDP growth correlations in the second period can thus now be identified for all the economies under review. In comparison with other countries, the correlations for the Czech Republic can be evaluated as slightly above average. Given the extremely strong global shocks in the recent past, which, from the Czech Republic's perspective, were predominantly external demand shocks, only in future years will it be possible to prove or disprove whether greater business cycle alignment has been achieved in normal global economic conditions.

Table 5: Correlation coefficients of economic activity

		2002Q1–2008Q2		2008Q3–2012Q1		2002M1–2008M6		2008M7–2012M6	
		GDP		GDP		IPI		IPI	
Method 1	CZ	0.70 **	(0.49 ; 0.84)	0.91 **	(0.79 ; 0.97)	0.67 **	(0.56 ; 0.77)	0.96 **	(0.94 ; 0.98)
	AT	0.82 **	(0.68 ; 0.91)	0.97 **	(0.91 ; 0.99)	0.76 **	(0.67 ; 0.83)	0.95 **	(0.91 ; 0.97)
	DE	0.93 **	(0.86 ; 0.96)	1.00 **	(0.99 ; 1.00)	0.92 **	(0.89 ; 0.95)	1.00 **	(0.99 ; 1.00)
	PT	0.62 **	(0.37 ; 0.79)	0.75 **	(0.47 ; 0.90)	0.37 **	(0.20 ; 0.52)	0.85 **	(0.76 ; 0.90)
	HU	-0.32	(-0.59 ; 0.02)	0.97 **	(0.91 ; 0.99)	0.54 **	(0.39 ; 0.66)	0.97 **	(0.94 ; 0.98)
	PL	0.68 **	(0.45 ; 0.82)	0.86 **	(0.66 ; 0.94)	0.54 **	(0.40 ; 0.66)	0.87 **	(0.79 ; 0.92)
	SI	0.81 **	(0.65 ; 0.90)	0.92 **	(0.80 ; 0.97)	0.58 **	(0.44 ; 0.69)	0.94 **	(0.90 ; 0.96)
	SK	0.61 **	(0.36 ; 0.79)	0.91 **	(0.79 ; 0.97)	0.40 **	(0.23 ; 0.55)	0.92 **	(0.86 ; 0.95)
Method 2	CZ	0.65 **	(0.41 ; 0.81)	0.83 **	(0.61 ; 0.93)	0.09	(-0.10 ; 0.28)	0.63 **	(0.46 ; 0.75)
	AT	0.50 **	(0.20 ; 0.71)	0.77 **	(0.49 ; 0.90)	0.23 **	(0.05 ; 0.40)	0.30 **	(0.06 ; 0.50)
	DE	0.82 **	(0.68 ; 0.91)	0.96 **	(0.90 ; 0.98)	0.51 **	(0.36 ; 0.64)	0.75 **	(0.63 ; 0.84)
	PT	0.77 **	(0.59 ; 0.88)	0.75 **	(0.46 ; 0.89)	0.43 **	(0.26 ; 0.57)	0.35 **	(0.12 ; 0.54)
	HU	0.11	(-0.23 ; 0.43)	0.83 **	(0.61 ; 0.93)	0.09	(-0.10 ; 0.27)	0.18	(-0.06 ; 0.40)
	PL	0.27	(-0.07 ; 0.55)	0.56 **	(0.16 ; 0.81)	0.46 **	(0.29 ; 0.59)	0.35 **	(0.12 ; 0.54)
	SI	0.49 **	(0.19 ; 0.71)	0.91 **	(0.79 ; 0.97)	0.15	(-0.04 ; 0.33)	0.36 **	(0.14 ; 0.56)
	SK	0.40 **	(0.08 ; 0.64)	0.81 **	(0.57 ; 0.92)	0.13	(-0.06 ; 0.31)	0.38 **	(0.15 ; 0.56)

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.

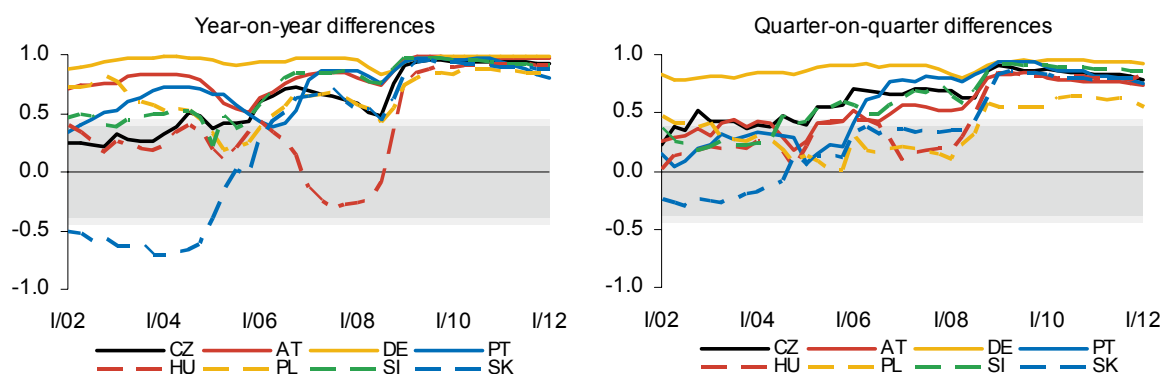
Under Method 1, the correlation analysis of the industrial production index signals an increase in the correlation between the periods under review for all countries, while under Method 2, shifts in both directions are recorded and the resulting correlations are lower for all countries compared to Method 1. This is due to greater volatility of the month-on-month data for the individual countries. Generally, however, the positive correlations in the second period are statistically significant in all the countries under review and according to both calculation methods,²⁶ with the exception of Hungary. The correlation of the industrial production indices of the Czech Republic and the euro area is among the highest in the second period.

²⁵ 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.

²⁶ 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

Chart 13 shows the **rolling correlations** of real GDP growth for the two methods. Under both methods used, the alignment has gradually increased over time. The positive correlation values have been statistically significant since 2006. In 2008, the correlation rose sharply owing to the global financial crisis and since 2009 has stayed at high levels.

Chart 13: Rolling correlations of economic activity

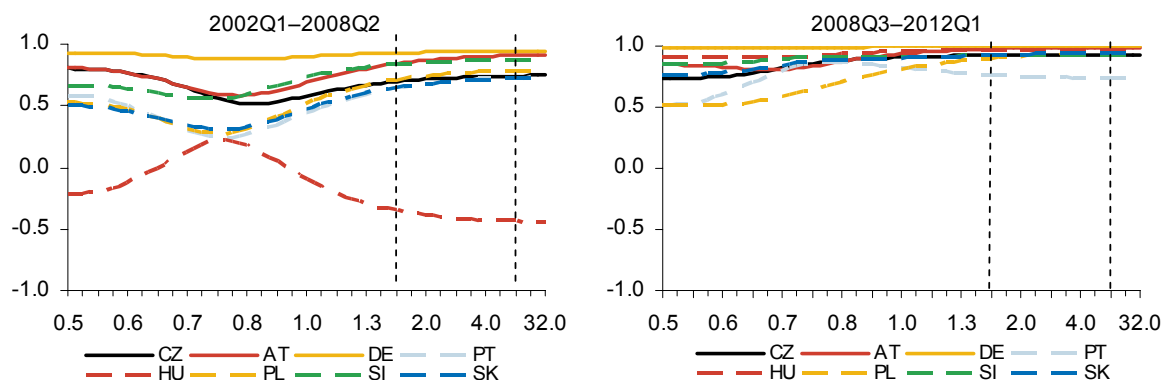


Note: The time data indicate the end of the rolling window of 5 years. The statistical significance of the correlation coefficients is indicated in the chart: values statistically significant at the 5% level lie in the white area of the chart, and values statistically significant at the 10% level lie in the white or 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, and to study the correlation in a given frequency band. 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 except Portugal, where the correlation was broadly flat at the frequency monitored.

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 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.

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, at about 0.8. The correlations of Czech exports to the euro area with euro area GDP are lower in the first period than in the second period according to both methods used. As with the previous indicators, however, a large part of the increase in the correlation of export performance in the second period under review 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

		2002M1–2008M6	2008M7–2012M4	2002Q1–2008Q2	2008Q3–2012Q1
		EXP _{TOTAL}	EXP _{TOTAL}	EXP _{to EA} vs. GDP _{EA}	EXP _{to EA} vs. GDP _{EA}
Method 1	CZ	0.77 ** (0.67 ; 0.83)	0.84 ** (0.74 ; 0.90)	0.39 * (0.06 ; 0.64)	0.97 ** (0.91 ; 0.99)
	AT	0.92 ** (0.89 ; 0.95)	0.95 ** (0.92 ; 0.97)	0.66 ** (0.42 ; 0.81)	0.99 ** (0.97 ; 0.99)
	DE	0.82 ** (0.75 ; 0.87)	0.95 ** (0.92 ; 0.97)	0.78 ** (0.61 ; 0.88)	0.99 ** (0.97 ; 1.00)
	PT	0.84 ** (0.78 ; 0.89)	0.91 ** (0.86 ; 0.95)	0.63 ** (0.37 ; 0.79)	0.97 ** (0.92 ; 0.99)
	HU	0.77 ** (0.68 ; 0.83)	0.69 ** (0.53 ; 0.80)	0.61 ** (0.35 ; 0.78)	0.89 ** (0.74 ; 0.96)
	PL	0.67 ** (0.55 ; 0.76)	0.61 ** (0.42 ; 0.74)	0.10 (-0.23 ; 0.42)	0.38 (-0.07 ; 0.71)
	SI	0.91 ** (0.87 ; 0.94)	0.87 ** (0.80 ; 0.92)	0.38 * (0.06 ; 0.63)	0.98 ** (0.94 ; 0.99)
	SK	0.59 ** (0.46 ; 0.70)	0.79 ** (0.67 ; 0.87)	0.31 (-0.02 ; 0.58)	0.97 ** (0.92 ; 0.99)
	Method 2	CZ	0.82 ** (0.75 ; 0.88)	0.82 ** (0.73 ; 0.89)	0.36 * (0.03 ; 0.62)
AT		0.91 ** (0.87 ; 0.94)	0.93 ** (0.89 ; 0.96)	0.47 ** (0.16 ; 0.69)	0.87 ** (0.69 ; 0.95)
DE		0.82 ** (0.75 ; 0.87)	0.95 ** (0.93 ; 0.97)	0.34 * (0.02 ; 0.61)	0.94 ** (0.85 ; 0.98)
PT		0.87 ** (0.81 ; 0.91)	0.80 ** (0.69 ; 0.88)	0.20 (-0.14 ; 0.50)	0.69 ** (0.36 ; 0.87)
HU		0.81 ** (0.73 ; 0.87)	0.59 ** (0.40 ; 0.73)	0.61 ** (0.35 ; 0.78)	0.68 ** (0.34 ; 0.86)
PL		0.70 ** (0.59 ; 0.78)	0.43 ** (0.21 ; 0.61)	0.29 (-0.04 ; 0.57)	-0.10 (-0.52 ; 0.36)
SI		0.87 ** (0.81 ; 0.91)	0.50 ** (0.29 ; 0.66)	0.24 (-0.10 ; 0.53)	0.73 ** (0.43 ; 0.89)
SK		0.68 ** (0.57 ; 0.77)	0.79 ** (0.67 ; 0.86)	0.06 (-0.28 ; 0.38)	0.74 ** (0.44 ; 0.89)

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 increased significantly in the recent period. 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. The cyclical alignment of economic activity, however, has been greatly affected by the recent extremely strong global shocks. The very high alignment of business cycles can therefore not be considered definitive. It remains to be seen whether the correlations will return to pre-crisis, less high values as the extreme shocks dissipate.

1.1.3 Analysis of cyclical alignment using the Taylor rule

Sufficient cyclical alignment is one of the conditions for successful functioning of a member country's economy in a monetary union. The pro-cyclicality of unified nominal interest rates is often discussed in this context. 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 growth rate. The opposite effect can be observed with an economy in the contractionary phase of the cycle with *ceteris paribus* lower inflation and higher real rates (see, for example, Björkstén and Syrjänen, 1999).

Potential differences in the cyclical positions of monetary union countries can be analysed using implied monetary policy rates estimated based on the Taylor rule.²⁷ The difference of the implied rate of a specific country from the implied rate for the entire euro area (see the *Methodological Part* for details) is shown in Table 7. The difference in the implied rate has generally been decreasing for all the countries under review over the last ten years – except 2007–2008 – as has the gap between the old euro area countries (Germany, Portugal and Austria) on one side and the new euro area countries (Slovakia and Slovenia) or candidate countries, including the Czech Republic, on the other. In the latest period under review, the indicator for some countries (the Czech Republic, Austria, Portugal, Slovenia and Slovakia) increased modestly.

In 2002–2006, this indicator decreased significantly in the Czech Republic and was one of the lower ones among the new EU member countries. In 2007–2008, however, it increased as a result of faster domestic economic growth and inflation shocks recorded particularly in 2008. In this period, alignment also decreased in some of the other new member countries under comparison. In the period since the start of 2009 the indicator has fallen again in the Czech Republic, as the crisis has had similar impacts in the euro area and the Czech Republic.

Table 7: Taylor rule indicator of interest rate alignment

	2002Q1	2004Q1	2006Q1	2008Q1	2010Q1	2011Q1
CZ	7.0	4.1	0.4	22.7	0.6	1.2
AT	0.5	1.5	0.6	0.1	0.1	1.3
DE	0.9	1.2	0.5	0.3	0.5	0.2
PT	7.5	0.6	0.6	1.3	0.7	1.2
HU	35.4	44.3	6.8	32.2	32.3	5.7
PL	3.1	4.5	3.8	0.8	22.6	1.6
SI	64.9	10.2	0.2	30.2	0.4	1.9
SK	20.6	82.3	5.2	3.2	1.8	2.1

Note: A smaller value means greater alignment; calculated using moving averages with a period length of two quarters before and after the given quarter.

Source: Eurostat, CNB calculations.

To sum up, the Taylor rule gives relatively similar results for the Czech Republic and the euro area, pointing to relatively high cyclical alignment. As in the case of the correlation of economic activity, however, 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.²⁸ However, there is no consensus on the effect of demand and supply shocks. While insufficient symmetry of demand shocks is a general argument against joining a single currency area, the literature does not provide a unanimous opinion on the need for alignment of supply shocks.

²⁷ The Taylor rule (Taylor, 1993) is a simple but relatively robust form of the central bank's reaction function. It is a backward-looking rule which can be interpreted as an overall indicator 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.

²⁸ For example, Frankel and Rose (1998).

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, and supply shocks, i.e. shocks with a long-term effect on GDP growth accompanied by opposite movement of inflation.²⁹ The analysis draws on quarterly estimates of economic shocks for 2002 Q1–2012 Q1. To compare the synchronisation of economic shocks over time, the periods 2002 Q1–2008 Q2 and 2008 Q3–2012 Q1 are also assessed separately. The correlation of the shocks can take values in the range [-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.

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 is statistically insignificant in both periods. The risk due to demand shock asymmetry for the Czech Republic is thus comparable with the other countries under review, as their correlations (except for Germany in the period 2002–2008 Q2) do not take on statistically significantly positive values either.

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

	2002–2008Q2	2008Q3–2012
CZ	-0.03	-0.05
AT	-0.01	0.02
DE	0.61 ***	-0.28
PT	0.10	-0.12
HU	-0.11	0.40
PL	-0.03	-0.30
SI	0.18	0.24
SK	0.03	0.40

Note: The significance of the correlation coefficient is marked *** for the 1% significance level.

Source: Eurostat, CNB calculations.

As regards **supply shocks** (see Table 9), the correlation for 2008 Q3–2012 is positive and statistically significant for all the countries under review except Austria and Poland. Compared to the previous period, most of these countries have seen shifts towards higher alignment of supply shocks with the euro area. By contrast, asymmetry of supply shocks is identified for Austria and Poland. The correlation coefficients for these countries are negative and statistically significant. For Austria, statistical significance also applies for the other period under review. The measured correlation of the supply shocks of the Czech Republic with the euro area changed from a statistically insignificant value of 0.05 for 2002–2008 Q2 to a positive and statistically significant value of 0.80 for 2008 Q3–2012.

²⁹ The analysis used identifies economic shocks using econometric methods and does not ascribe specific structural interpretations to them, for example their source or form. In reality, a demand shock, which should have a temporary effect on GDP growth (e.g. the recent decline in economic activity), may be identified as a supply shock.

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

	2002–2008Q2	2008Q3–2012
CZ	0.05	0.80 ***
AT	-0.44 **	-0.57 **
DE	0.76 ***	0.93 ***
PT	0.40 **	0.60 **
HU	0.36 *	0.62 **
PL	-0.35 *	-0.42
SI	0.33	0.96 ***
SK	0.14	0.58 **

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

Source: Eurostat, CNB calculations.

According to the results of the analysis, therefore, the Czech economy faces demand shocks which do not correlate with shocks in the euro area, whereas the supply shocks identified by the model have been similar in recent years. However, this is because the contraction in economic activity during the current crisis – given its long duration – is interpreted in the analysis as a supply shock (whereas in reality it was largely a significant demand shock). Overall, the Czech Republic's results are comparable overall to those in most of the countries under review. Based on this analysis, therefore, the implications for the appropriateness of adopting the euro are not clear.

1.1.5 Structural similarity of the economies

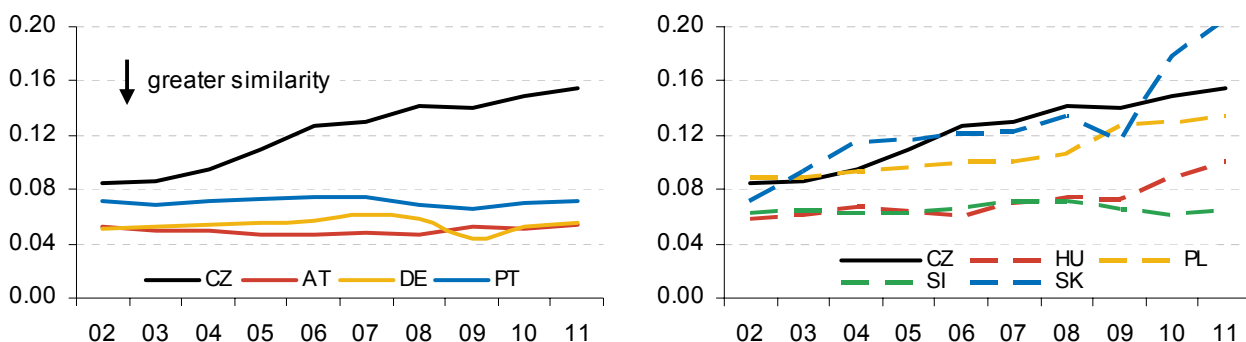
Greater similarity of the structure of economic activity between the acceding economy and the other economies of the monetary union reduces the risk of occurrence of an asymmetric shock. The structural similarity of the economies of the countries under comparison with the euro area can be measured using the Landesmann structural coefficient, which compares the shares of the ten 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 [0, 1]. The closer the coefficient is to zero, the more similar is the structure of the economies under comparison. Chart 15 shows that the Landesmann coefficient is relatively high for the Czech Republic throughout 2002–2010 and is increasing over time. The largest increase in structural differences between the Czech Republic and the euro area was recorded in 2003–2008. A return to a rising path can be observed in 2010. In 2011 (as in previous years), the structure of economic activity in the Czech Republic, together with Slovakia, was therefore the least similar to the euro area average of all the countries compared. The difference in the structure of value added in both the Czech and Slovak economies consists mainly in a high share of value added in industry³⁰ and in a slightly lower share in services (sectors K–U).

The share of industry in the Slovak economy increased from 29% in 2009 to a record 40% last year (see Chart 16), thus exceeding the share of industry in the Czech Republic (37%), which traditionally used to be the highest of the countries under comparison. Manufacture of motor vehicles, refinery products, basic metals and machinery rose the most in 2010 and also

³⁰ 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).

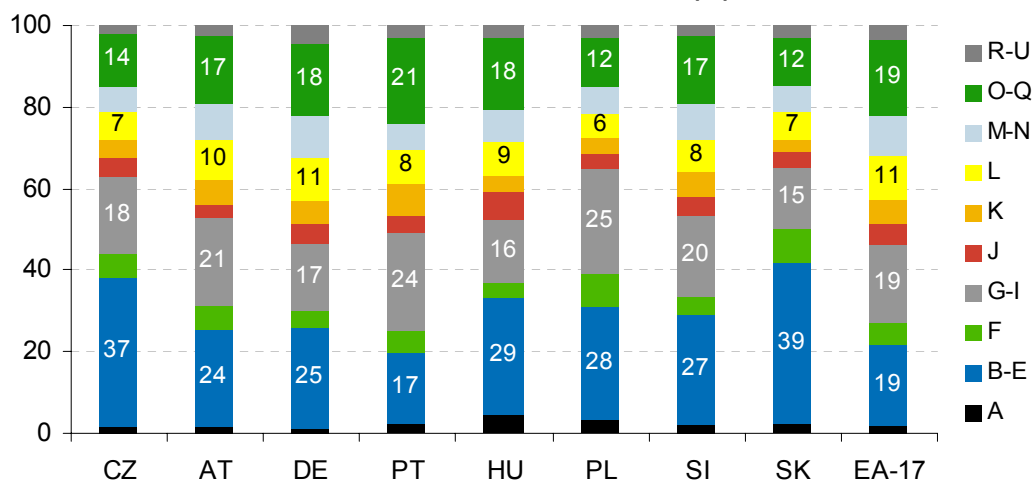
contributed significantly to total growth in value added.³¹ The share of industry in Slovakia is currently the highest of all the economies under review. This explains why this country has the highest Landesmann index values.

Chart 15: Structural similarity vis-à-vis the euro area



Source: Eurostat, CNB calculations.

Chart 16: Shares of economic sectors in GDP in 2011 (%)



Note: The sectors are broken down according to the NACE Rev2 classification: A – Agriculture, forestry and fishing, B–E – Industry (except construction), F – Construction, G–I – Wholesale and retail trade, transport, accommodation and food service activities, J – Information and communication, K – Financial and insurance activities, L – Real estate activities, M–N – Professional, scientific and technical activities; administrative and support service activities, O–Q – Public administration, defence, education, human health and social work activities, R–U – Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organisations and bodies.

Source: Eurostat, CNB calculations.

1.1.6 Interest rate convergence

Some countries entering the euro area faced fast nominal interest rate convergence³² to the Union level, which acted as an asymmetric shock manifesting itself mainly in the emergence of property market bubbles and weaker fiscal discipline. Earlier nominal interest rate convergence – gradual and based on fundamentals – is thus better for smoother accession to the euro area,

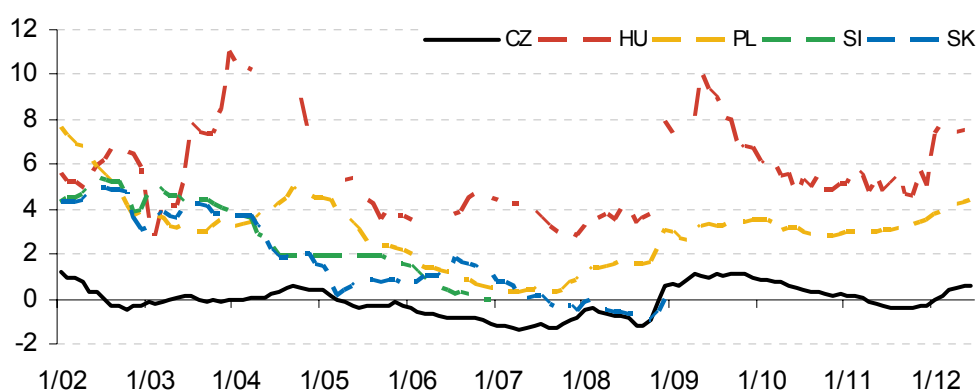
³¹ Detailed data for 2011 are not yet available.

³² 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).

as it will not leave room for the additional asymmetric shock associated with euro adoption and sudden elimination of the risk premium.³³

The following comparison of the **nominal interest rate differential** vis-à-vis the euro area/Germany³⁴ 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 effect on the economy.

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



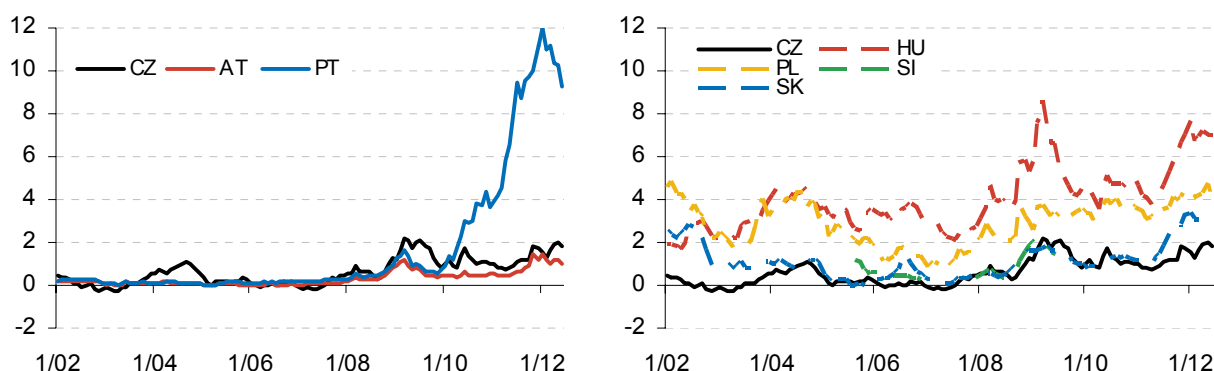
Source: Eurostat, CNB calculations.

Chart 17 shows that short-term interest rate convergence proceeded more or less continuously for all the countries under comparison until 2008 Q3. The differences in interest rates vis-à-vis the euro area started to grow again following the escalation of the global financial crisis, 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 at around 5 p.p. in Hungary and 3 p.p. in Poland. Monetary policy in these two countries fostered renewed growth in their differentials in 2012 H1. In the Czech Republic, short-term interest rate differentials were fairly close to zero throughout the period and even turned negative in 2005–2008 and again in 2011. Growth in short-term interest rates in 2012 H1 was also observed in the Czech Republic, although in this case the differential increased to only 0.55 p.p. in June 2012.

The interest rate differentials for ten-year government bonds are shown in Chart 18. For Central European countries, long-term interest rate differentials show convergence until 2008 Q3, large fluctuations during 2009, greater stability in 2010–2011 and a subsequent slight increase in late 2011. The interest rate differential for Czech ten-year government bonds fluctuated around zero between 2005 and 2008, but has been within a range of 1–2 p.p. since 2009. Long-term rates in the Czech Republic thus remain closest to Germany's values among the non-euro area countries under comparison.

³³ See also section 1.1.1.

³⁴ The euro area average is used as the reference rate for short-term rates. German bond values are used for long-term rates. The long-term rates of some euro area countries have been showing extreme values in recent years, so the euro area average influenced by such countries cannot be considered a suitable benchmark.

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

Source: Eurostat, CNB calculations.

To sum up, Czech nominal interest rates have long been close to rates in stable euro area countries 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 sustainable.

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 reference currency can thus be an indicator that the two countries could share a single currency.³⁵ 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) on the one hand and the euro on the other hand 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 19 plots the correlation coefficients in the new EU member countries under review. The Czech koruna and the Hungarian forint recorded rising correlation coefficient volatility in the period of escalation of the financial crisis, while the volatility of the correlation between the Polish zloty and the euro fell slightly. The correlation of the Czech koruna and the Polish zloty with the euro can be assessed as high in 2011–2012 (0.85–0.95 for the Czech Republic and 0.75–0.90 for Poland). Rather lower and more volatile correlation was recorded between the Hungarian forint and the euro, probably due to political events in that country. Uncertainty regarding the situation in Hungary in 2011 H2 generated negative sentiment which also affected the Czech koruna.

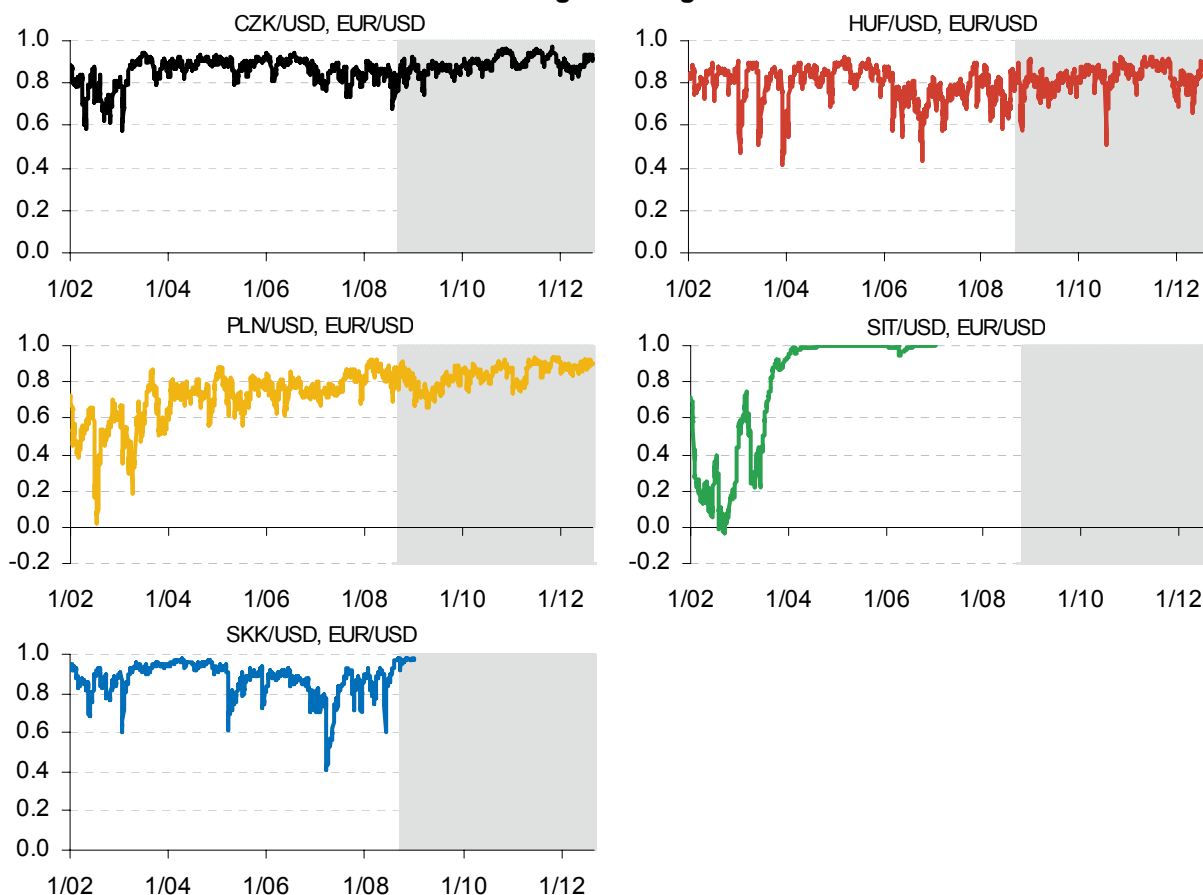
There is a difference in the convergence of the exchange rates of Slovenia and Slovakia during their past stays in ERM II. This difference chiefly reflects differences in their foreign exchange regimes and the fact that Slovakia continued to pursue inflation targeting after it joined ERM II (see NBS, 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 and the setting of the central rate helped keep the correlation at high levels.

To sum up, the relatively high correlation between the exchange rate of the Czech koruna against the dollar and the exchange rate of the euro against the dollar observed in recent

³⁵ See Aguilar and Hördahl (1998).

years suggests that the Czech currency responds to changes in the external environment outside the euro area similarly as the euro.

Chart 19: Correlation coefficients of exchange rates against the US dollar



Note: The grey colour of the background marks the period since the crisis began.

Source: Thomson Datastream, Eurostat, CNB calculations.

1.1.8 Analysis of exchange rate volatility

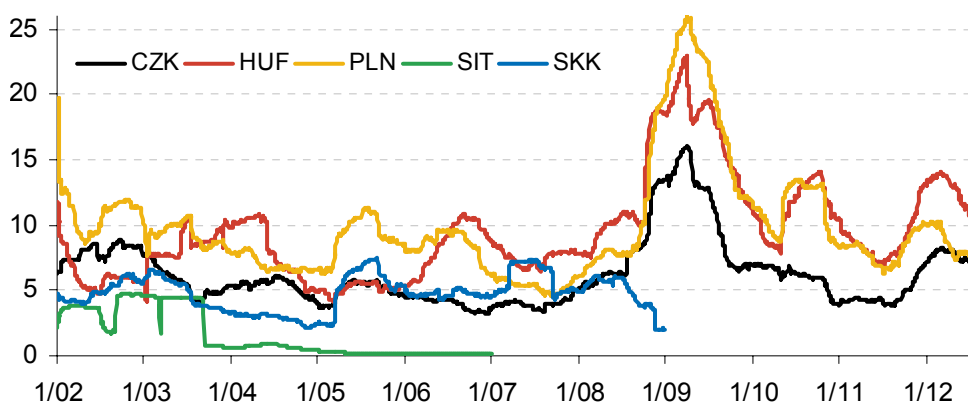
Another way of assessing the risk of occurrence of asymmetric shocks in the Czech economy vis-à-vis the euro area is to analyse exchange rate volatility. Low volatility of the exchange rate between two countries may be regarded, in the case of a floating exchange rate regime, as an indicator of their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

Chart 20 describes the historical volatility of selected countries' exchange rates vis-à-vis the euro between 2002 and 2012. 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 low volatility in the sample of countries under comparison.³⁶ 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

³⁶ The lowest volatility was recorded for the Slovenian tolar, whose daily changes were negligible owing to the exchange rate regime applied.

the Czech koruna was lower than that of the last-mentioned two currencies. Although the volatility of the exchange rates of all the currencies under review fell to pre-crisis levels in 2011 H1, it started to grow again in mid-2011 due to the escalation of the euro area debt crisis. The Czech koruna continued to show the lowest volatility among the currencies under review, but the differences in volatility between the Polish zloty and the Czech koruna have recently diminished significantly.

Chart 20: Historical volatility of exchange rates vis-à-vis the euro (%)

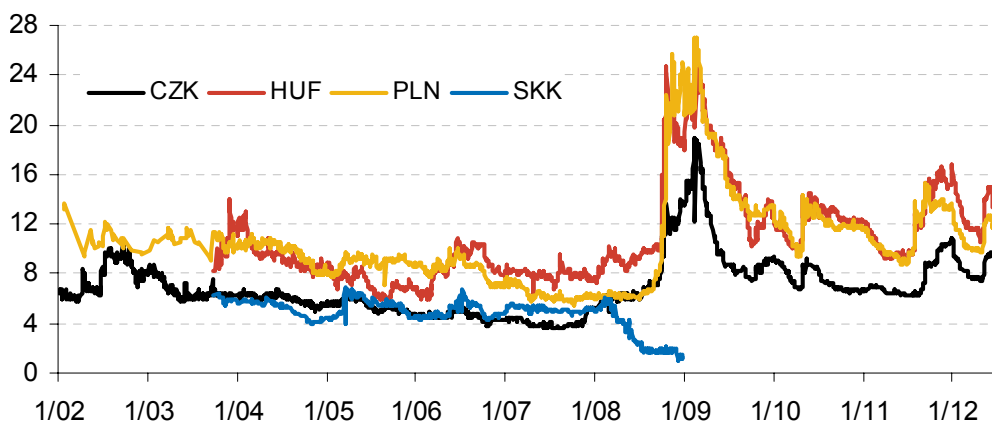


Note: Six-month annualised historical volatility of daily returns.

Source: Datastream, CNB calculations.

An outlook for exchange rate volatility can be derived from financial market data. Chart 21 shows the movements in the expected volatility of the exchange rates of the countries under review as reflected in the prices of options for the individual currencies (implied volatility). In 2002–2007, the implied volatility fell gradually for all currencies under review 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 all these currencies except the Slovak koruna, which was heading towards being replaced by the euro. In 2009 Q2, the implied volatility of the Czech, Polish and Hungarian currencies started to fall again. Although the volatility of the currencies under review fluctuated in 2010–2012 due to persisting market uncertainty, it was still considerably lower than at the start of the global financial crisis.

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



Source: Bloomberg.

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.³⁷

For the Czech Republic, the variability is due partly to the appreciation trend of the Czech koruna, and also to global shocks 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 relatively high volatility immediately before the crisis and after its onset was largely due to desirable dampening of the impacts of economic shocks on the Czech Republic via the exchange rate.

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.

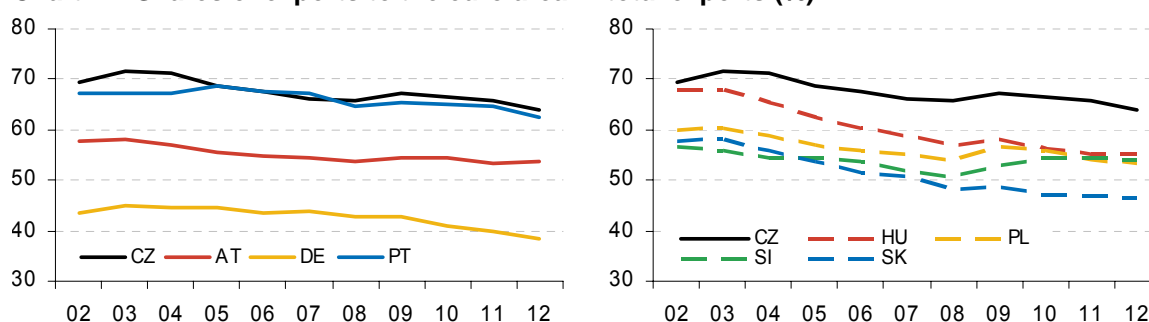
1.2.1 The integration of the economy with the euro area

Greater economic integration between countries increases the probability of synchronisation of their economies.³⁸ It can thus be said that higher intensity of trade of the countries under review with the euro area (see Charts 22 and 23) 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 64% of the Czech Republic's total exports and 60% of its total imports.³⁹ This is a higher level than in the other countries under review, although a downward tendency can be observed. The high share of trade with the euro area was maintained in the Czech Republic during the 2008–2009 crisis, but a downward trend is still visible. Despite gradually increasing territorial diversification, foreign trade represents a relatively wide channel for transmission of economic impulses from the euro area to the Czech economy.

³⁷ 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).

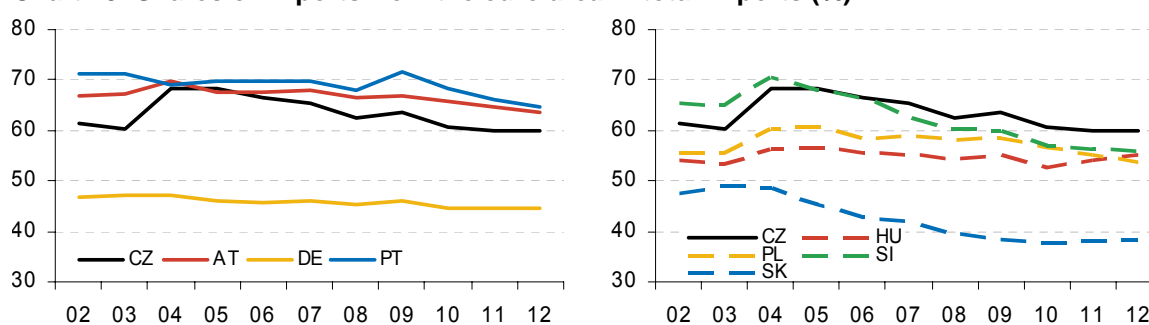
³⁸ Closer trade links thus foster higher correlation of economic activity within a single currency area (Frankel and Rose, 1997). On the other hand, higher trade intensity may lead to growing specialisation and decreasing structural similarity and thus to less economic symmetry (Krugman, 1993).

³⁹ Six countries of the monetary union account for almost 90% of the Czech Republic's trade with the euro area. Trade with Germany accounts for about half of the total, followed by Slovakia with 12% and Austria, France, the Netherlands and Italy each with around 7%.

Chart 22: Shares of exports to the euro area in total exports (%)

Note: The preliminary value for 2012 was calculated from the 2012 H1 data. Data are not available for Hungary and Poland for June 2012. The euro area is defined in its current composition (EA-17) over the entire period under review.

Source: Eurostat, CNB calculations.

Chart 23: Shares of imports from the euro area in total imports (%)

Note: The preliminary value for 2012 was calculated from the 2012 H1 data. Data are not available for Hungary and Poland for June 2012. The euro area is defined in its current composition (EA-17) over the entire period under review.

Source: Eurostat, CNB calculations.

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.⁴⁰ In addition, capital integration between two countries can help to dampen a negative unilateral demand shock. 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 10) and by the share of direct investment (DI) from the surveyed country in the euro area in GDP (see Table 11).

Table 10: Shares of FDI from the euro area in GDP (%)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
CZ	39.7	36.7	37.2	41.3	42.8	47.0	50.0	51.6	53.0
AT	12.1	11.8	14.3	20.0	24.5	28.7	27.2	30.0	28.4
DE	15.2	15.6	14.7	15.1	16.1	16.4	16.8	17.8	17.5
PT	20.0	18.9	19.6	21.8	26.7	31.4	25.5	31.9	-
HU	29.5	35.8	36.2	37.7	40.5	43.3	43.4	50.5	50.6
PL	16.1	17.7	23.3	23.4	26.1	28.7	23.9	30.6	32.2
SI	11.4	12.2	13.9	14.9	15.9	22.6	23.7	23.6	23.5
SK	19.7	28.1	29.7	33.9	34.8	34.5	37.3	44.6	44.9

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

⁴⁰ 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.

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, albeit at a slightly slower pace in recent years compared to the pre-crisis period. Hungary comes second in terms of this indicator, followed by Slovakia.

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

	2002	2003	2004	2005	2006	2007	2008	2009	2010
CZ	1.2	1.6	1.7	1.8	2.2	3.1	5.0	5.1	5.8
AT	6.7	7.0	7.4	8.5	10.6	11.7	13.2	13.7	15.9
DE	11.4	11.2	10.9	11.8	12.6	14.1	15.5	18.7	18.9
PT	9.7	9.7	10.5	11.6	12.9	13.6	13.4	14.4	-
HU	1.2	1.5	2.7	3.9	4.2	4.2	4.7	4.5	3.5
PL	0.3	0.4	0.6	0.5	1.7	1.6	1.9	2.8	4.2
SI	1.1	1.3	1.7	1.8	1.9	1.9	1.9	1.9	2.0
SK	0.3	0.2	-0.3	-0.4	0.2	0.3	0.9	1.1	1.4

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 relatively low in the case of the new EU members.⁴¹ However, the Czech Republic's share is gradually increasing. According to the available data, it was the highest of all the new member countries under comparison in 2010.

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. This integration 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.

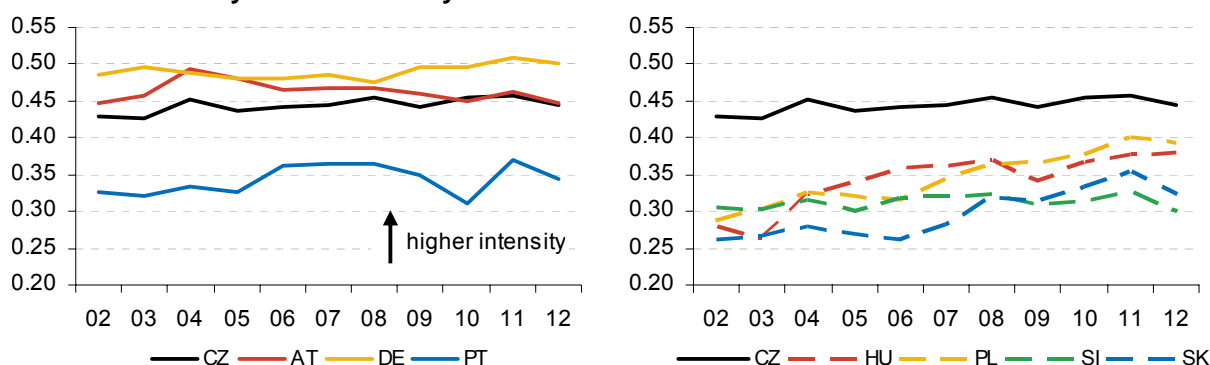
1.2.2 Intra-industry trade

Intra-industry trade (international trade within a single industry) is significant between countries with a similar factor structure and is thus another indicator of the structural similarity of economies. Strong intra-industry trade fosters cyclical convergence⁴² and can also affect the economy's ability to absorb economic shocks.⁴³ The theory of intra-industry trade 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. On the other hand, 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 with the euro area in total foreign trade turnover. Chart 24 plots this indicator in the countries under review.

⁴¹ 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.

⁴² Frankel and Rose (1997). For the theory of intra-industry trade see also Krugman (1981) and Hoekman and Djankov (1996).

⁴³ 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.

Chart 24: Intensity of intra-industry trade with the euro area

Note: The results were calculated using the five-digit SITC classification. The preliminary value for 2012 was calculated from the data for January–March 2012.

Source: Eurostat, CNB calculations.

The SITC5-based Grubel-Lloyd index showed a slightly upward trend for most of the countries under review in 2002–2012, the exceptions being Austria (where it declined slightly) and Portugal (where it was more volatile). The Grubel-Lloyd index values for the Czech Republic are still among the highest of the countries under comparison and are very similar to those in Austria, for example. The results based on the more detailed CN8 classification (see Table 12) show a similar assessment of the Czech Republic. The Czech Republic therefore continues to be characterised by an above-average share of intra-industry trade with the euro area compared to the other countries.

Table 12: Grubel–Lloyd indices for 2011 by degree of aggregation

	SITC 1	SITC 2	SITC 3	SITC 5	CN8
CZ	0.78	0.68	0.60	0.46	0.39
AT	0.78	0.69	0.62	0.46	0.38
DE	0.76	0.68	0.61	0.51	0.43
PT	0.70	0.61	0.51	0.37	0.28
HU	0.77	0.63	0.54	0.38	0.30
PL	0.82	0.66	0.54	0.40	0.31
SI	0.73	0.59	0.47	0.33	0.24
SK	0.76	0.64	0.49	0.35	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 classification.

Source: Eurostat, CNB calculations.

Trade can be classified as either horizontal, i.e. trade in goods of similar quality and/or degree of processing, or vertical, i.e. trade in goods with significant differences in quality and/or degree of processing.⁴⁴ Horizontal intra-industry trade occurs mainly 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.

Table 13 shows that the shares of both horizontal and vertical intra-industry trade between the Czech Republic and the euro area in total foreign trade are just over 40%. The intensity of intra-industry trade along both the vertical and horizontal dimensions in the Czech Republic is more similar to the situation in Germany and Austria than that in the other countries under comparison. Table 13 also shows that 60% of the trade of the Czech economy with the euro

⁴⁴ Fontagné and Freudenberg (1997) and Fontagné et al. (2006).

area countries was vertical and 30% of it was horizontal.⁴⁵ This illustrates the great importance of subcontracting relationships between domestic and euro area companies. All the countries under review have a dominant share of vertical trade in total trade with the euro area, 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 13: Grubel-Lloyd indices for 2011 by type of trade

	Intensity of intra-industry trade			
	Horizontal		Vertical	
CZ	0.44	(30%)	0.40	(60%)
AT	0.42	(34%)	0.41	(52%)
DE	0.45	(35%)	0.47	(57%)
PT	0.36	(24%)	0.34	(54%)
HU	0.29	(27%)	0.32	(49%)
PL	0.37	(33%)	0.31	(53%)
SI	0.25	(30%)	0.31	(47%)
SK	0.35	(24%)	0.30	(58%)

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.

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 similar the financial sectors and capital markets of countries considering joining a single currency area are to the markets within that union.⁴⁶ The financial sector plays an important role in the functioning of the monetary policy transmission mechanism. The degree of alignment of selected financial market indicators thus shows the extent to which the implementation of a single monetary policy would have a similar impact in different countries. Financial markets can simultaneously be a source of undesirable asymmetric shocks. A similar structure of financial markets (banking sectors in particular) of monetary union countries reduces the risk of such asymmetric shocks occurring. It is important to observe the characteristics of the financial market also from the perspective of financial stability.

1.3.1 Financial system

The **depth of financial intermediation** in the Czech Republic remains low relative to the euro area. The ratio of financial institutions' assets to GDP was around 155% in the Czech Republic and 590% in the euro area in 2011. The significance of the financial sector thus remains much higher in the euro area than in the Czech Republic; in this respect, the domestic financial system is comparable with that in Hungary, Poland or Slovakia (see Chart 25).

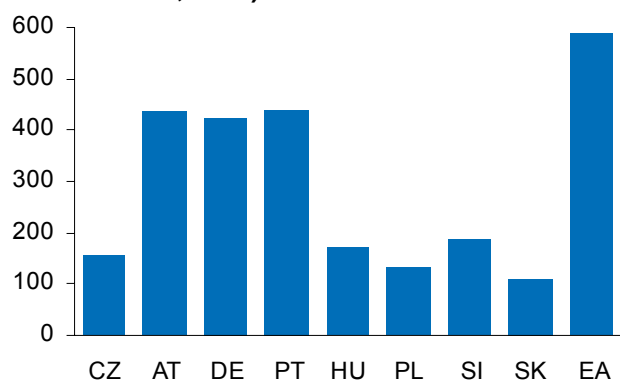
⁴⁵ The difference between total foreign trade turnover and the sum of horizontal and vertical trade consists of one-way trade and measurement errors.

⁴⁶ 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.

As its annual growth rate suggests, the depth of financial intermediation declined and then stagnated in the euro area in 2011, while still showing growth since mid-2005 in the Czech Republic, where, following a slight slowdown during 2011, it picked up again to 4% year on year (see Chart 26). This favourable trend was fostered mainly by 6% growth in the assets of MFIs (excluding the CNB), which account for almost 80% of the total assets of financial institutions (excluding the CNB) in the Czech Republic.

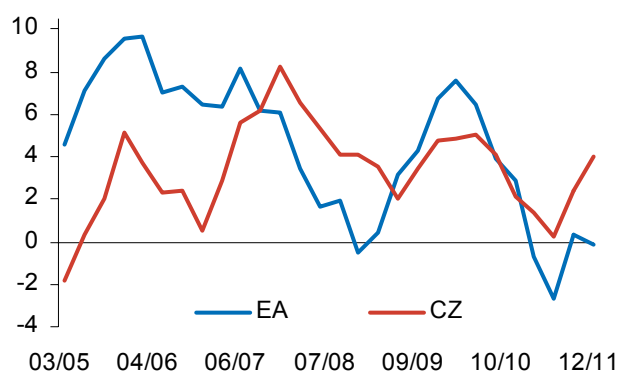
Although financial intermediation in the Czech Republic is still at a relatively low level, the depth of financial intermediation in the euro area cannot be considered a target to which the Czech financial sector should converge. On the contrary, a too large financial sector can represent a substantial risk, limiting the ability of institutions or states to solve current and other potential problems in the financial system. The ratios of financial assets to GDP in the Czech Republic and the euro area in the last five years reveal that in this respect the Czech Republic's convergence towards the euro area has not been significant in recent years (see Chart 26).

Chart 25: Depth of financial intermediation (assets of financial institutions as % of GDP, 2011)



Source: CNB, ECB, Eurostat, central banks

Chart 26: Growth in financial intermediation (year-on-year change in ratio of assets of financial institutions to GDP, %)



Source: CNB, ECB.

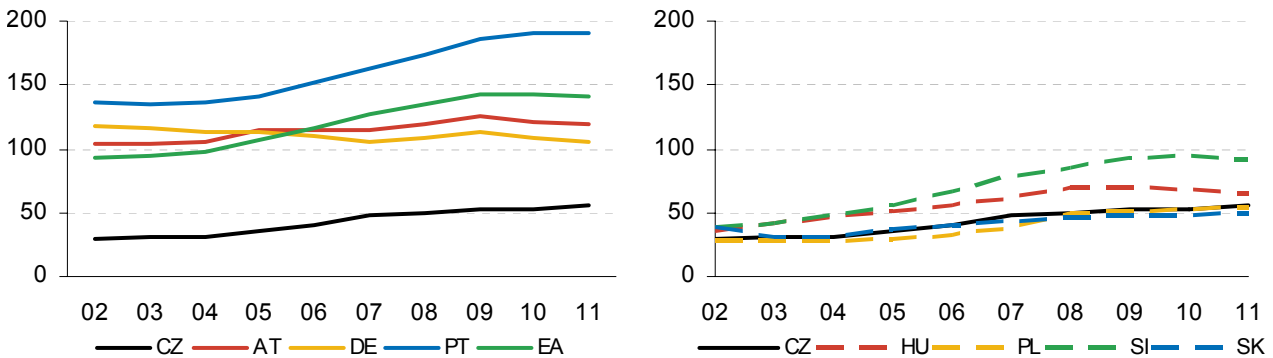
The depth of financial intermediation is closely linked to the **private sector debt ratio**. Czech households and corporations remain significantly less indebted than their euro area counterparts and are comparable more with Poland, Hungary and Slovakia in this respect (see Chart 27). Although loan growth has slowed sharply in the Czech Republic (as in the euro area) as a result of the global financial crisis, the ratio of private sector debt to GDP in the Czech Republic rose by 5% year on year to 56% in 2011. However, this represents a moderate rise compared to the significantly higher pre-crisis growth rate, which averaged around 15% a year in 2005–2007.

Both the supply of, and demand for, loans were noticeably affected by the uncertainty surrounding future global and domestic economic growth. This uncertainty remained significant in 2011 and during 2012.

It can be assumed that private sector debt in the Czech Republic is still below its long-term equilibrium level and convergence to it will continue only if the global economy recovers.⁴⁷ 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.

⁴⁷ See Geršl and Seidler (2011).

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

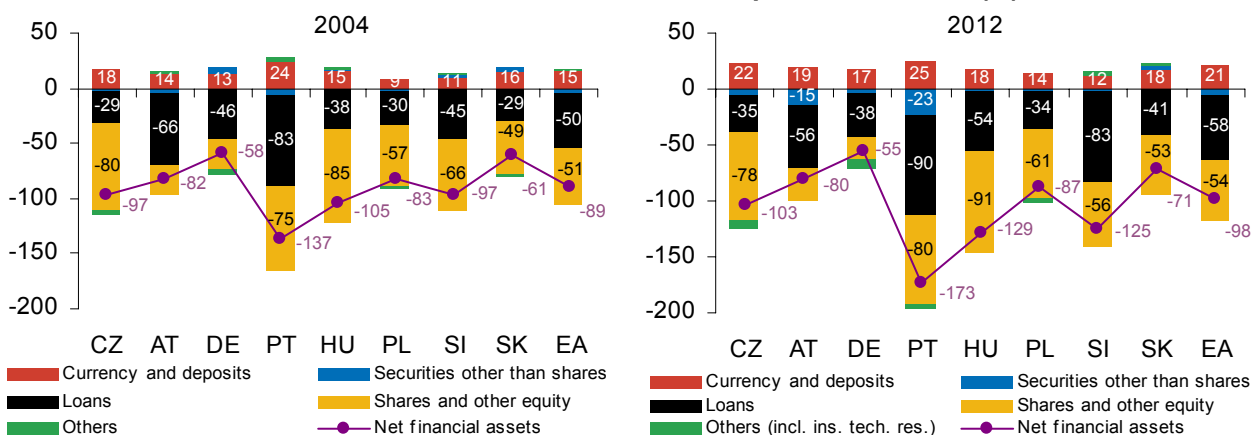


Note: EA represents the average of euro area member countries.
Source: IMF IFS.

1.3.2 Structure of financial assets and liabilities of non-financial corporations and households

A similar structure of financial assets and liabilities of real sectors of individual economies is a key condition for the single monetary policy to have a symmetric effect and for the transmission mechanism to function. This section will first address the financial position of non-financial corporations and households and its structure. The financial position, as expressed by net financial assets, shows to what extent a sector is able to finance other sectors and to what extent it needs the funds of other sectors to finance its activities. Given the different responses of various financial asset and liability items to a monetary policy shock, it is necessary to compare not only the level, but also the structure of the position. Selected indicators based on aggregate balance sheets can subsequently be used to identify risks stemming from mismatches in sectoral balance sheets that might lead to financial tensions and affect the functioning of the single monetary policy. Owing to the links between balance sheet items of different sectors, a look at the financial balance sheets of real sectors also provides information about the link to the financial sector and especially to the banking sector, whose exposure to real sectors is high in all the economies under comparison on both sides of the balance sheet.

Chart 28: Ratios of net financial assets of non-financial corporations to GDP (%)



Note: The 2004 and 2012 data are for Q1.
Source: ECB, CNB calculations.

Chart 28 shows the **net financial assets of non-financial corporations** as a percentage of GDP. The net debtor position of the non-financial corporations sector, which is due largely to a large proportion of non-financial assets in the balance sheet, increased in most countries compared to 2004. The deterioration in the net position was fostered largely by an increase in loan debt. Only Germany and Austria saw a slight improvement in both net position and debt. As regards the level of corporate loan debt, the Czech Republic is comparable to Germany but below the euro area level. Debt also increased in the other non-euro area countries compared to 2004. Hungary is now almost at the euro area average.

Unlike in the advanced euro area countries, shares have a higher weight in the net debtor position in the other countries (including the Czech Republic). This is due mainly to a far lower proportion of shares in financial assets, related to lower ownership links to corporations both in the domestic economy and, in particular, abroad. Although debt securities have a slightly higher weight in corporate financing in the Czech Republic and in some of the euro area countries under review (Austria and Portugal in particular) compared to 2004, they still contribute to corporate financing to a relatively limited extent. Other accounts receivable and payable have a relatively high share in the financial assets and liabilities of Czech corporations, but their net amount remains insignificant. Currency and deposits of non-financial corporations increased in all the countries under comparison compared to 2004. Their ratio to GDP in the Czech Republic is comparable to that in the euro area.

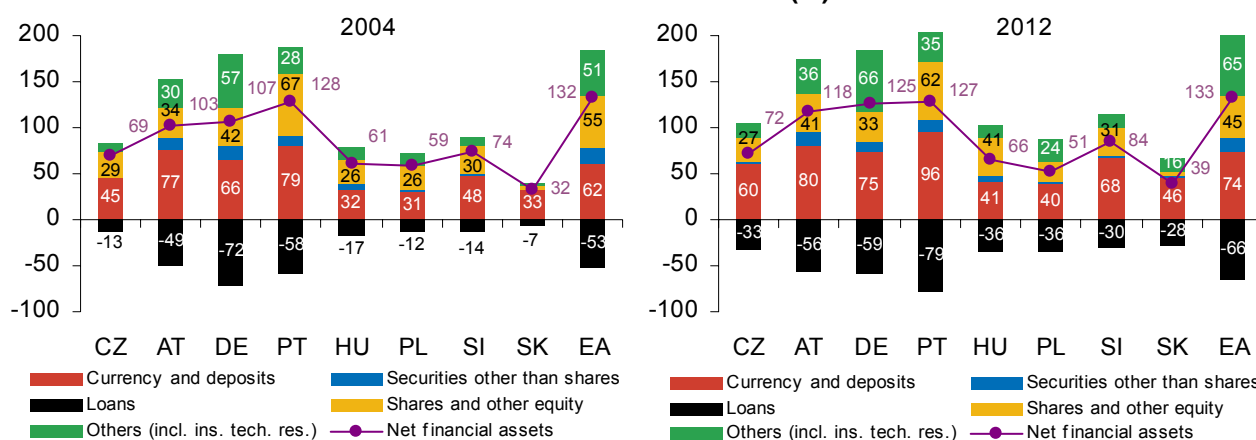
Compared to 2004, the ratio of total net financial assets to GDP neared the euro area level. The level of loan debt has a smaller weight in the net debtor position compared to the euro area, while the net position of shares has a larger share. These differences can give rise to an asymmetric effect of monetary policy.

Unlike non-financial corporations, the **household sector** is in a net creditor position (see Chart 29).⁴⁸ The ratio of the net creditor position of households to GDP increased most of all in Germany and Austria. As in the euro area, it remained virtually unchanged in the Czech Republic. However, the Czech ratio is about half that in the euro area, corresponding to about half the level of financial wealth. With the exception of Germany, all the countries recorded an increase in household loan debt. Debt in the Czech Republic rose by around 20% of GDP compared to 2004, as it did in the other non-euro area countries and in Slovakia, Portugal and Slovenia. The euro area recorded an increase of roughly half that size.

Households in the Czech Republic slightly reduced their share holdings at the expense of currency and deposits and other assets. The euro area recorded a similar shift towards more liquid assets and other assets including insurance reserves. The share of currency and deposits increased in all the countries under review, and most of all in Slovenia, Portugal and the Czech Republic. The ratio of currency and deposits to total financial assets of residents in 2012 was highest in the Czech Republic and Slovakia, in line with the historically conservative investment behaviour of households in these countries.

The ratio of the net creditor position of the Czech household sector to GDP remains at roughly one-half the level in the euro area. Moreover, as in the case of corporations, there are persisting differences in structure – in particular a lower debt ratio and a lower share of other assets including insurance reserves. An asymmetric effect of monetary policy can thus also be expected here.

⁴⁸ Compared to the level of the net debtor position of non-financial corporations, an important role is played here by the rest of the world, which acts as a net creditor in all countries except Germany. In the case of Austria, the size of the creditor position of the rest of the world is negligible.

Chart 29: Ratios of net financial assets of households to GDP (%)

Source: ECB, CNB calculations.

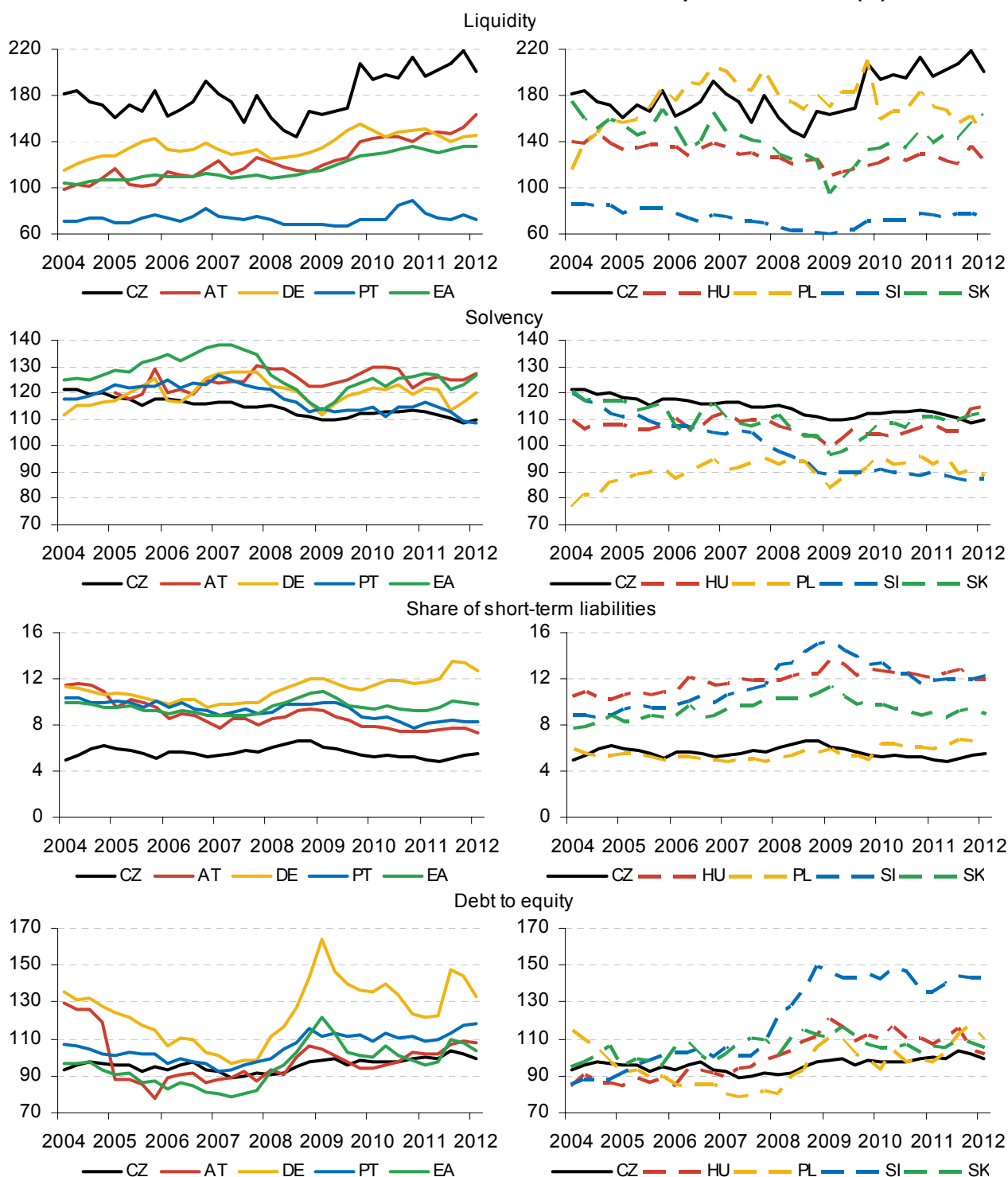
Selected **balance sheet indicators** can be used to describe a sector's balance sheet structure.⁴⁹ The primary purpose of these indicators is to reveal any mismatch between financial asset and liability items. This determines the vulnerability of the sector (and, given the links between sectors, the vulnerability of the whole economy) to adverse shocks. From the perspective of adopting the single currency, any vulnerability affects the functioning of monetary transmission and thus of the single monetary policy. The individual financial asset and liability items behave differently in monetary transmission, and some may directly dampen or, conversely, amplify the impact of adverse shocks. Balance sheet indicators are therefore assessed in terms of the similarity of their levels to the euro area provided that the levels of the euro area indicators are not indicating elevated risks. It is reasonable to assume that the same degree of similarity to some extent guarantees the same reaction to economic shocks and thus alignment between individual economies.

Most countries, including the Czech Republic, recorded an increase in **liquidity in non-financial corporations** in response to the financial crisis. When assessed using this indicator, non-financial corporations in the Czech Republic overtook the other countries under comparison. The movement in this indicator is due to steady growth in currency and deposits. A fall in short-term loans after the outbreak of the financial crisis also had a large effect. A significant fall in the growth rate or a decline in the volume of short-term loans features in all the countries under review except Germany.⁵⁰ The liquidity indicator in the euro area shows a stable upward trend, but is lower than that in the Czech Republic. Poland was at a comparable level at the start of the period under review, but has been flat or falling slightly since recording a large downward fluctuation in 2010. Portugal and Slovenia are below 100% throughout the period under review.

The **solvency ratio** of non-financial corporations is slightly lower in the Czech Republic than in more advanced euro area countries. On the other hand, it is higher over almost the entire period under review than in the other candidate countries. Although the non-financial corporations sector in the Czech Republic is showing a slightly downward tendency in terms of solvency, it is not subject to as much crisis-related volatility as the euro area and some other countries.

⁴⁹ Balance sheet indicators are based on the balance sheet approach to analyzing financial crises, which was comprehensively defined in Allen et al. (2002). Applications of the balance sheet approach to the Czech Republic can be found in Kalous (2009) and especially in Kubicková, Komárek and Plašil (2012).

⁵⁰ This might have been due partly to deleveraging, which is analysed in detail in Financial Stability Report 2011/2012 (see Box 1).

Chart 30: Selected balance sheet indicators of the non-financial corporations sector (%)

Source: ECB, CNB calculations.

The **share of short-term liabilities** is much lower for the non-financial corporations sector in the Czech Republic than in the euro area. Czech non-financial corporations also have a lower share of short-term liabilities compared to the other countries. The value of the indicator is comparable only to Poland. Longer liability maturity is pushing up the liquidity ratio. The

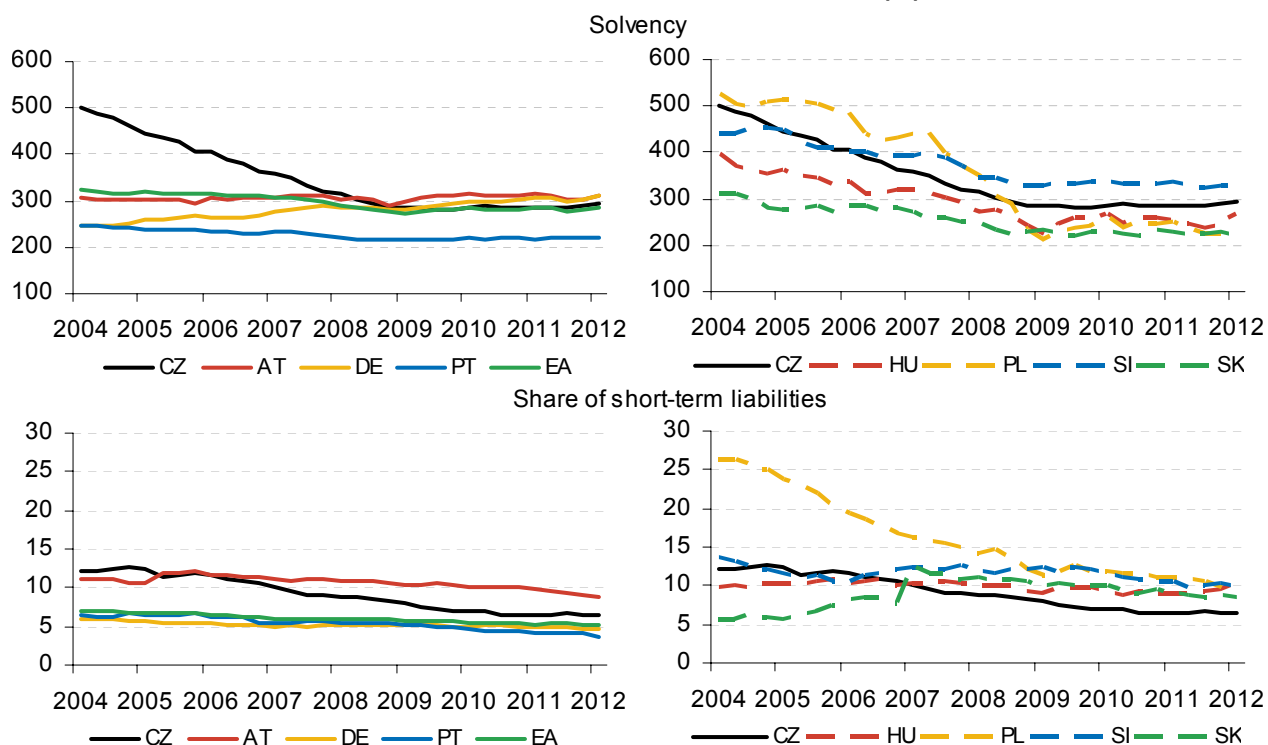
shorter maturity of liabilities in the euro area than in the Czech Republic may influence the effect of monetary policy, especially in the event of changes in the slope of the yield curve.

According to the **debt/equity ratio**, the non-financial corporations sector in the Czech Republic has shown a slight tendency towards debt financing since the onset of the financial crisis, although the latest data show that the ratio is back below 100%. However, this tendency has been nowhere near as dramatic as in the euro area countries, and Germany in particular. The worse conditions have also been reflected in a more pronounced rise in this indicator in the other countries than in the Czech Republic.

So, the non-financial corporations sector in the Czech Republic is generally showing differences from the euro area in terms of the levels of some indicators and their evolution over time and their responses to adverse shocks. Czech non-financial corporations have longer liability maturity and a related greater predominance of short-term assets over short-term liabilities. The extent of debt financing is more stable and is not subject to such large fluctuations as in some other countries.

The **solvency of Czech households** was declining until the end of 2008, signalling faster growth in debt than in total financial assets. Since 2009, the rate of growth of debt has slowed and the decline in the solvency ratio has halted. This is in line with the other non-euro area economies and also with Slovenia and Slovakia. By contrast, the ratios in Germany and Austria have for the entire period under review been fluctuating around a level broadly the same as that observed for Czech households in recent years. The solvency ratio of the household sector in Portugal is noticeably lower, despite having been the same as that in Germany in 2004.

Chart 31: Selected balance sheet indicators of the household sector (%)



Source: ECB, CNB calculations.

As for the maturity structure in the Czech household sector, the share of **short-term liabilities** has been slowly decreasing and is nearing the level in Germany and the euro area average. Austria is the exception within the euro area, showing a slightly higher share of

short-term liabilities. In the other countries this indicator has been gradually declining since around 2009 (in Poland over almost the entire period under review). The Czech Republic has recorded relatively lower levels over this period.

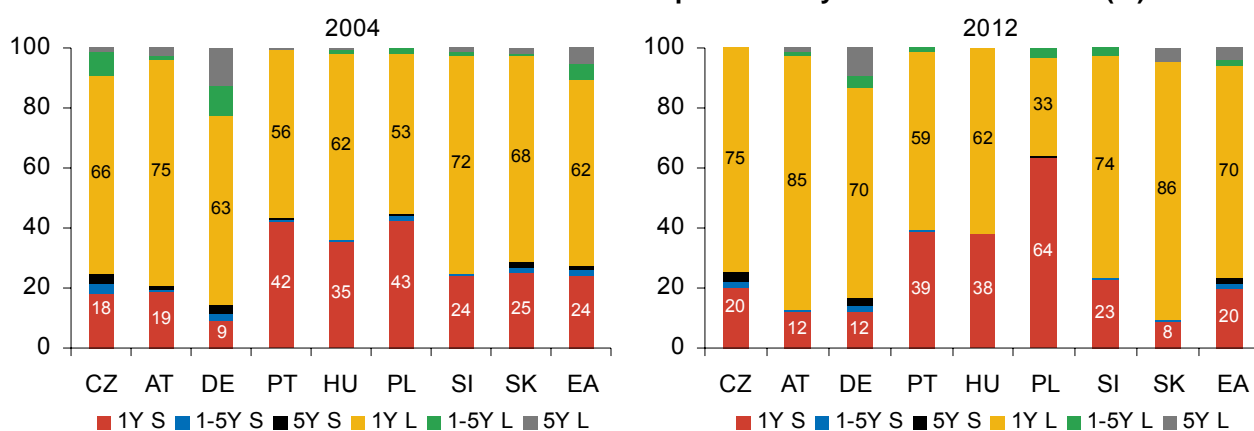
Overall, in terms of the balance sheet indicators under comparison, the Czech household sector neared the levels typical of euro area households in the second half of the period under examination. In this respect, therefore, the household sector is aligned with the euro area and shows an identically low risk of overall insolvency.

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 is important for accession to the euro area. Moreover, a low degree of alignment of client interest rates may be accompanied by possible asymmetric shocks to risk premia after euro adoption, with adverse impacts on balance sheets of the non-financial private sector and on economic growth.

Transmission of money market interest rates to client rates with fixations of up to one year is relatively fast in the Czech Republic. Short-term client rates reflect changes in money market rates at a horizon of 1–3 months (Horváth and Podpiera, 2009). Client rates with long fixations are affected by long-term government bond yields, with the transmission taking around 2–3 months. The financial crisis somewhat weakened the transmission in the Czech Republic owing to an increase in client risk premia. This reflected extraordinarily adverse cyclical developments and banks' increased prudence when lending. Client risk premia have partially reversed their previous increases over the last two years, but this adjustment halted in 2012 due to pessimistic expectations regarding the euro area debt crisis. In the euro area, client interest rates with short-term fixation are also derived from money market rates, and long-term rates are derived from long-term government bond yields. The transmission of short-term market rates to client rates with fixations of up to one year is faster than that of long-term rates. The transmission of long-term interest rates on loans to households and some corporate loans is incomplete and weakened in the euro area due to the debt crisis. This reflects elevated financial market tensions and vulnerability of European banks (ECB, 2012).

Chart 32 shows the structure of new loans to non-financial corporations broken down by interest rate fixation period. A higher share of loans with a short-term rate in general indicates greater **interest rate sensitivity of new loans to non-financial corporations**. Corporations mainly take out loans with floating rates or rates fixed for up to one year in all the countries under review in the long term. The interest rate sensitivity of corporate loans in the Czech Republic is similar to that in Austria and Germany, but also to that in Slovenia and Slovakia. Loans in these countries are thus immediately sensitive to changes in monetary policy and market rates – loans with floating rates and rates fixed for up to one year account for around 90% of the total. This also indicates relatively fast transmission of client interest rates to corporate balance sheets and demand for loans. Large loans (i.e. loans of over EUR 1 million) – provided usually to large corporations (accounting for 70–90% of the total volume of loans) – have the largest share in the said countries, and this share has increased since 2004. By contrast, small loans – usually provided to small and medium-sized corporations – also have a significant share in Poland and to a lesser extent in Portugal and Hungary. Moreover, these corporations are usually more sensitive to interest rate changes than large corporations; since 2004, however, the share of small loans has increased significantly only in Poland.

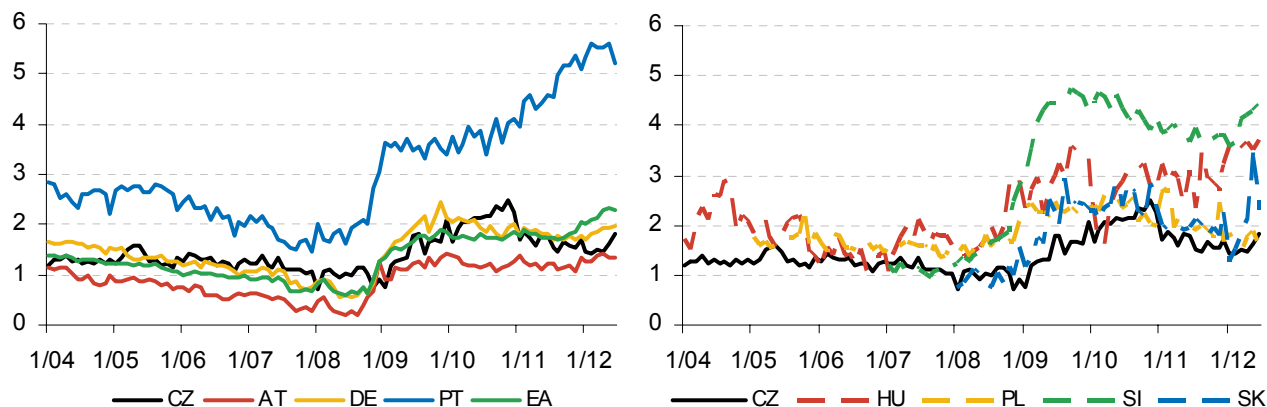
Chart 32: Structure of new loans to non-financial corporations by interest rate fixation (%)

Note: 1Y S and 1Y L stand, respectively, for small (up to EUR 1 million) and large (over EUR 1 million) 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 number of euro area member countries. The 2012 data are as of June.

Source: ECB, CNB calculations.

A low degree of alignment of client interest rates may be accompanied by asymmetric shocks to risk premia after accession to the monetary union. The **spreads between the interest rate on new loans to non-financial corporations** and the relevant market rates are shown in Chart 33. It reveals that the spread in the Czech Republic is very close to the level in Germany and Austria (as it is in Poland). On the other hand, among the countries under review, a significantly higher spread was observed in Portugal and Slovenia and for domestic currency loans in Hungary, especially after the escalation of the financial crisis. This may weaken the effect of the single monetary policy. Except for Portugal, the spread gradually declined or was flat in 2010 and 2011 and edged up again in most cases in 2012. This seems to reflect growth in client risk premia affected by the downward phase of the business cycle amid escalation of the debt crisis and problems in banks of some euro area countries and a decline in short-term market interest rates. The spread is higher in all the countries under review compared to the pre-crisis period. Client interest rates were relatively homogeneous in the **euro area** before the escalation of the financial crisis in 2008, but their degree of **heterogeneity** has increased in recent years. This reflects the mixed effects of the crisis on individual euro area countries, manifesting itself in fiscal, macroeconomic and financial imbalances (in Portugal, Greece and Ireland, and later in Spain and Italy). The current degree of heterogeneity of the financial conditions, and in particular of client interest rates, is the main challenge to ensuring that the transmission of the single monetary policy has a symmetric effect (see ECB, 2012).

Chart 33: Spreads between interest rates on loans to non-financial corporations and 3M market rates (p.p.)

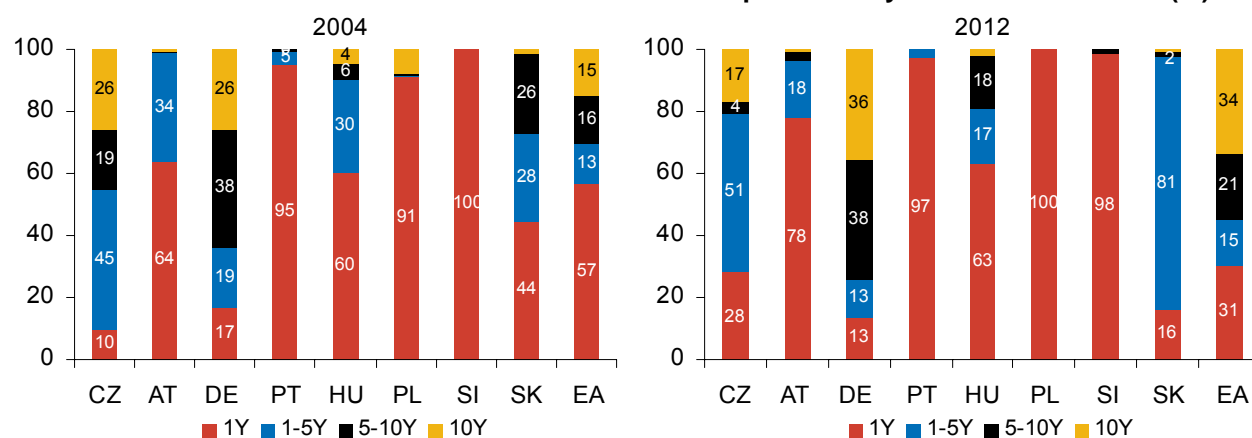


Note: The spreads for Poland and Hungary are calculated from interest rates on domestic currency loans (in Poland's case the rate with a fixation of up to one year). For the other countries, the spread is calculated from the average interest rate on total corporate loans. The structure of the euro area total varies according to the number of euro area member countries.

Source: ECB, CNB calculations.

Chart 34 shows the structure of new **loans for house purchase broken down by interest rate fixation period**. Such loans make up the main segment of household debt. In the Czech Republic, as in Germany, Slovakia and the euro area as a whole, households mostly take out loans with fixations of over one year. This indicates similarity of monetary policy transmission to households' balance sheets. These loans account for around 70% to 80% of the total. While loans with fixations of over one year and up to five years are predominant in the Czech Republic, loans with even longer fixations dominate in the euro area on average. Compared to 2004, the share of loans with fixations of up to one year increased in the Czech Republic and converged towards the euro area level. These loans are immediately affected by changes in monetary policy and market rates and have knock-on effects on households' balance sheets. They have a share of about 30% in the Czech Republic and in the euro area. By contrast, the share of these loans is significantly higher in Austria, Portugal, Hungary, Poland and Slovenia. This reflects, among other things, different financial products, market structure and some regulatory measures.

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 number of euro area member countries. The 2012 data are as of June.

Source: ECB, CNB calculations.

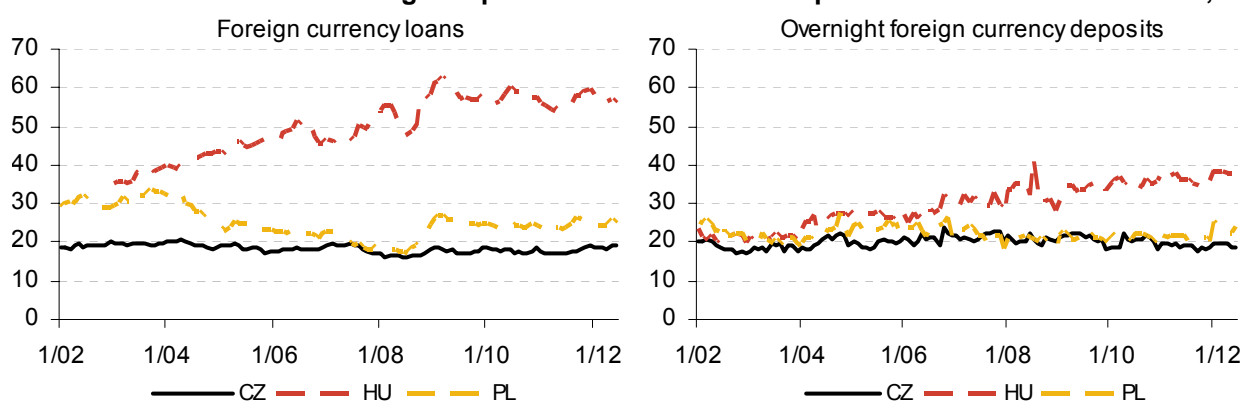
To sum up, the degree of heterogeneity of client interest rates has increased in the euro area due to the current crisis. This represents one of the main challenges to ensuring that the single monetary policy has a symmetric effect. Client interest rates in EU countries can be expected to be more differentiated in future than in the pre-crisis period. Following a reversal of growth in 2008 and 2009, client interest rates in the Czech Republic are mostly close to average rates in the euro area. With the exception of consumer credit, a similar pattern was observed for the spread between client and market rates. The transmission of changes in money market interest rates to client rates in the Czech Republic does not differ greatly from the euro area as a whole and so represents no barrier to future euro adoption. The transmission to short-term rates remains fairly fast. For long-term rates, however, it is slowing in the euro area due to the current debt crisis. The interest rate sensitivity of corporate loans and house purchase loans does not differ much from the euro area average.

1.3.4 Spontaneous euroisation

A high **share of foreign currency in transactions** of domestic economic agents may pose a risk to the effectiveness of independent monetary policy and to financial stability. While foreign currency loans and deposits of non-financial corporations are usually related to transaction motives and foreign currency loans are mostly hedged against exchange rate risk, demand for foreign currency among households increases their financial vulnerability and, subsequently, the vulnerability of the whole financial system.

The level of use of foreign currency in transactions of **non-financial corporations** has long been stable in the Czech Republic. The share of foreign currency deposits in total overnight deposits and the share of foreign currency loans in total corporate loans are fluctuating around 20% (see Chart 35). Foreign currency loans and deposits are usually denominated in euros, reflecting the importance of euro area trading partners. Foreign currency loans are thus used mainly as a natural hedge by exporting corporations, reducing their sensitivity to exchange rate changes.⁵¹ The shares of foreign currency deposits and loans in Poland are similar to those in the Czech Republic. On the contrary, in Hungary they remain significantly higher – the share of overnight foreign currency deposits is around 40% and foreign currency loans account for around 60% of total loans. However, their upward trend has halted due to the financial and debt crisis.

Chart 35: Foreign currency loans and overnight deposits of non-financial corporations (shares in total loans and overnight deposits of non-financial corporations with domestic banks, %)



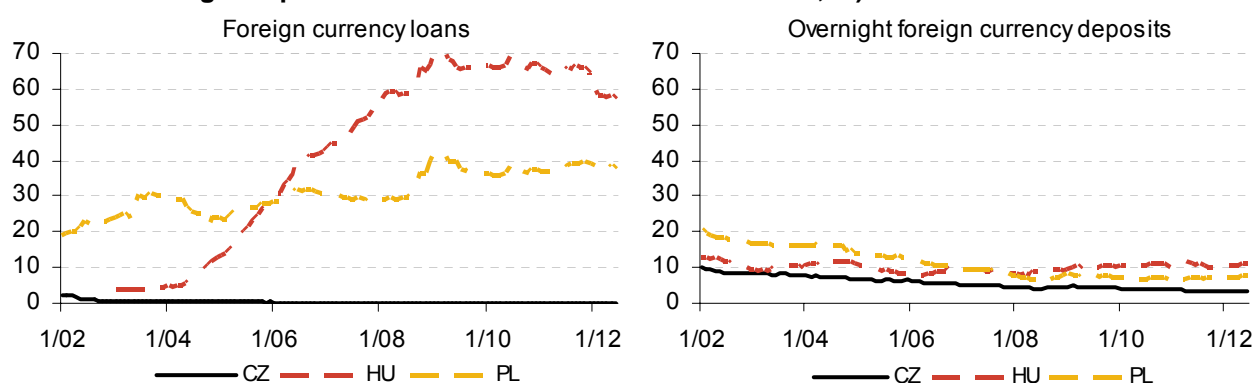
Source: Central banks, CNB calculations.

⁵¹ According to a CNB and Confederation of Industry survey of selected non-financial corporations, the shares of foreign currency payments and receipts in total domestic payments and receipts of corporations are currently around 9% only and have been quite stable for long time.

Substitution of the domestic currency with foreign currency is still negligible among **households** in the Czech Republic. The share of foreign currency deposits in total overnight deposits is around 3% and has been declining in the last ten years (see Chart 36). This share is slightly lower than that in Poland and Hungary. The share of foreign currency loans to households is virtually zero in the Czech Republic, but is around 40% and 60% in Poland and Hungary respectively. The rising share of foreign currency loans has halted in Poland in recent years, while Hungary has seen a decline due mainly to regulatory measures. Studies addressing this issue for Central and Eastern European countries show that the financial and debt crisis has reduced the foreign currency debt level of households, but there are signals that this effect may be only temporary.⁵²

Beckmann and Scheiber (2012) also suggest that the debt crisis has had a significant impact on **households' trust in the euro**.⁵³ In the Czech Republic, Poland and Hungary, households' perceptions of euro area stability and trust in the euro fell into negative territory (a negative overhang of replies to the question whether the euro will be a stable and trustworthy currency over the next five years) in 2011 for the first time since 2007. More than 70% of households in the Czech Republic and Poland continue to prefer saving in the domestic currency in circulation, while the figure in Hungary is lower (around 50%). The share of households responding to the crisis with greater demand for foreign currency was thus low in these countries – less than 10% in the Czech Republic and Poland, and rather higher in Hungary (just above 10%).

Chart 36: Foreign currency loans and overnight deposits of households (shares in total loans and overnight deposits of households with domestic banks, %)



Source: Central banks, CNB calculations.

To sum up, corporations continue to use foreign currency in financial transactions, naturally as a result of their high trade integration with the euro area. The use of foreign currency by Czech households is minimal, due mainly to their high trust in the domestic currency, long-term low inflation and low interest rates. Moreover, the euro area financial and debt crisis has strengthened households' trust in the domestic currency. The use of foreign currency therefore does not substantially reduce the effect of independent monetary policy on the economy and thus does not represent an additional argument for euro adoption beyond the framework of corporations' high trade integration.

⁵² According to Stix et al. (2011), households' demand for foreign currency loans in Central and Eastern European countries as a whole is driven by lack of trust in the domestic currency and financial system. The currency structure of household income and, in some countries, expectations of euro adoption in the medium term are also important factors.

⁵³ However, demand for the euro is not expected to be replaced by demand for another currency in countries with a high level of euroisation. Trust in the euro remains higher than trust in the domestic currency in these countries. Major shifts of household portfolios are not likely.

1.3.5 Financial market integration

Financial market integration has been achieved when financial assets having similar risk factors and yields are priced identically by the markets no matter which country they are traded in. Fully integrated markets with no barriers (economic, legal, etc.) provide an opportunity for arbitrage to equalise asset prices across countries. A direct comparison of prices of financial assets across markets thus illustrates the level of financial market integration in the countries under review. 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 these asset prices should be affected by common (global) factors rather than by national (local) 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.⁵⁴ Price-based measures use the concepts of beta-convergence and sigma-convergence. Beta-convergence enables identification of the speed of convergence of the national market to the euro area, while 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 the same speed (beta). News-based measures are based on the assumption that in the case of an integrated market, 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 countries' asset prices respond to news in the same way as euro area asset prices.⁵⁵

The results of the analysis for the individual financial market segments are shown in Table 14 for beta, in Chart 37 for sigma and in Chart 38 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 14: Beta coefficients

	Money market		Forex market		Bond market		Stock market	
	1/02–7/07	8/07–7/12	1/02–7/07	8/07–7/12	1/02–7/07	8/07–7/12	1/02–7/07	8/07–7/12
CZ	-0.66	-0.38	-0.89	-0.89	-0.74	-0.73	-0.93	-0.80
AT	-	-	-	-	-1.09	-0.87	-1.03	-0.66
DE	-	-	-	-	B	B	-0.71	-0.90
PT	-	-	-	-	-0.68	-0.92	-1.05	-0.95
HU	-0.83	-0.79	-0.96	-0.92	-0.90	-0.69	-0.86	-1.07
PL	-0.48	-0.83	-0.82	-0.97	-0.81	-0.81	-0.93	-0.87
SI	-	-	-	-	-	-	-0.73	-0.87
SK	-0.79	-0.56*	-0.98	-	-0.99**	-0.89	-0.79	-0.96
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.

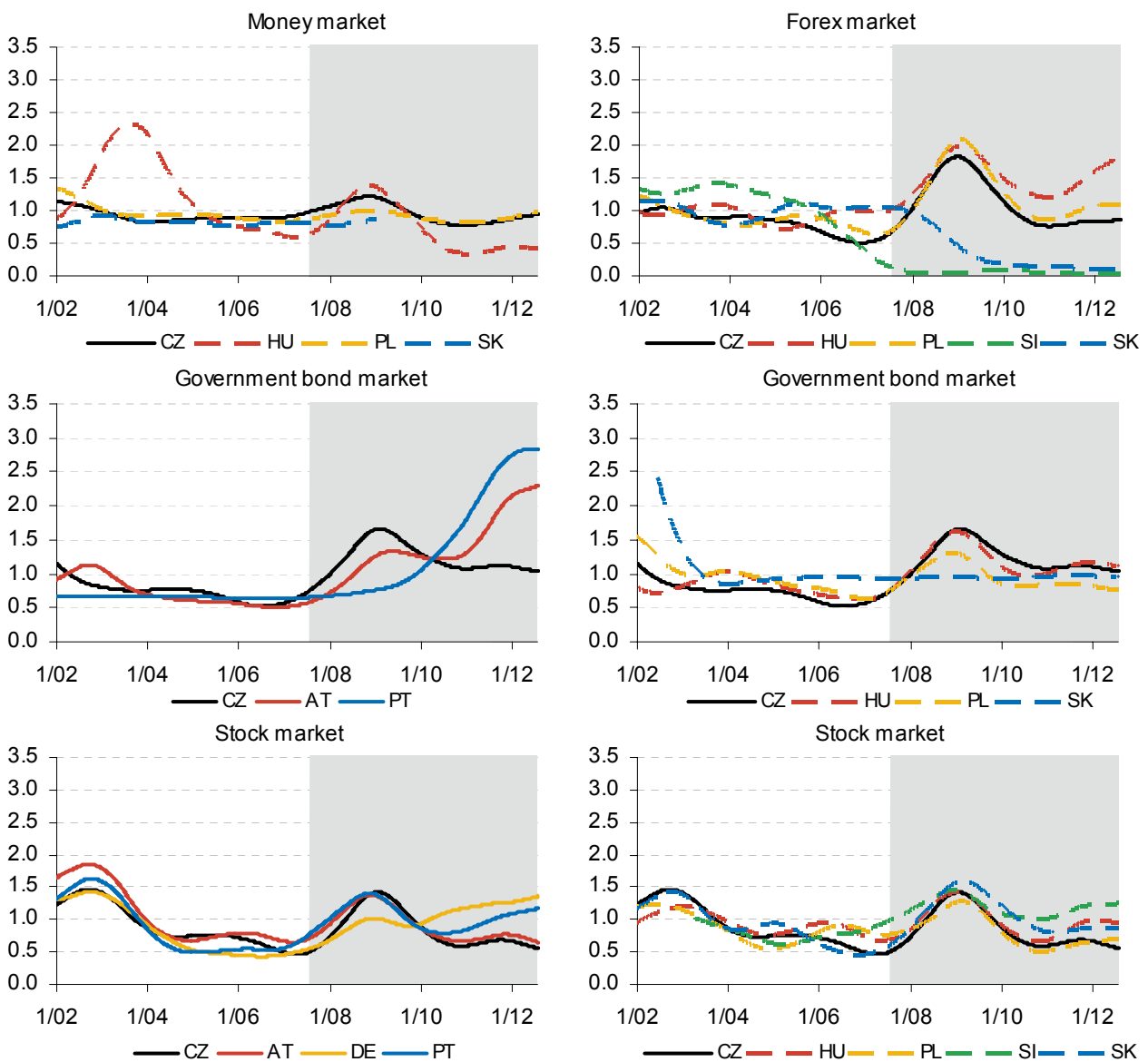
Source: Thomson Datastream, CNB calculations.

⁵⁴ 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 usually entail various surveys of statistical information monitoring change in investor behaviour in the process of financial market integration.

⁵⁵ Asset prices are monitored at an aggregate level and it is assumed that euro area assets respond primarily to global news.

The results of **price-based measures** signal that in the pre-crisis period the speed of price convergence/divergence 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 14). The level of convergence achieved did not differ much across the countries under review in the case of these markets (sigma coefficients; see Chart 37). The results of the analysis of convergence of individual financial markets rank the Czech Republic among the countries with a higher degree of integration, i.e. those where global factors have a greater effect on financial asset prices. Moreover, the integration of the Czech markets with the euro area is broadly unchanged over time, except during the highly volatile crisis period in 2008 and 2009.

Chart 37: Sigma coefficients



Note: Lower standard deviation values (y-axis) correspond to a higher convergence level. The grey area marks the period since August 2007.

Source: Thomson Datastream, CNB calculations.

The money market showed the slowest integration in the new member countries under comparison, including in the pre-crisis period. This may reflect a relatively strong effect of specific domestic factors (e.g. the national currency). It may stem from different monetary policies settings, which rank among the primary determinants of money market asset yields, and from the exchange rate generally affecting the value of assets denominated in the domestic currency. Among the countries under review, Poland achieved a relatively high degree of money market integration (as evidenced by its gamma values; see Chart 38); this integration process, moreover, is accelerating. The level of integration of the Czech money market has remained broadly unchanged since 2002 and the speed of the integration process is therefore slowing. The experience of countries with the euro shows that the effect of some specific domestic factors weakens after the announcement of euro adoption. Nevertheless, events in recent years have proved that other domestic factors (such as the country's fiscal position and rating or close links between the domestic public and financial sectors) can persist and have a strong effect on market prices despite the single money and foreign exchange market, especially in crisis periods. This reflects several factors, in particular differences in the fiscal positions of individual euro area countries, in the evolution and financial situation of their banking sectors, and in the overall economic trends in these countries. Growth in risk aversion among investors (repricing of risks), which has changed their demand for individual assets, is also an important factor. Instead of creating internationally diversified portfolios, investors are preferring portfolios made up of domestic or safe assets in the current conditions. These factors are increasing the volatility of market prices differently for the countries under review and causing them to diverge according to the price-based method (see, for example, the bond markets in Austria and Portugal and the stock markets in Germany, Portugal and Slovenia).

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). In this period, a slightly higher degree of integration measured using this method was obtained across the Czech markets in the case of the government bond market followed by the stock market. Higher sensitivity to the transmission of global news can be expected for both these markets given the greater influence of foreign investors there. The reaction to common news has remained relatively low in all markets since the start of the crisis, although it has edged up in the foreign exchange and stock markets and edged down in the bond market.

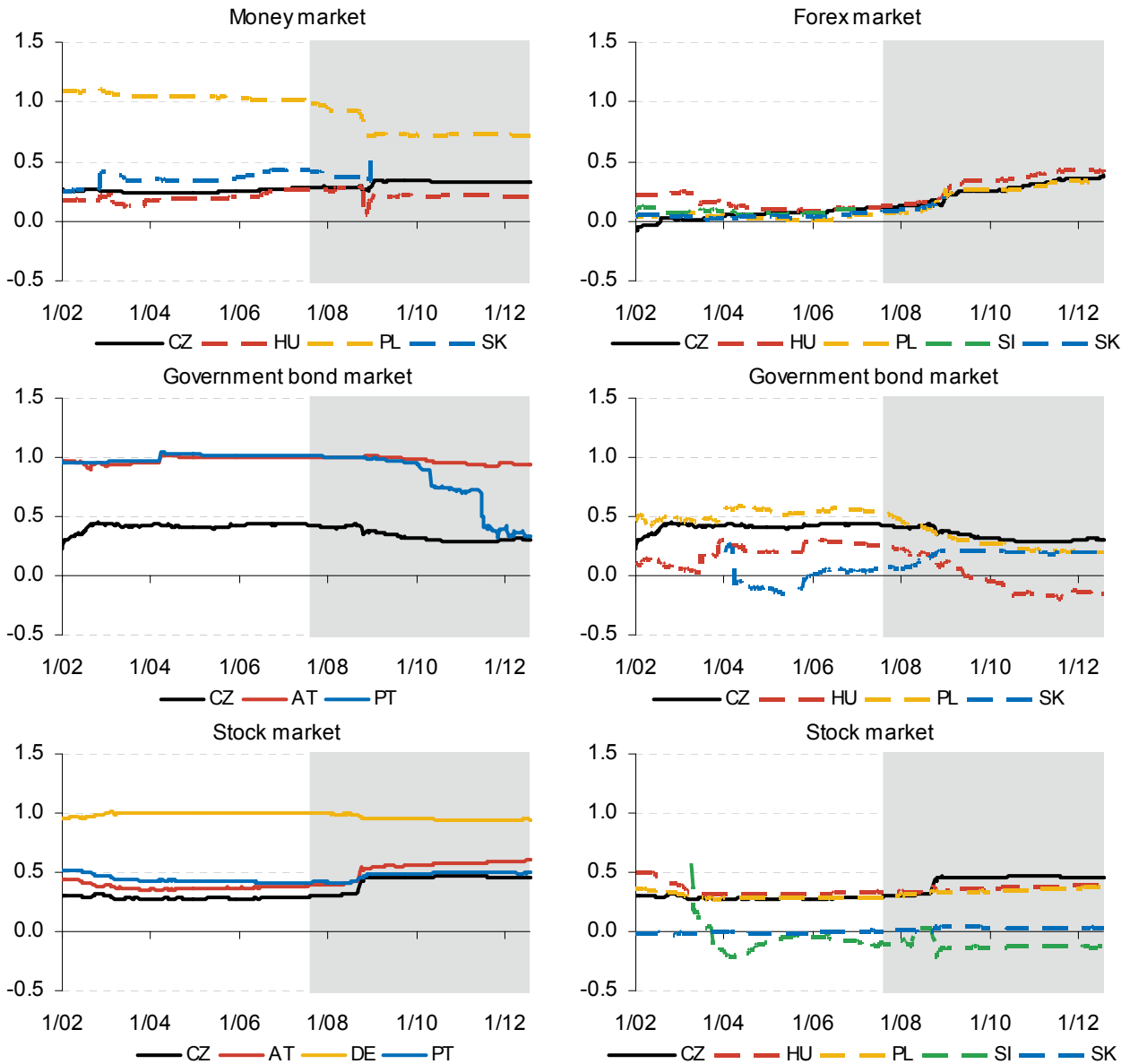
Both methods signal that the **financial crisis and the euro area debt crisis** had a significant impact on the financial market integration of all the countries under review with the euro area. Chart 39 shows that increased price volatility, and in some cases divergence, are apparent from the outbreak of the crisis almost until mid-2009, when the situation on most financial markets started to calm gradually.⁵⁶ However, divergence re-emerged in some markets at the start of the debt crisis due to increased price volatility. This is especially true of the Austrian and Portuguese government bond markets (see above), although higher sensitivity of market prices to common or global news is evident in Austria, while largely domestic effects can be seen in Portugal (see Chart 37).⁵⁷ Slight divergence can also be observed in the German, Portuguese and Slovenian stock markets. The Polish zloty and Hungarian forint markets are diverging as well. Since the outbreak of the financial crisis, there has thus been a prevalence of asymmetric, country-specific shocks. This is linked with higher market volatility, the different impacts of the crisis on each country, and the different crisis resolution methods adopted.

⁵⁶ Only the Slovak forex market recorded "artificial" convergence at the beginning of the crisis, owing to euro adoption.

⁵⁷ The sources of the response of asset prices are different for these two countries. While the response of assets in Portugal stems from adverse macroeconomic developments and deepening structural imbalances, that in Austria stems from financial sector developments.

To sum up, the process of financial integration with the euro area in the individual segments of the Czech financial market is neither accelerating nor intensifying significantly due to the ongoing crisis.

Chart 38: 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. 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 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

In the absence 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 may 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. The negative experience with activist fiscal policy in the advanced countries in the 1970s is an argument against the wider application of discretionary fiscal measures, since such policy failed to produce the desired, or provable, results or was counterproductive.⁵⁸ 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 were 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.⁵⁹ 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. This was later reflected in the response of the financial markets. Stabilisation of public budgets therefore became a fiscal policy priority (as part of the so-called exit strategy) in 2011–2012.

The EU fiscal rules recommend a broadly balanced government budget policy over the business cycle and the free operation of automatic fiscal stabilisers, which can absorb shocks without

⁵⁸ The long 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.

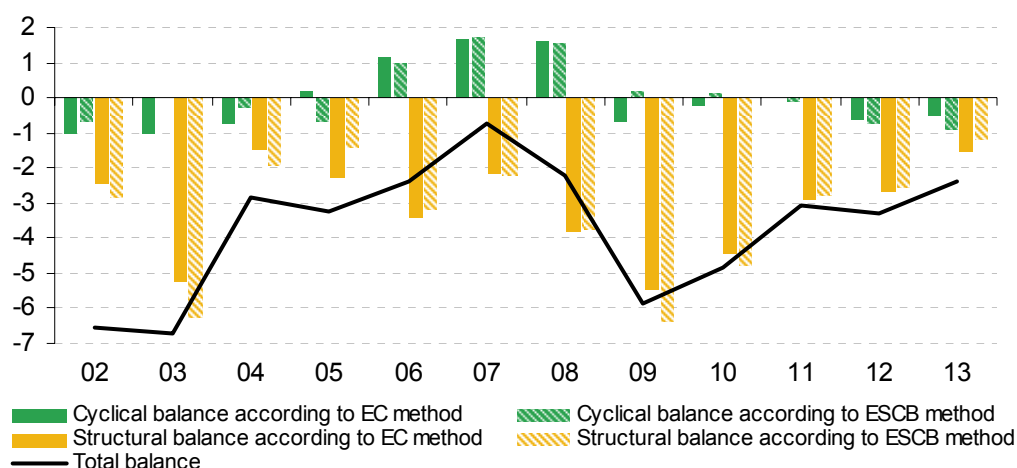
⁵⁹ For details on the assessment of the impact of discretionary measures and the operation of automatic stabilisers in the Czech Republic in 2001–2011, see Ambriško et al. (2012).

the need for ad hoc discretionary fiscal measures. In a period of recession, public finances should thus stimulate aggregate demand by means of deficits, while 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, preferably, 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 is adjusted for the effects of temporary or one-off fiscal measures that are not related to the basic characteristics of fiscal policy.

Chart 39 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 39: The fiscal balance and its cyclical and structural components (% of GDP)



Note: Positive values represent a public budgets surplus and negative values a public budgets 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 2012 and 2013 figures come from the CNB’s forecast published in Inflation Report III/2012)

The assessment of the trend in the structural component and its share in the overall deficit is basically the same for both methods (despite some differences in individual years). The structural balance shown in Chart 40 indicates that the government’s fiscal policy was persistently in a deficit and pro-cyclical for most of the period under review, since the structural deficit was not reduced even in the years of solid economic growth in 2002–2008. In this period, windfall tax revenues were employed to generate new public expenditures rather than reduce the deficit. Tax cuts affecting the revenue side were not accompanied by relevant austerity measures on the public expenditure side. Fiscal policy had the desirable counter-cyclical nature in 2009, the year most affected by the crisis, when government anti-crisis

measures leading to a widening of the structural deficit were adopted. In the following period, fiscal policy turned procyclical again as a result of public finance consolidation efforts. Despite a negligible economic recovery, the structural deficit was reduced considerably by budget austerity measures in 2010. The structural deficit shrank again significantly in 2011 due to government fiscal measures (by around 1.5–2% of GDP year on year depending on the methodology selected). According to the CNB's current forecast, the reduction of the structural deficit based on government revenue and expenditure measures should continue in 2012 and 2013, again amid a decline, or only very weak growth, in the economy.

In the period under review (except for 2006–2008), the cyclical component played only a slightly negative role in the total budget balance, and the action of automatic stabilisers, which respond to the business cycle and smooth its fluctuations, was therefore very limited in the Czech Republic. 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. 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 III/2012, the cycle will foster an increase in the overall general government deficit in 2012–2013.

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 government sector 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 deficit 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 objective⁶⁰ (MTO)⁶¹ of a structural deficit of 1% of GDP in 2015. The achievement of these objectives should be aided by measures adopted by the government in 2011 and 2012 as part of reforms of the pension and health insurance system, and by minor measures aimed at streamlining the social benefit system and simplifying 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

⁶⁰ Convergence Programme of the Czech Republic, April 2012.

⁶¹ 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 public 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 2012 Convergence Programme assumes that this objective will be met in 2015.

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 to the MTO) so that sufficient room is left for stabilising fiscal policy in bad times. Table 15 summarises the forecast for the **fiscal balance** of the countries under review as published by the European Commission in spring 2012. 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 15: General government balance, European Commission estimate (% of GDP)

	Total balance					Structural balance				
	2009	2010	2011	2012	2013	2009	2010	2011	2012	2013
CZ	-5.8	-4.8	-3.1	-2.9	-2.6	-5.6	-4.6	-2.6	-1.8	-1.8
AT	-4.1	-4.5	-2.6	-3.0	-1.9	-2.7	-3.3	-2.4	-2.2	-1.8
DE	-3.2	-4.3	-1.0	-0.9	-0.7	-1.3	-2.3	-0.8	-0.4	-0.3
PT	-10.2	-9.8	-4.2	-4.7	-3.1	-8.6	-8.4	-6.2	-3.0	-1.3
HU	-4.5	-4.3	4.2	-2.6	-3.0	-2.2	-3.6	-4.3	-2.1	-2.0
PL	-7.4	-7.9	-5.1	-3.0	-2.5	-7.4	-7.5	-5.0	-2.8	-1.9
SI	-6.1	-6.0	-6.4	-4.3	-3.8	-4.4	-4.5	-3.9	-2.2	-1.9
SK	-8.0	-7.7	-4.8	-4.8	-5.1	-7.7	-7.3	-5.1	-4.4	-4.6
EA-17	-6.4	-6.2	-4.1	-3.2	-2.9	-4.6	-4.4	-3.4	-2.1	-1.9
CZ^{a)}	-5.8	-4.8	-3.1	-3.3	-2.4	-5.5	-4.4	-2.9	-2.7	-1.5

Note: The general government deficit is calculated according to ESA95 methodology and the "Excessive Deficit Procedure" definition.

^{a)} Total balance: data according to the CZSO's notifications (October 2012) for 2009–2011, and the CNB's estimates for 2012 and 2013 from Inflation Report III/2012. 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 (2012a), 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, all countries except Hungary saw a deterioration in 2008 as a result of the financial crisis and the subsequent economic downswing. Table 15 shows that due to automatic stabilisers and discretionary fiscal measures taken to boost the economy, all the countries under review significantly exceeded the 3% reference value for the public finance deficit in 2009–2010 (except Germany in 2009). However, thanks to consolidation measures, most of the countries under review are showing a gradual improvement and a return below this limit in the outlook for 2013, albeit with major risks regarding the fiscal impacts of any further escalation of the euro area debt crisis.

This confirmed in practice that positive public budget performance based mainly on extraordinary revenues (including windfalls) and only partly on reform measures, as observed before the crisis, 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 the above-mentioned extraordinary revenues, 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 just a classification of the speed at which the government is able to alter such expenditures if the need arises, with mandatory expenditures being the least flexible.⁶²

In this regard, the evolution of the expenditure structure in recent years and in the outlook until 2013 is not very encouraging. 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 16) as a result of adverse cyclical effects and in 2010–2012 also as a result of the government's budget austerity measures. Moreover, the current data, based on the government's draft state budget for 2013, imply a further, albeit more moderate, rise in the share of mandatory expenditure.

Table 16: Shares of mandatory state budget expenditure (%)

	2002	2006	2007	2008	2009	2010	2011	2012	2013
Shares of mandatory expenditure in total SB expenditure	51.5	51.3	50.8	53.7	53.3	54.3	56.5	58.1	58.7
Shares of mandatory expenditure in total SB revenue	54.8	56.7	54.1	54.6	63.8	62.8	64.4	63.7	64.1

Note: Data for 2002–2011 are actual figures; data for 2012 and 2013 are based on the government's August 2012 draft state budget (state budget compilation methodology).

Source: Ministry of Finance of the Czech Republic (2012), 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 17). "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. For both indicators, the Czech Republic ranked among the countries with lower figures, below the euro area average. The Czech Republic's low debt service expenditure ratio is a consequence of its still relatively low government debt. The situation is similar for compensation of employees (salaries in budgetary and subsidised organisations), which 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).

⁶² The definition of mandatory expenditures used in this analysis is given in the *Methodological Part*.

Table 17: Public revenues and expenditures in 2011 (% of GDP)

	CZ	AT	DE	PT	HU	PL	SI	SK	EA-17
Total revenue	40.3	47.9	44.7	44.7	52.9	38.5	44.5	32.6	45.3
- taxes	19.0	27.2	22.9	23.5	23.0	20.7	22.3	16.0	24.6
- social contributions	15.5	16.2	16.9	12.3	13.0	11.4	15.5	12.5	15.7
Total expenditure	43.4	50.5	45.7	48.9	48.6	43.6	50.9	37.4	49.4
- compensation of employees	7.3	9.3	7.8	11.3	10.1	9.8	12.7	7.1	10.6
- intermediate consumption	5.9	4.3	5.0	4.6	7.5	5.7	6.5	4.3	5.5
- social payments	20.0	24.5	24.6	22.1	17.9	16.2	20.2	18.2	23.2
- gross fixed capital formation	3.6	1.0	1.6	2.6	2.9	5.8	3.6	2.3	2.3
- interest expenditure	1.4	2.6	2.7	3.9	4.1	2.7	2.0	1.6	3.1

Source: European Commission (2010b)

A high share of mandatory expenditures defines (and limits) the room for government fiscal policy. On the one hand, high mandatory expenditures can limit the 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 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 can have serious macroeconomic impacts, can also become important factors limiting the stabilising ability of fiscal policy.⁶³ Moreover, fiscal policy will have to take into account the fact that in the reform of the Stability and Growth Pact the debt criterion will gain much greater weight than before, comparable to that of the deficit criterion.⁶⁴ Table 18 provides a comparison of the outlook for the ratio of gross consolidated debt to GDP.

⁶³ 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 a strongly adverse macroeconomic situation.

⁶⁴ See also section 2 in part D.

Table 18: Government debt, European Commission estimate (% of GDP)

	2002	2006	2007	2008	2009	2010	2011	2012	2013
CZ	27.1	28.3	27.9	28.7	34.4	38.1	41.2	43.9	44.9
AT	66.2	62.3	60.2	63.8	69.5	71.9	72.4	74.4	74.5
DE	60.7	68.1	65.2	66.7	74.4	83.0	81.2	82.2	80.7
PT	53.7	63.7	68.3	71.6	83.1	93.3	107.8	113.9	117.1
HU	55.9	65.9	67.1	73.0	79.8	81.4	80.6	78.5	78.0
PL	42.2	47.7	45.0	47.1	50.9	54.8	56.3	55.0	53.7
SI	27.8	26.4	23.1	21.9	35.3	38.8	47.6	54.7	58.1
SK	43.4	30.5	29.6	27.9	35.6	41.1	43.3	49.7	53.5
EA-17	68.0	68.6	66.3	70.1	79.9	85.6	88.0	91.8	92.7
CZ^{a)}	27.1	28.3	27.9	28.7	34.2	37.8	40.8	43.9	45.0

Note: ^{a)} Data according to the CZSO's notifications (October 2012) for 2009–2010, and the CNB's estimate from the forecast for 2012 and 2013 in Inflation Report III/2012.

Source: European Commission (2012a), CNB.

Like the other fiscal indicators, debt has been affected by dramatic changes in the economic situation in 2008–2010. In the countries under review, the slightly declining government debt path observed in the pre-crisis years has been 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 being reflected in a rise in mandatory expenditure connected with debt service (see Table 19), although this trend has so far been curbed by the prevailing low interest rates.

Table 19: Debt service, European Commission estimate (% of GDP)

	2002	2006	2007	2008	2009	2010	2011	2012	2013
CZ	1.1	1.1	1.1	1.1	1.3	1.4	1.4	1.4	1.5
AT	3.1	2.7	2.7	2.6	2.8	2.7	2.6	2.7	2.7
DE	3.0	2.8	2.8	2.8	2.7	2.5	2.7	2.6	2.4
PT	2.8	2.8	2.9	3.0	2.8	2.9	3.9	4.8	4.9
HU	4.1	3.9	4.2	4.2	4.7	4.1	4.1	4.1	4.2
PL	2.9	2.7	2.3	2.2	2.6	2.7	2.7	2.7	2.7
SI	2.2	1.4	1.3	1.1	1.4	1.6	2.0	2.5	2.6
SK	3.6	1.5	1.4	1.2	1.4	1.3	1.6	1.9	2.0
EA-17	3.5	2.9	3.0	3.0	2.9	2.8	3.1	3.2	3.2

Source: European Commission (2012b)

The overview shows that the growth rate of debt service expenditure in the Czech Republic only slightly exceeds the levels in some of the countries under review, but lags behind the growth rate of the average for the euro area and the EU as a whole (where an increase from 2.6% of GDP in 2009 to 3.1% of GDP in 2013 is expected).

2.1.3 Sustainability of public finance

Sustainability of public finance, i.e. a controlled 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 20.

Table 20: Age-related government expenditures (% of GDP)

	Pensions		Health care		Long-term care		Total	
	2010	2060	2010	2060	2010	2060	2010	2060
CZ	9.1	11.8	6.9	8.6	0.8	1.5	16.8	21.9
AT	14.1	16.1	7.4	9.0	1.6	2.8	23.1	27.9
DE	10.8	13.4	8.0	9.4	1.4	3.1	20.2	25.9
PT	12.5	12.7	7.2	8.3	0.3	0.6	20.0	21.6
HU	11.9	14.7	4.9	6.0	0.8	1.4	17.6	22.1
PL	11.8	9.6	4.9	6.8	0.7	1.7	17.4	18.1
SI	11.2	18.3	6.1	7.2	1.4	3.0	18.7	28.5
SK	8.0	13.2	6.2	8.3	0.3	0.7	14.5	22.2
EA	12.2	14.2	7.3	8.4	1.8	3.5	21.3	26.1

Source: European Commission (2012c)

The Czech Republic (together with Slovakia) has the lowest level of age-related expenditure compared to the other selected countries (and also in the broader context of the EU) in the base year. Due to positive effects of parametric changes in the pension system (the “small” pension reform), the Czech Republic maintains a position among the countries with expenditure below the euro area average at the long-term forecast horizon, despite some increase in expenditure.

Ensuring public finance sustainability therefore remains 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 and approved by the parliament aim to limit growth in age-related expenditure. As regards public finance sustainability, the increase in the retirement age, which was adopted within 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 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.

To sum up, despite a relatively low government debt level (compared to that in the other selected countries and to the 60% Maastricht debt criterion), fiscal policy in the Czech Republic has been facing a relatively high structural deficit throughout the period under review and since 2009 has also been facing a growing government debt-to-GDP ratio and increasing debt service expenditure. A relatively high share of mandatory expenditures, which are time-consuming and politically challenging to change, is limiting for fiscal policy. Coping with population ageing will be of key importance for sustainability. Although compliance with the fiscal convergence criteria can be expected in the years ahead, numerous measures fostering efficiency and sustainability of public finances will have to be adopted and implemented in the Czech Republic so that the stabilising function of fiscal policy can be fulfilled and the necessary conditions for adoption of the euro can be credibly met.

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 variants 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 an absence of wage flexibility. The Phillips curve estimates were made using the ordinary least squares method (OLS) for the periods 2002 Q1–2008 Q2 and 2008 Q3–2012 Q1. Table 21 shows a summary of the results.

Table 21: Elasticity of wages to the unemployment rate

	2002Q1–2008Q2	2008Q3–2012Q1
CZ	-0.087 **	-0.002
AT	-0.023	-0.042
DE	0.027	0.114
PT	0.034	0.095
HU	-0.009	-0.073
PL	-0.105	0.010
SI	-0.126	0.011
SK	0.061	-0.027
EU-17	-0.049	-0.008

Note: The significance of the elasticity is marked ** for the 5% significance level.

Source: CNB calculations.

The estimated wage elasticity for the Czech Republic decreased in the latter period under review, becoming statistically insignificant. The estimates for the latter period are not statistically significantly different from zero for all the countries under review. Real wages in the Czech Republic and the other countries under review are thus not likely to have had a stabilising effect at the macroeconomic level in 2008–2012. 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.⁶⁵ Apart from changing base wages (which show significant downward rigidity), firms influenced total labour costs by adjusting the more flexible components of remuneration and in other alternative ways.⁶⁶ The absence of real wage flexibility may be linked with lagged changes in wages compared to the changes in unemployment and with the impacts of cost pressures, associated among other things with the evolution of world commodity prices. The above-mentioned conclusions thus send out a rather ambiguous message as regards euro adoption in the Czech Republic.

⁶⁵ See Box 3 in the 2009 Alignment Analyses.

⁶⁶ See Box 1 in the 2011 Alignment Analyses.

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. The values of persistence indicators in Methods 2 and 3 increase with inflation persistence. 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.

Table 22 summarises the inflation persistence estimates for 2002 Q1–2012 Q2. Compared to the other countries under review, the inflation persistence in the Czech Republic is approximately average for all three estimation methods. The potential impacts of a common monetary policy would thus be similar in this respect. However, greater price flexibility would be an advantage in terms of adjustment to an asymmetric shock.

Table 22: Inflation persistence estimates

	Method 1	Method 2	Method 3
CZ	0.81	0.84	0.43
AT	0.78	0.72	0.38
DE	0.81	0.70	0.48
PT	0.89	0.87	0.52
HU	0.83	0.61	0.45
PL	0.81	0.86	0.42
SI	0.78	0.88	0.54
SK	0.81	0.90	0.40

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 and skill mismatch in the supply of and demand for labour. High long-term unemployment is one of the indicators of high structural unemployment, regional differences in unemployment may be related to low regional mobility of labour, and skill mismatch may point to inappropriate configuration of the education system.

Table 23 shows the **long-term unemployment** rate in the countries under review. As in most of these countries, this indicator gradually declined in the Czech Republic from levels above 4% to 2% due to robust economic growth in 2003–2008. In 2010, it reflected the impacts of economic recession with a lag and increased to 3%. The subsequent moderate decline in 2011 reflected the previous year's temporary economic recovery. The long-term unemployment rate also declined in the other countries under review in 2011, except for Slovenia, Poland and Austria. The long-term unemployment rate has been falling continuously in Germany since 2007. Compared to the other countries under review, the Czech Republic has the second-lowest long-term unemployment rate behind Austria. By contrast, Slovakia still has the highest long-term unemployment rate.

The share of the long-term unemployed in total unemployment (see Table 24) is cyclical. It fell considerably in 2009, largely due to a sharp increase in the number of persons newly unemployed as a result of the economic crisis. In 2010, the share of the long-term unemployed in total unemployment increased to 41% as the duration of unemployment of the newly unemployed exceeded 1 year. It remained at the same level in 2011. The other countries under review show a similar pattern as the Czech Republic. The Czech Republic has the third-lowest indicator of the countries under review, behind Austria, which has a considerably lower share than the other countries, and Poland. In Slovakia, by contrast, the share of the long-term unemployed is much higher than in the rest of the sample.

Table 23: Long-term unemployment rate (%)

	2002	2006	2007	2008	2009	2010	2011
CZ	3.7	3.9	2.8	2.2	2.0	3.0	2.7
AT	1.1	1.3	1.2	0.9	1.0	1.1	1.1
DE	4.2	5.8	4.9	4.0	3.5	3.4	2.8
PT	2.0	4.3	4.2	4.0	4.7	6.3	6.2
HU	2.5	3.4	3.4	3.6	4.2	5.5	5.2
PL	10.9	7.8	4.9	2.4	2.5	3.0	3.6
SI	3.5	2.9	2.2	1.9	1.8	3.2	3.6
SK	12.3	10.3	8.3	6.7	6.5	9.3	9.2

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

Source: Eurostat

Table 24: Share of the long-term unemployed in total unemployment (%)

	2002	2006	2007	2008	2009	2010	2011
CZ	51	54	52	49	30	41	41
AT	16	27	27	24	21	25	26
DE	48	56	57	53	46	47	48
PT	36	50	47	47	44	52	48
HU	45	45	47	47	42	49	48
PL	54	56	51	34	30	31	37
SI	55	49	46	42	30	43	44
SK	65	76	74	70	54	64	68

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

Source: Eurostat

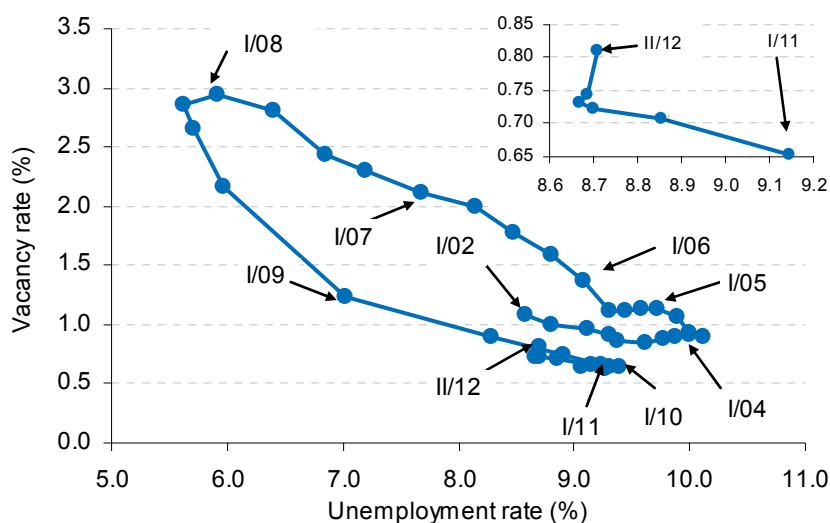
Cyclical and **structural unemployment** can be analysed by means of the Beveridge curve and with the aid of the aggregate fixed effects of the matching function.⁶⁷ The Beveridge curve plots the vacancy rate against the unemployment rate. Decreasing (increasing) unemployment amid a rising (falling) number 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.⁶⁸ There was a cyclical decline in unemployment from around the end of 2005 until early 2008 amid strong demand for labour stemming from robust growth in economic activity. Unemployment then recorded a cyclical rise starting in mid-2008 as the economy cooled. This was reflected in a shift in the opposite direction. In 2011, owing to a previous slight economic recovery, the Beveridge curve saw a reverse cyclical shift in the north-west direction. Further administrative changes, including termination of the duty of firms to report vacancies to labour offices, were adopted at the start of 2012.⁶⁹ However, this change did not visibly affect the Beveridge curve. The unemployment rate has been broadly flat in 2012, amid a slight increase in vacancies.

⁶⁷ 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.

⁶⁸ Horizontal or vertical shifts of the Beveridge curve not only reflect changes in structural unemployment, but often also administrative effects on the number of unemployed persons and vacancies. Such shifts occurred probably at the end of 2004 and in 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).

⁶⁹ The Labour Code and the Employment Act were extensively amended with effect from 1 January 2012. The most important changes to the Labour Code included a modification of the duration and chaining of fixed-term contracts, the possibility of temporarily assigning an employee to another employer, an increase in the maximum number of hours worked under service contracts, and a modification of working hours accounts. The amended Employment Act, among other things, tightened the definition of illegal employment (employment based on trade licence certificates), changed the conditions for exclusion of job applicants from the labour office register, cancelled the duty to report vacancies, and tightened the eligibility conditions for unemployment benefit.

Chart 40: Beveridge curve

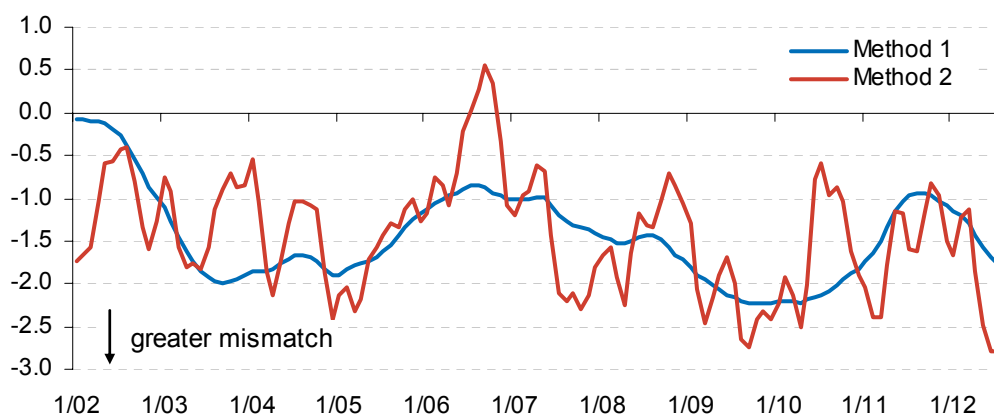


Note: Seasonally adjusted quarterly data.

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 41). Moreover, both methods suggest that the decline in mismatch recorded in 2010 and 2011 was only temporary and that the structural mismatch is not improving.⁷⁰

Chart 41: Indicator of mismatch between supply and demand on the labour market



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).

Regional differences in unemployment can be quantified using the coefficient of variation of the unemployment rate for areas (NUTS II) and regions (NUTS III). Table 25 shows that coefficients of variation of the unemployment rate for regions in the Czech Republic have been gradually decreasing since 2008. The gradual decline in this indicator can partly be explained by the economic cycle, with the transition into recession and a larger rise in unemployment in

⁷⁰ For the methodological differences see Galuščák and Münich (2007).

regions with lower unemployment resulting in a noticeable decline in regional differences in the unemployment rate in 2009.⁷¹ By contrast, a continuing decline in the coefficient of variation in the years of renewed economic growth (i.e. 2010 and 2011) suggests a slight decline in the mismatch between the regional supply of and demand for labour. The coefficient of variation also dropped noticeably in Portugal in 2011, while increasing in the other countries. The Czech Republic is in the middle of the notional ranking of the countries under review.

Table 25: Coefficient of variation of the unemployment rate (%)

	NUTS II regions							NUTS III regions					
	2002	2006	2007	2008	2009	2010	2011	2002	2006	2007	2008	2009	2010
CZ	44	45	42	44	34	31	28	52	46	43	46	35	32
AT	43	44	45	40	31	35	38	44	45	46	41	33	37
DE	55	39	44	45	37	36	41	58	44	50	51	43	41
PT	31	21	20	18	18	20	12	36	29	27	-	-	-
HU	32	32	39	43	31	23	27	36	36	45	48	36	28
PL	17	12	14	18	20	14	15	27	28	39	30	32	28
SK	23	38	38	41	32	27	32	31	43	46	51	38	29

Note: The coefficient of variation is the ratio of the standard deviation weighted by region size to the average unemployment rate in percent.

Source: Eurostat (LFS).

Low regional mobility of the population may be one of the causes of the regional differences in unemployment in the Czech Republic. Although **internal mobility** (see Table 26) in the Czech Republic has long been greater than in Poland and Slovakia, it is significantly lower than in Germany and especially Austria. This indicator recorded a temporary slight increase in the Czech Republic in 2007 compared to the previous period, but fell back to its previous level in the following years.⁷² Sánchez and Andrews (2011) also point to very low population mobility in Slovenia, Slovakia, Poland and the Czech Republic in 2007.

Table 26: Internal migration (per 1,000 inhabitants)

	2002	2006	2007	2008	2009	2010	2011
CZ	22	22	25	24	22	23	-
AT	43	36	37	38	37	37	-
DE	47	43	44	44	44	44	-
HU	23	25	25	24	21	-	-
PL	11	13	11	11	11	11	11
SI	10	14	43	38	42	-	-
SK	16	17	16	15	16	16	16

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

⁷¹ The coefficient of variation of the unemployment rate is counter-cyclical in the Czech Republic (see Galuščák and Mních, 2003).

⁷² The figures in Table 32 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.

rate have decreased, so the Czech results are in the middle in terms of this indicator. Internal geographical labour mobility remains low by comparison with advanced European countries, thus reducing the ability to adjust through the labour market. The long-term unemployment trend is similar to that in the other countries under comparison, although its rate is among the lowest.

2.3.2 Estimate of the structural unemployment rate

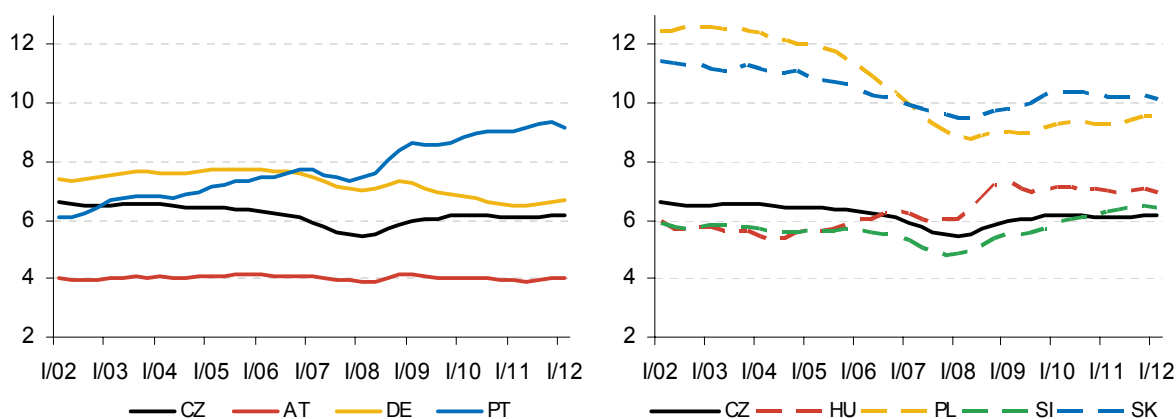
Structural unemployment is a sign of labour market inflexibility, hindering the smooth two-way transition of economically active persons between employment and unemployment. This type of unemployment shows up, for example, in regional differences in unemployment or skill mismatch between unemployed persons 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 inefficient 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 (non-accelerating inflation rate of unemployment), i.e. the unemployment rate consistent with stable inflation, which adjusts total unemployment for unemployment caused by cyclical effects. 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 42 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 coped well with the effects of the economic crisis (thanks among other things to the introduction of the *Kurzarbeit* reduced working hours scheme and earlier labour market reforms). The unemployment rate in Germany rose only slightly during the crisis and was falling again by 2009 H2 (when adjusted for seasonal effects); this was reflected in a decreasing NAIRU. In the other countries under review, the impacts of the crisis on the labour market were longer-lasting. In Poland, Slovenia and Portugal, the unemployment rate has been rising steadily since 2008, and this has been reflected in gradually increasing NAIRUs. In Hungary and Slovakia, estimated structural unemployment rose to higher levels following the onset of the economic crisis, but has been flat or falling slightly in recent years.

The evolution of the labour market in the Czech Republic was similar to that in neighbouring countries. The global economic crisis began to take effect following a positive trend until 2007/early 2008. The NAIRU stopped going up in 2010 H1 and has been flat at around 6% since then. The NAIRU estimate for the Czech Republic is among the lowest in the sample of countries under review. From the perspective of structural unemployment, therefore, we do not see any significant obstacles to the Czech Republic joining the monetary union.

Chart 42: The NAIRU (%)



Source: Eurostat, CNB calculations.

2.3.3 International labour mobility

International labour mobility within a currency area is one of the most important channels for the ability of individual economies to absorb asymmetric shocks, in particular those of a long-term nature, through changes in labour supply.⁷³

International mobility is also evidenced by the data on the **proportion of foreigners in the population** (see Table 27). The share of foreigners in the population in the Czech Republic is similar to that in Portugal and Slovenia; in Hungary, Poland and Slovakia, by contrast, this share is lower. Austria and Germany have considerably higher shares of foreigners. Compared to previous years, there has been a marked increase in the share of foreigners in the population in the Czech Republic since 2006. In 2011, however, the rise came to a halt in the Czech Republic and most other countries under review. The growth in foreign employment was a result of rising demand for labour and can be viewed as evidence of an ability to adjust. However, the mobility of the foreign labour force may itself pose a risk where employees are entering sectors with chronic excess labour supply, as this may hinder employment prospects and have adverse social effects. However, foreign workers usually increase labour market flexibility, not least because they are often used as agency workers. According to OECD (2012a), the Czech Republic recorded the highest level of immigration from non-EU countries of all the countries that joined the EU in 2004. The data on international migration during the crisis in this study also show that although migration performed its role from the point of view of correcting macroeconomic imbalances, it can by no means be regarded as the main adjustment mechanism.

⁷³ See, for example, Mundell (1961) or McKinnon (1963).

Table 27: Share of foreign nationals in the population (%)

	2002	2006	2007	2008	2009	2010	2011
CZ	1.6	2.5	2.9	3.3	3.9	4.0	4.0
AT	9.1	9.7	9.7	10.0	10.3	10.5	10.8
DE	8.9	8.8	8.8	8.8	8.8	8.7	8.8
PT	2.2	2.6	4.1	4.2	4.2	4.3	4.2
HU	1.1	1.5	1.7	1.8	1.9	2.0	2.1
PL	0.1	0.1	0.1	0.2	0.1	0.1	0.1
SI	2.3	2.4	2.7	3.4	3.5	4.0	4.0
SK	-	0.5	0.6	0.8	1.0	1.2	1.3

Source: Eurostat, CNB calculations.

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 so that they reflect 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).⁷⁴ If industry-level bargaining predominates, it may result in lower wage flexibility. The negative impact of industry-level bargaining can be intensified by regulations forcefully extending the binding effect of collective pay agreements beyond the contractual parties (Brandt, Burniaux and Duval, 2005).

According to CZSO data, the **coverage of employees by collective agreements** was relatively stable until 2010 (see Table 28). A sizeable fall in coverage was recorded in 2011, but this may be a statistical effect (a rise in “not specified” answers rather than “no collective agreement” answers). The 2010 Alignment Analyses give the latest available 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.

Table 28: Coverage of employees in the Czech Republic by collective agreements (%)

	2006	2007	2008	2009	2010	2011
Collective agreement yes	48	48	46	47	48	38
Collective agreement no	28	38	38	35	31	33
Not specified	23	15	16	18	21	30

Source: CZSO, Trexima.

⁷⁴ 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.

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 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 almost 40%. The minimum wage has remained at CZK 8,000 since 2007 and its ratio to the average wage is therefore falling over time. It fell to 32.5% in 2011 (see Table 29) and is relatively low by comparison with the other countries under review. By contrast, Slovenia has the highest ratio. Therefore, the minimum wage in the Czech Republic probably does not have a stronger negative impact on the labour market than in the other countries.⁷⁵

Table 29: Minimum wage (% of the average wage)

	2002	2006	2007	2008	2009	2010	2011
CZ	36.9	39.7	38.1	35.2	34.0	33.3	32.5
PT	43.0	40.7	41.6	44.6	43.2	42.8	42.6
HU	42.1	41.7	39.8	38.5	38.6	38.8	39.1
PL	33.0	36.1	32.4	35.7	39.7	40.4	38.3
SI	45.3	45.2	43.4	41.0	41.1	47.5	50.0
SK	32.4	34.8	-	34.7	36.5	36.6	36.6

Note: Until 2008, the 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. No minimum wage has been defined at the national level in Germany. In Austria it represents around 30% of the average wage.

Source: Eurostat.

The minimum wage's negative impact on wage flexibility can be more pronounced in sectors and professions where the wage is well below the national average. The minimum wage as a percentage of the wage in the first decile of the wage distribution is traditionally high in low-skilled professions (see Table 30). This relationship indicates that for the 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 90% of their average earnings in 2011. This is the highest level since 2003. In the case of the average for the business sector and in the case of all three monitored classes of low-skilled professions, the ratio of the minimum wage to the wage in the first decile increased in 2011. This was due to a marked wage decline in the lowest part of the wage distribution.

Table 30: Minimum wage and gross monthly wage in selected professions (%)

Main employment class	Minimum wage / 1 st decile						
	2003	2006	2007	2008	2009	2010	2011
Total for the Czech Republic (business sector)	63.9	70.4	67.2	63.2	63.9	63.5	72.9
- services and shop workers	87.6	91.1	88.8	85.0	85.9	86.5	91.4
- skilled agricultural and fishery workers	74.4	75.8	70.6	67.2	67.9	65.2	71.9
- elementary occupations	84.3	90.7	89.8	87.7	88.1	89.1	91.7

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.

⁷⁵ According to Amendment No. 246/2012 Coll., the minimum wage will be unified on 1 January 2013.

Employment protection

Strict legislative **conditions for the recruitment and dismissal of employees** tend to reduce labour market flexibility and increase long-term unemployment (OECD, 2004; OECD, 2010).⁷⁶ 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.

Data on the evolution of the Employment Protection Legislation (EPL) index and on the costs of individual termination of open-ended contracts until 2008 are given, for example, in the 2011 Alignment Analyses. In terms of the aggregate index of employment protection, the Czech Republic ranked among the countries with average or slightly easier regulation of the labour market in 2008 in the sample of countries compared, amid disparate intensity of protection of permanent and temporary jobs. However, European labour markets are generally rather inflexible, so the benchmark offers a rather low standard in this case.⁷⁷

Revisions to the Czech labour code valid from 1 January 2012 introduce a new level of severance pay in the case of organisational changes. Employees will now receive severance pay equal to one average wage if they have been employed for less than a year, two times the average wage if they have been employed for more than a year but less than two years, and three times the average wage in all other cases. These measures should encourage the creation of new open-ended jobs. More specifically, a reduction in the cost of dismissing an employee in the period shortly after the employment contract is signed or the probationary period has ended should result in higher job creation, especially for graduates and young people.

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 with children, school-leavers and older people. Moreover, high labour taxation increases the size of the grey economy⁷⁸ and can significantly increase unemployment if the minimum wage is high.⁷⁹ The taxation of high earners is also 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 2011 and throughout the period under review was higher than in Portugal, Poland and Slovakia both at the average wage level and for low-income earners (see Table 31). By contrast, labour taxation is markedly 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 increased slightly in the Czech Republic and in most of the countries under review.

⁷⁶ By contrast, Bassanini and Duval (2006) confirm the conclusions of other papers that employment protection, as measured by the EPL index (Employment Protection Legislation), has no clear impact on the overall unemployment 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.

⁷⁷ New EPL data will not become available until 2013.

⁷⁸ Brandt et al. (2005)

⁷⁹ Bassanini and Duval (2006).

Table 31: Overall labour taxation

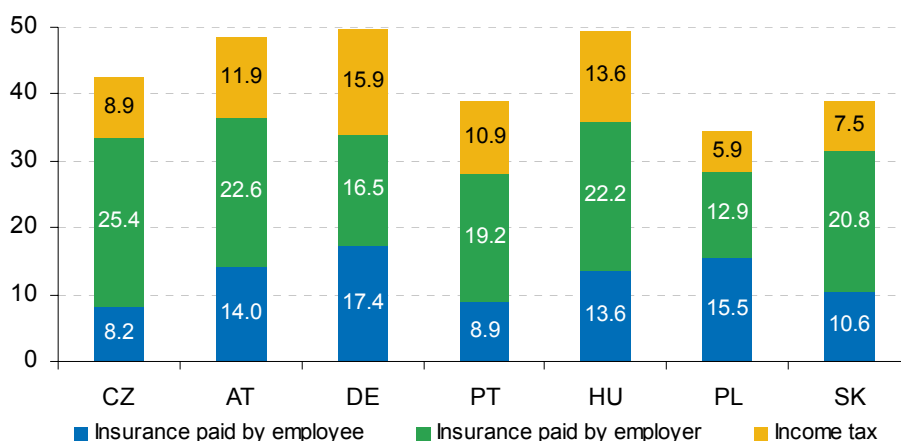
	100% of average wage					67% of average wage				
	2002	2008	2009	2010	2011	2002	2008	2009	2010	2011
CZ	42.9	43.4	41.9	42.2	42.5	41.5	40.0	38.6	38.9	39.5
AT	47.1	48.8	47.9	47.9	48.4	43.1	44.4	43.3	43.3	43.7
DE	53.5	52.0	50.9	49.1	49.8	48.1	47.3	46.0	44.9	45.6
PT	36.6	37.6	37.2	37.7	39.0	32.3	32.9	32.3	32.8	33.1
HU	53.7	54.1	53.4	46.4	49.4	48.2	46.7	46.3	43.6	45.2
PL	42.7	39.7	34.0	34.3	34.3	41.4	38.7	33.0	33.3	33.4
SK	42.5	38.9	37.6	37.8	38.9	40.8	36.1	34.3	34.5	36.1

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.

Source: OECD (2012b), CNB calculations.

The data on the components of labour taxation (see Chart 43) show that in all the selected countries health and social insurance affects overall labour taxation to a considerably greater extent than income tax. Compared to the other countries under review, the Czech Republic has lower health and social insurance than Germany, Hungary and Austria. Austria has the highest sum of insurance paid by employees and employers. By contrast, Portugal has the lowest insurance burden, closely followed by Poland. Since 2006, overall taxation has increased in all the countries under review except Poland, where it has been broadly flat. The rise in overall taxation in all the countries was mostly due to contributions paid, while the rise in income tax was only moderate.

Chart 43: Components of labour taxation in 2011 (%)

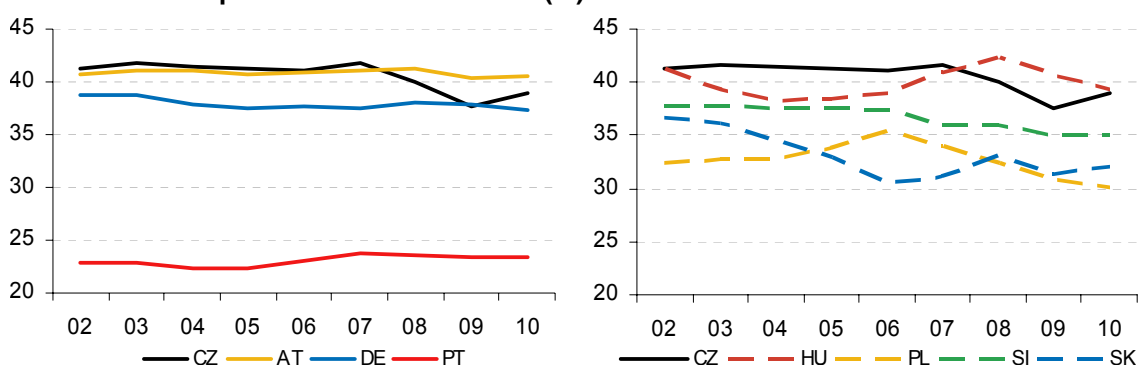


Source: OECD (2012b).

The real tax burden, i.e. aggregate tax revenues as a percentage of total compensation of employees relating to the production factor of labour, is described by **implicit tax rates** (see Chart 44). Until 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. In 2010, however, the implicit tax burden edged up again; while lower than in Austria, it was still

considerably higher than in Portugal, Poland Slovenia and Slovakia and slightly higher than in Germany. Owing to a continuing decline in the implicit tax rate in Hungary in recent years, the implicit tax burdens in the Czech Republic and Hungary have converged to approximately the same level.

Chart 44: 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 total compensation of employees.

Source: Eurostat (2012).

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). This motivation is measured using 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 32 compares the **net replacement rates** for short-term and long-term unemployment and for two types of households.

Table 32: Net replacement rates

	Initial phase of unemployment ^{a)}								Long-term unemployment ^{b)}							
	Individuals without children				Family (2 children) ^{c)}				Individuals without children				Family (2 children) ^{c)}			
	2002	2008	2009	2010	2002	2008	2009	2010	2002	2008	2009	2010	2002	2008	2009	2010
CZ	58	61	75	77	88	91	79	79	50	42	45	48	88	77	75	74
AT	55	55	55	55	85	83	81	82	52	51	51	53	85	83	81	82
DE	61	59	60	61	81	80	80	77	58	48	50	47	81	80	80	77
PT	78	78	78	75	77	77	77	77	22	24	24	23	67	70	70	70
HU	56	73	73	75	58	79	79	81	26	30	32	31	52	70	69	45
PL	75	67	67	75	70	63	63	72	46	35	33	34	65	57	56	56
SK	66	71	60	61	109	67	57	59	75	27	28	28	122	60	57	59

Note: 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.

^{a)} Unemployed entitled to unemployment benefits.

^{b)} Unemployed persons after five years.

^{c)} 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 in 2010 were highest in Austria (the lowest replacement rate), followed by Germany and Slovakia. In the Czech Republic, by contrast, the incentive to seek work was the lowest and edged down further compared to the previous year. In the case of a family with two children, the highest pressure to find a job is exerted in Slovakia (slightly higher even than that exerted on childless individuals). The support provided to Slovak families is about three-quarters of that in the Czech Republic. Austria, the Czech Republic and Germany have the highest net replacement rates (i.e. the lowest incentives to work) in the case of long-term unemployment. In Portugal, by contrast, a long-term unemployed person receives only around 23% 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. There are marked differences in the support provided to families with small children in the event of long-term unemployment. As in the initial phase of unemployment, the support provided to families with children is highest in Austria. In 2010, the support provided to families declined significantly in Hungary, while net replacement rates were broadly flat in other countries.

Several legislative changes affecting the incentive to work have been made in the Czech Republic in recent years. In 2010, the ceiling on the annual base for calculating health and social insurance was increased to 72 times the monthly average wage. 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 was reduced to 45% of the previous net wage over the entire support period.⁸⁰ 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. Another important change is the abolition of payment of unemployment benefits together with so-called "non-clashing" employment, which should increase the incentive to seek "proper" work.⁸¹

In addition to a rise in the tax discount for children to CZK 11,604, normative (deductible) housing expenses, which determine housing benefit, were increased as they are every year. The abolition of the social allowance was an important change in 2011. This allowance is now paid only to families who care for a long-term sick or disabled child.

The minimum subsistence level and minimum living level were increased in 2012. This change affects claims for certain other social benefits (child allowance, maternity allowance and social assistance benefits). In January 2012, normative housing expenses⁸² were increased slightly and a maximum time limit for drawing housing benefit was introduced. As regards, unemployment benefits, the period within which an applicant must work for at least 12 months was shortened to two years.

Microsimulations for model types of households using the methodology of Galuščák and Pavel (2007, 2012) reveal that the changes are leading to a decrease in net replacement rates (an increase in the incentive to work) compared to 2010 (see Chart 45) above all in households with children owing to the abolition of the social allowance. This shortfall in the income of the socially weakest households, which at the same time do not receive parental allowance, is partly offset with social assistance benefits. Net replacement rates are also falling slightly for

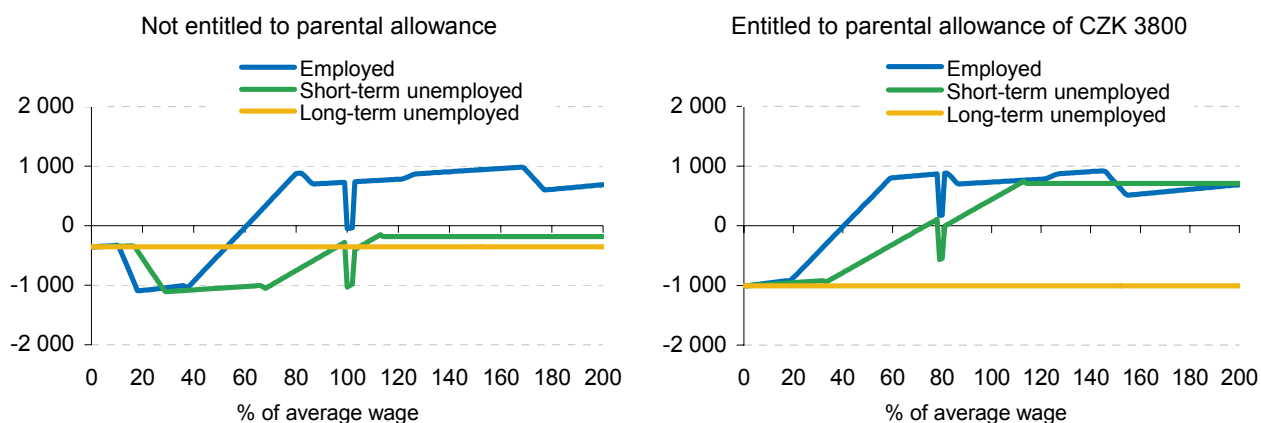
⁸⁰ Employees who prove that they terminated the employment contract for serious reasons are exempt from the reduction in unemployment benefits.

⁸¹ 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. Since 2011 it has not been possible to combine unemployment benefits with "non-clashing" employment.

⁸² In 2011, normative housing expenses recorded stronger growth due to rent deregulation.

childless households, owing to slower growth in benefits than in labour income.⁸³ The changes in social benefits are thus creating greater incentives to work.

Chart 45: Change in the net income of households with a non-working partner in 2011 compared to 2010 (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, 2012).

To sum up, the ratio of the minimum wage to the average wage in the business sector fell slightly and is now lower than in most of the countries under review. Labour taxation rose moderately in the Czech Republic and its implicit rate is the third highest behind Austria and Hungary. However, the incentives to work arising from the configuration of taxes and benefits remained relatively low in 2011 in the case of the initial phase of unemployment and, despite a gradual improvement, also in the case of low-income families with children. On average, however, the parametric changes made to taxes and benefits in 2011 tended to increase the financial incentive to work. The coverage of employees by collective agreements is essentially stable and does not exceed the level in the current euro area countries.

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.⁸⁴ Lower flexibility on product markets thus restricts adjustment mechanisms in the event of an asymmetric shock.

According to a World Bank assessment forming part of the regular survey of conditions for doing business, the Czech Republic recorded an improvement in 2011 and in 2012. The Czech Republic this year ranked 65th in the Doing Business database⁸⁵ (out of the total of 185 countries assessed). The conditions for doing business improved thanks also to reforms in data

⁸³ The effect of the temporary decrease in the tax discount per taxpayer in 2011 on households' net income is small.

⁸⁴ Nicoletti and Scarpetta (2004).

⁸⁵ See <http://www.doingbusiness.org/reports/global-reports/doing-business-2013>.

digitisation in the property cadastre, electronic communication with notaries, simplification of the tax system and reduction of the administrative burden on sole proprietors.⁸⁶

Despite the positive reform steps, World Bank data signal that the Czech Republic's position relative to other countries as regards the conditions for starting a business worsened year on year again (see Table 33). The Czech Republic's position was the worst of all the countries under review. 2010 saw a marked improvement in the area of closing a business (due among other things to amendments to the Insolvency Act). The positions of the other countries under review have remained broadly unchanged or worsened slightly in recent years. The conditions for closing a business in the Czech Republic are therefore comparable to those in most of the countries under review except Hungary, where the conditions are considerably worse.

Table 33: Conditions for starting and closing a business

	Starting a business					Closing a business				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
CZ	91	113	130	138	140	115	116	32	33	34
AT	106	122	125	134	134	20	20	20	21	12
DE	101	84	88	98	106	35	35	35	36	19
PT	39	60	59	26	31	22	22	21	22	23
HU	29	39	35	39	52	58	58	62	66	70
PL	145	117	113	126	124	85	85	81	87	37
SI	42	26	28	28	30	40	40	38	39	42
SK	39	66	68	76	83	39	39	33	35	38

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 (2012).

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.

The Czech Republic has been applying a **corporate income tax rate** of 19% since 2010. Together with Slovakia and Poland, this is the lowest figure among the countries under comparison (see Table 34). Except for Hungary, which had the lowest tax burden at the beginning of the period under review, corporate income tax rates declined sharply in the countries under comparison between 2002 and 2009. The tax burden on businesses in the countries under comparison was unchanged in the last three years, with the exception of Portugal, which applies a 2.5 percentage point higher rate this year than in 2011.

⁸⁶ See Act No. 169/2012 Coll.

Table 34: Highest statutory corporate income tax rate (%)

	2002	2006	2007	2008	2009	2010	2011	2012	Change (p.p.)
CZ	31.0	24.0	24.0	21.0	20.0	19.0	19.0	19.0	-12.0
AT	34.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	-9.0
DE	38.3	38.7	38.7	29.8	29.8	29.8	29.8	29.8	-8.5
PT	33.0	27.5	26.5	26.5	26.5	29.0	29.0	31.5	-1.5
HU	19.6	17.5	21.3	21.3	21.3	20.6	20.6	20.6	1.0
PL	28.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	-9.0
SI	25.0	25.0	23.0	22.0	21.0	20.0	20.0	20.0	-5.0
SK	25.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	-6.0

Note: Changes in p.p. for 2002–2012.

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 a complementary indicator of the tax rate (see Table 35). Following a sizeable decrease in the implicit tax rate in the Czech Republic in 2008 and 2009, a more moderate decline continued in 2010. The implicit tax rate in the Czech Republic is thus roughly in the middle of the group of countries under review, behind Hungary, Poland and Slovakia. With the exception of Slovakia, it also declined in the other countries in 2010. Hungary saw the largest fall (due among other things to the lifting of the solidarity surcharge on corporations, the raising of the ceiling for application of the regular corporate income tax rate, and the introduction of deductibility of sectoral surtaxes from the tax base).

Table 35: Implicit corporate income taxation rate (%)

	2002	2006	2007	2008	2009	2010	Change (p.p.)
CZ	28.5	24.3	23.7	22.0	20.2	19.6	-8.9
AT	28.1	22.9	24.2	25.4	24.6	22.4	-5.7
PT	23.1	23.3	27.4	36.0	-	-	-
HU	20.7	14.9	18.7	19.0	21.1	8.6	-12.1
PL	37.0	19.1	20.3	20.3	14.9	12.8	-24.2
SI	25.3	30.3	30.6	28.6	23.5	25.1	-0.2
SK	34.4	20.3	19.8	21.7	22.5	19.2	-15.2

Note: The implicit taxation rate expresses aggregate corporate tax revenues as a percentage of the potential tax base. Changes in p.p. for 2002-2010. 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

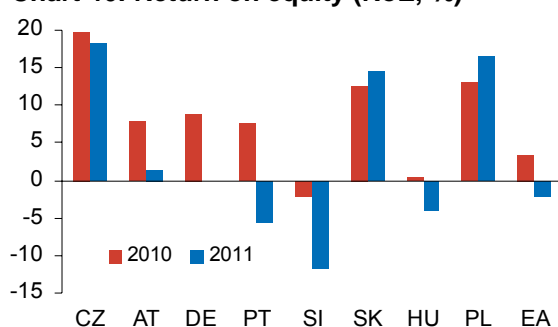
The banking sector – the largest segment of the financial sector – is currently stable. This increases the probability of it performing its adjustment and stabilisation mechanism function well in the event of euro adoption. It displays very good profitability, capitalisation and liquidity,⁸⁷ and its very limited dependence on financing from abroad is also a very favourable phenomenon. The reduction of credit risk in bank balance sheets during 2011 can also be regarded as positive. The evolution of credit risk going forward will be closely linked with that

⁸⁷ Data presenting international comparisons are only indicative, as the methods for calculating individual indicators and consolidating within banking groups 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.

of the real economy. However, the domestic banking sector's good capitalisation and its ability to generate sufficient income even in bad times provide ample room for absorbing loan impairment losses in the event of persisting weakness in global and, in turn, domestic economic growth. The Czech banking sector is therefore 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 during the crisis, significantly exceeding the figure for the euro area countries (see Charts 46 and 47). Moreover, the profit of the Czech banking sector consists of stable components, above all interest rate income and fee and commission income. The Slovak and Polish banking sectors are also showing good profitability.

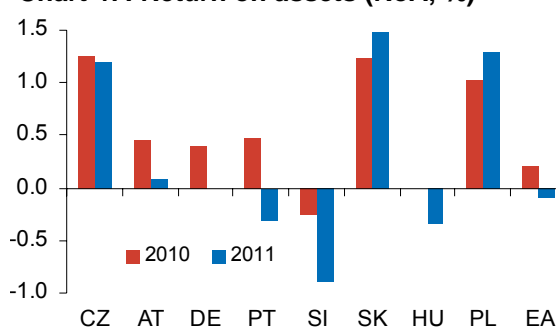
Chart 46: Return on equity (RoE, %)



Note: The chart does not contain the figure for Germany in 2011 owing to data unavailability. To calculate the euro area (EA) average for 2011, 2010 data were used for Germany.

Source: IMF FSI.

Chart 47: Return on assets (RoA, %)



Note: The chart does not contain the figure for Germany in 2011 owing to data unavailability. To calculate the euro area (EA) average for 2011, 2010 data were used for Germany.

Source: IMF FSI.

The quality of the loan portfolio of banks in the Czech Republic saw a slight year-on-year improvement in 2011. Non-performing loans (NPLs) accounted for 5.9% of total bank loans in the Czech Republic at the end of 2011 (see Table 36). The modest economic recovery in 2010 and 2011 contributed to a decline in NPLs in the Czech Republic. The evolution of credit quality differs across the countries under review. As in the Czech Republic, a slight decrease in the NPL ratio was recorded in Germany, Austria, Poland and Slovakia. By contrast, a rapidly rising NPL ratio was visible in both Slovenia and Hungary, where it exceeded 10% in 2011.

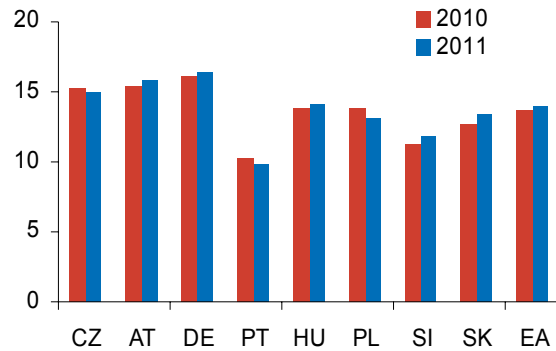
The stability and shock-absorbing capacity of the Czech banking sector is aided by a relatively strong capital buffer, consisting mainly of retained earnings. The domestic banking sector's capital adequacy ratio, which stands at 15%, is the third highest among the countries under review, behind Germany and Austria (see Chart 48). Thanks to their sufficient capitalisation and operating profits, domestic banks should be able to withstand even relatively large credit losses.

Table 36: Non-performing loans, NPLs (% of total bank loans)

	2009	2010	2011
CZ	5.2	6.2	5.9
AT	2.3	2.8	2.7
DE	3.3	3.2	3.0
PT	4.8	5.2	7.5
SI	5.8	8.2	11.8
SK	5.3	5.8	5.6
HU	6.7	9.8	13.4
PL	7.9	8.8	8.2
EA	4.6	5.2	6.5

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

Source: IMF FSI, CNB.

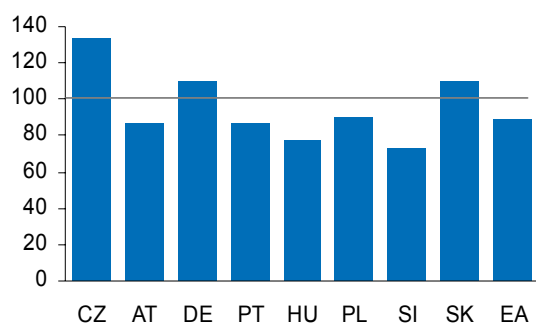
Chart 48: Capital adequacy ratio (%)

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

Source: IMF FSI.

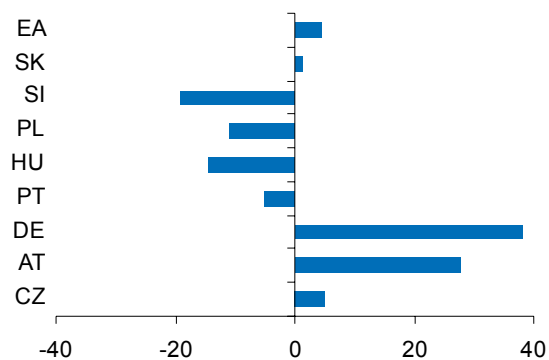
Domestic banks focus largely on a very conservative banking business model that involves accepting deposits and providing loans. Deposits of residents exceed loans to residents by 34% (see Chart 49), the largest figure in the countries under review, while almost 90% of deposits and 80% of loans are vis-à-vis residents in the domestic currency. The Czech banking sector is not dependent on funds from abroad. Despite a moderate decline in 2011, its net external position remained positive at 5% of GDP (see Chart 50). As regards the other countries under review, only Germany, Austria and, to a small extent, Slovakia have a positive net external position of banks. Czech banks' exposure to highly indebted euro area countries (not only to governments, but also to private sectors) is low, and the stress test results therefore indicate that even a sharp drop in its value should not have a significant effect on the banking sector as a whole.

The above information suggests that Czech 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 (one of the indicators of bank liquidity) preserves room for banks to further expand their lending while maintaining sufficiently high liquid assets without being forced to seek funding on interbank markets or abroad. Thus, the link of domestic banks to the European banking sector is due solely to the fact that almost 97% of the banking sector's assets are controlled by foreign owners.

Chart 49: Ratio of deposits to loans in selected EU countries (%)

Note: Data as at the end of 2011; deposits/loans to residents. EA represents the euro area.

Source: ECB.

Chart 50: Net external position of banking sector (net external assets in % of GDP, 2011)

Note: Data for AT as at the end of 2010.

Source: IMF IFS, central banks.

To sum up, the Czech banking sector is displaying very good levels of traditional macroprudential indicators. It should therefore continue to be able to absorb adverse economic shocks and dampen their impacts so that the domestic real economy is affected as little as possible.

Banking sector stress tests

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. To capture the long-term effects of shocks, the previous two-year test horizon was extended at the end of 2011 and the tests now focus on the coming three years. The test results using the data available as of 31 March 2012 indicate that the capitalisation of the sector as a whole would stay above the regulatory minimum of 8% even in an extreme stress scenario. The results thus confirm that the Czech banking sector is highly resilient to potential negative shocks.

The **Baseline Scenario** corresponds to the CNB's official macroeconomic forecast published in Inflation Report II/2012. The scenario expected the Czech economy to stagnate in 2012 and recover in 2013. In the first two years, the scenario is based on the CNB's official prediction. Beyond this horizon, extrapolation towards the expected long-term equilibrium values is used.

The **Europe in Depression** stress scenario assumes a longer-lasting adverse trend in economic activity in Europe as a result of persisting uncertainty regarding the solution to the euro area debt crisis, intensive deleveraging and the impact of new regulatory rules restricting bank loan supply. The adverse foreign developments are reflected in the Czech Republic in a sustained decline in GDP over the entire three-year horizon of the scenario. Households are hit hardest by the adverse developments, with wages stagnating and real income falling due to commodity price growth, exchange rate depreciation and a further rise in indirect taxes. The worse solvency of households and corporations causes significant losses in the banking sector.

Table 37 presents the evolution of the key macroeconomic variables of the stress scenario compared to the baseline scenario.

Table 37: Evolution of key macroeconomic variables in the scenarios used

	Baseline			Europe in depression		
	2012	2013	2014	2012	2013	2014
GDP (y-o-y in %)	0.0	1.9	3.1	-2.0	-3.2	-2.7
Exchange rate (CZK/EUR)	24.7	24.3	24.2	25.3	26.5	25.9
Inflation (%)	3.6	1.5	1.7	3.6	1.3	1.4
Unemployment (%)	8.8	8.9	8.4	9.3	11.0	11.7
3M PRIBOR (%)	0.8	0.8	1.1	2.4	1.3	0.0

Note: In the first two years, the path in the *Baseline Scenario* is based on the CNB's official prediction. Beyond this horizon, it is extrapolated towards the expected long-term equilibrium values.

Source: CNB.

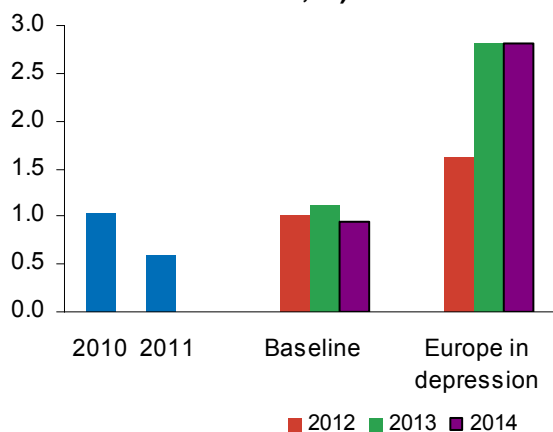
Owing to the adverse trend in economic activity, the stress scenario assumes a significant rise in credit risk parameters (PD – probability of default, LGD – loss given default). This leads to a rise in loan impairment losses and therefore in provisions. The risk costs of the banking sector, as measured by the amount of new provisions relative to initial good (i.e. non-defaulted) loans, would thus rise significantly in the stress scenario from 0.6% in 2011 (see Chart 51).

In the context of growing credit risk, the ratio of NPLs to total loans would increase considerably in the stress scenario for both non-financial corporations and households, with the overall NPL ratio rising from 6% in 2011 to 8.5% during 2014. The adverse developments would therefore result in high loan impairment losses. The losses in the banking sector would be accompanied by losses due to a drop in prices of government bonds as a result of market interest rate movements.

As part of the *Europe in Depression* stress scenario, an extended variant entitled *Europe in Depression and Loss of Confidence* was tested. This assumes an escalation of the debt crisis and a significant rise in EU government bond yields. Impairment of exposures to all euro area countries with public debt exceeding 60% of GDP is assumed. The degree of impairment is derived from the ratings of the countries in question and ranges from 0% to 65%.⁸⁸ This assumption implies additional losses of CZK 20 billion for the Czech banking sector.

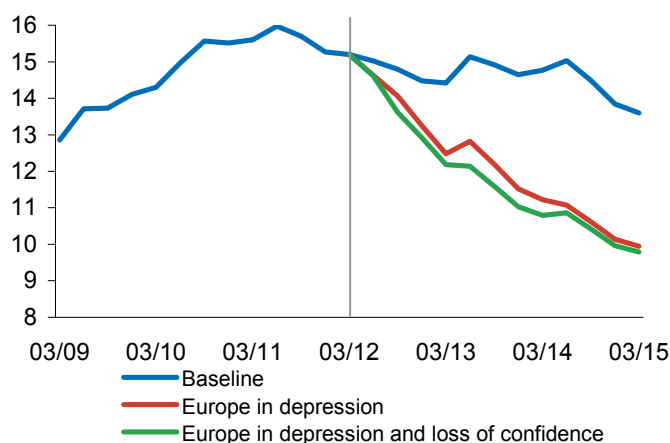
⁸⁸ More details on the haircut used for the exposures to individual countries are given in CNB (2012b), p. 85.

Chart 51: Risk costs of the banking sector (provisioning relative to non-defaulted loans, %)



Source: CNB.

Chart 52: Capital adequacy ratio (%)



Source: CNB.

Despite the relatively high credit and market losses, the banking sector as a whole remains stable in both stress scenarios and its aggregate capital adequacy ratio stays almost 2 percentage points above the regulatory minimum of 8% (see Chart 52). This result is achieved despite the conservative settings of many of the stress test assumptions. One of the reasons for the banking sector's strong resilience is its high capital adequacy ratio, which exceeded 15% at the end of 2011.

In both variants of the stress scenario, several banks could get into a situation of insufficient capital adequacy. In the extended variant of the *Europe in Depression and Loss of Confidence* stress scenario, 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 CZK 17.6 billion (i.e. around 0.4% of GDP) as at the end of the test period; this is an insignificant figure relative to the size of the sector.

Based on the above indicators and stress test results, the Czech banking sector can be considered stable and resilient to external shocks. Its characteristics confirm that the sector itself is not a source of shocks; moreover, it would dampen rather than amplify 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.							Commentary
		The <u>underlined figures</u> are not comparable to the previous values owing to data revisions or changes in calculation or methodology.							
		2006	2007	2008	2009	2010	2011	2012	

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	<u>74.1</u>	<u>73.4</u>	73.9	73.8	Czech convergence process not yet resumed. 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	<u>67.9</u>	64.6	67.4	70.4	Convergence resumed, but large lag in price level behind AT and DE and also PT and SI.
Real exchange rate against euro, 1998=100; from 2012: 2002=100.	1.1.1	123	129	133	151	143	149	<u>126</u>	Real annual rate of appreciation 2.6% on average so far. Real appreciation of koruna against euro at average rate of 1.6–2.1% 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	-0.9	Relatively low real rates mean lower need for adjustment.
3M real rate outlook for following five years given no change in exchange rate and risk premium (min/max)	1.1.1	-	-	0.5	0.5	-0.2	0.0	0.2	After euro adoption, real rates would be low or even negative.
				-0.6	-1.7	-1.6	-0.6	-0.3	

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), 2007–2010 (2002 Q1–Q1 in given year), 2011 (2004 Q1–2011 Q1), 2012 (2008 Q4–2012 Q1)										
GDP	Method 1	1.1.2	0.29	0.62	0.73	0.88	0.92	<u>0.92</u>	<u>0.95</u>	High correlation is present for all compared countries in recent years and is affected by effects of shared shock in form of financial and economic crisis and euro area debt crisis.
	Method 2	1.1.2	0.26	0.33	0.34	0.84	0.71	<u>0.80</u>	<u>0.87</u>	
GDP (dyn. correlation, avg. for cycle length considered)	1.1.2	0.33	0.70	0.80	0.89	0.94	<u>0.93</u>	<u>0.93</u>		
IPI	Method 1	1.1.2	0.77	0.77	0.74	0.90	0.92	<u>0.95</u>	<u>0.97</u>	Statistically significant and relatively high correlation according to both methods.
	Method 2	1.1.2	0.41	0.25	0.31	0.35	0.32	<u>0.42</u>	<u>0.62</u>	
Total exports	Method 1	1.1.2	0.64	0.63	0.63	0.76	0.85	<u>0.88</u>	<u>0.84</u>	Statistically significant and relatively high correlation according to both methods.
	Method 2	1.1.2	0.00	-0.04	0.36	0.47	0.52	<u>0.64</u>	<u>0.81</u>	
Czech exports to EA vs. EA GDP	Method 1	1.1.2	0.42	0.38	0.38	<u>0.56</u>	0.78	<u>0.65</u>	<u>0.98</u>	Statistically significant and relatively high correlation according to both methods.
	Method 2	1.1.2	0.24	0.30	0.27	<u>0.49</u>	0.48	<u>0.34</u>	<u>0.84</u>	

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.							Commentary
		The <u>underlined figures</u> are not comparable to the previous values owing to data revisions or changes in calculation or methodology.							
		2006	2007	2008	2009	2010	2011	2012	

Analysis of cyclical alignment using the Taylor rule

Taylor rule indicator of interest rate alignment	1.1.3	-	-	above-average alignment				Czech Republic's alignment according to Taylor rule is now highest ever. Alignment has long been higher than in other new EU Member States.
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Synchronisation of demand and supply shocks

Demand shocks	Structural vector auto-regression, correlation	1.1.4	asymmetry			weak sym.	asym	No correlation of demand-side shocks between Czech Republic and euro area. By contrast, correlation of supply-side shocks has been high in recent years.
Supply-side 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	0.16	Czech Republic has the highest structural dissimilarity among countries compared, owing to higher share of industry and lower share of services (financial intermediation among others).
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Convergence of interest rate differential

Difference in three-month and ten-year interest rates	1.1.6	convergence		slight divg.	stabilisation	slight divg.	Sustained low interest rate differentials. Slight rise in 2009 and again in 2012. Markedly lower than in HU and PL.
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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.
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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)	7-8 (2012)	Volatility started rising again in early 2012 owing to euro area debt crisis. However, it is 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)	8-10 (2012)	

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.							Commentary
		The <u>underlined figures</u> are not comparable to the previous values owing to data revisions or changes in calculation or methodology.							
		2006	2007	2008	2009	2010	2011	2012	

Effect of international economic relations

Share of foreign trade with euro area in total foreign trade

		2006	2007	2008	2009	2010	2011	2012	
Exports, %	1.2.1	59.3	<u>58.4</u>	<u>57.1</u>	<u>67.9</u>	<u>67.4</u>	<u>66.4</u>	<u>63.9</u>	High level of trade links. Increase compared to 2008 value reflects inclusion of SK in euro area total.
Imports, %	1.2.1	52.9	<u>58.4</u>	<u>59.1</u>	<u>61.3</u>	<u>61.8</u>	<u>60.1</u>	<u>59.9</u>	

Ratio of direct investment from/to euro area to GDP

		2004	2005	2006	2007	2008	2009	2010	
Inflow of direct investment, % (stock)	1.2.1	38	42	43	48	49	53	53	High level of ownership links, particularly on FDI inflow side.
Outflow of direct investment, % (stock)	1.2.1	1	1	1	2.3	4.1	5.2	5.8	

Share of intra-industry trade

		2004	2005	2006	2009	2010	2011	2012	
Grubel-Lloyd index	1.2.2	0.8	0.8	0.8	<u>0.4</u>	0.4	0.5	0.5	High share of intra-industry trade (only AT and DE have higher shares) remains broadly unchanged. Fall in 2009 due to change in methodology.

Financial market

Financial sector

		2006	2007	2008	2009	2010	2011	2012	
Financial system assets (% of GDP)	1.3.1	135	133	142	146	153	156	158	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	56	

Conditions for transmission of monetary policy changes to firms and households

		2006	2007	2008	2009	2010	2011	2012	
Structure of financial assets and liabilities of corporations and households	1.3.2	-	-	differences exist			Difference apparent mainly in relatively high share of trade liabilities 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 related to 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.							Commentary
		The <u>underlined figures</u> are not comparable to the previous values owing to data revisions or changes in calculation or methodology.							
		2006	2007	2008	2009	2010	2011	2012	

Financial market integration

Speed of convergence of yields with yields in euro area (beta-convergence coefficient, since 08/2007)

Market	1.3.5	-	-0.6	-0.6	-0.39	-0.38	-0.37	-0.38	Financial and economic crisis and subsequent euro area debt crisis led to decline in speed of adjustment on some of the analysed markets.
Money market	1.3.5	-	-0.9	-0.8	-0.89	-0.90	-0.88	-0.89	
Foreign exchange market	1.3.5	-	-0.9	-0.8	-0.73	-0.69	-0.73	-0.73	
Bond market	1.3.5	-0.9	-0.9	-0.9	-0.84	-0.77	-0.79	-0.80	
Stock market	1.3.5	-0.9	-0.9	-0.9	-0.84	-0.77	-0.79	-0.80	

Adjustment mechanisms

Fiscal policy

General government balance % of GDP, ESA 95 (latest outturns and CNB forecast for given year)	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)	-3.3 (2011) -3.3 (2012)	Latest developments reflect fiscal consolidation measures. Deficit is currently only slightly above Maastricht convergence criterion.
Government debt % of GDP, ESA 95 (latest outturns and CNB forecast for given year)	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)	40.8 (2011) 43.9 (2012)	Total government debt is rising. Ratio of government debt to GDP remains well below Maastricht convergence criterion, but risk to its sustainability remains.

Wage flexibility and inflation persistence

Rate of adjustment of real wage growth to unemployment rate									
Phillips curve	1.2.2	-0.008	-0.019	-0.030	<u>-0.009</u>	-0.003	-0.001	<u>-0.002</u>	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	<u>0.79</u>	0.79	0.81	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	0.84	
Method 3 (sum of AR coefficients, time-varying mean)	2.2.2	-	0.45	0.32	0.32	0.38	0.38	0.43	

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.							Commentary
		The <u>underlined figures</u> are not comparable to the previous values owing to data revisions or changes in calculation or methodology.							
		2006	2007	2008	2009	2010	2011	2012	

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	2.7	Impacts of economic recession are still apparent in long-term unemployment, but last year has seen slight improvement.
Long-term unemployment as % of total	1.3.2	53	54	52	49	30	41	41	
Regional differences in unemployment									
Coefficient of variation in unemployment rate (at regional level, NUTS III)	1.3.2	44 (20 04)	47 (20 05)	47	<u>45</u>	35	32	-	Regional differences in unemployment rate have decreased in recent years owing to higher 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	6.1	Structural unemployment rate is among lower ones of countries compared.
International migration									
Share of foreign nationals in population (%)	2.3.3	-	2.5	2.9	3.3	3.9	4.0	4.0	High growth in foreign employment in 2006–2008.
Institutional environment									
Trade unions and collective bargaining Coverage of employees by collective agreements, %	2.3.4	minor impact		51 (2006)	51 (2006)	46	48	38	Coverage of employees by collective agreements fell in 2011. Practice of extending the coverage of higher collective agreements is not very common in Czech Republic.
Minimum wage as % of average wage in industry and services	2.3.4	38.8 (2004)	39.1 (2005)	38.1 (2007)	38.1 (2007)	35.0 (2008)	<u>33.4</u>	32.5	Falling since 2007. Level in Czech Republic is lowest among countries compared.

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 <u>underlined figures</u> are not comparable to the previous values owing to data revisions or changes in calculation or methodology.							Commentary
		2006	2007	2008	2009	2010	2011	2012	
Overall labour taxation (persons on average wage, %)	2.3.4	43.8	42.6	42.9	43.4	41.9	42.2	42.5	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, %)	2.3.4	42.1	40.1	40.5	40.0	38.6	38.9	39.5	
Ratio of net household income when breadwinner is unemployed and employed, %	2.3.4	81 (2004)	74 (2006)	74 (2006)	80 (2007)	77 (2008)	75 (2009)	77 (2010)	Financial incentive to work in case of short-term and long-term unemployment in Czech Republic is lower than in other countries under review.

Product market flexibility

Regulatory barriers to entrepreneurship

Conditions for starting a business (ranking, WB)	2.4.1	-	-	86 (2008)	86 (2008)	<u>113</u>	130	140	Conditions in Czech Republic are worst among countries compared.
Conditions for closing a business (ranking, WB)	2.4.1	-	-	113 (2008)	113 (2008)	<u>116</u>	32	34	Conditions worse than in AT and PT, similar to SK.

Taxation rate

Implicit corporate taxation rate	2.4.2	-	-	23.4 (2006)	<u>24.1</u> (2007)	<u>25.7</u> (2008)	<u>19.9</u> (2009)	<u>19.6</u> (2010)	Implicit tax rates higher than in HU, SK and PL, lower than in AT and SI.
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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	5.9	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	15.0	Highest capital adequacy ratio after 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	9.8	Sufficient level.
Deposit-to-loan ratio, %	2.5	-	-	-	-	138	137	134	Sufficient financing sources from deposits ensure relative independence of Czech banks on both Czech interbank market and foreign financial markets.

F METHODOLOGICAL PART

D *Economic 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

$$\sigma_t = \sqrt{\frac{\sum_{i=1}^n (x_{i,t} - \bar{x}_t)^2}{(n-1)}} \text{ where } x_{i,t} \text{ is the value of the macroeconomic variable for country } i,$$

$$\bar{x}_t = \frac{\sum_{i=1}^n x_{i,t}}{n} \text{ is the arithmetic (unweighted) mean of the variable across countries at time } t \text{ and}$$

n is the number of countries under review. In addition to the 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 *Analyses of the Czech Republic's Alignment with the Euro Area*

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 Eurostat-OECD Purchasing Power Parities (PPP) programme. 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 2002.

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 2011 (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:

$$P_{C,t} = 23.70 + 0.79 HDP_{PPP,t} + 0.89 AR(1)_t,$$

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 $AR(1)_t$ 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 2012 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 2.5% a year.⁸⁹ 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 0.85–0.92 in the simulations).

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 the monitored countries over the whole period under review. The average annual level of interest rates is deflated by the annual inflation rate for the country concerned, using the Harmonised Index of Consumer Prices. The estimate of real “equilibrium” 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 calculated from Eurostat data as the ratio of the annual volume of wages and salaries in euro or PPP to the number of employees (without conversion into full-time equivalents, for which not enough data are available).

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.

⁸⁹ This parameter has been lowered from the 3% used in previous issues of the *Alignment Analyses*, as the rapid convergence seen before the financial and economic crisis can no longer be expected to re-emerge in the new EU Member States.

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**,⁹⁰ which allows this requirement to be met, was therefore used as a third method. Dynamic correlation is based on spectral analysis of time series, takes values in the range [-1, 1] and, analogously to the static correlation coefficient, is defined by the relationship:

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

where $S_x(\lambda)$ and $S_y(\lambda)$ are spectral density functions and $C_{xy}(\lambda)$ is a 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 literature⁹¹ 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.

⁹⁰ Croux, Forni and Reichlin (2001).

⁹¹ For example, Frankel and Rose (1997). The features of the individual methods are described in Canova (1998).

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.

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: 2002 Q1–2008 Q2 and 2008 Q3–2012 Q1. An analysis using rolling correlations was prepared as an alternative to the breakdown into two periods.

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).⁹² 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:

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

where π_t is the inflation rate, y_t the output gap (derived using the Hodrick-Prescott filter),⁹³ π_t^* the inflation target and r^{eq} equilibrium real interest rates.

The time series of seasonally adjusted GDP, three-month money market rates and the HICP are taken from Eurostat’s database. As in Taylor (1993), equilibrium real interest rates and the inflation target are set at 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.⁹⁴

The Taylor rule indicator of interest rate alignment gives the sums of the squares of the deviations of country X from the implied rate for the whole euro area (EA) and is calculated using simple moving averages, with period length $m = 2$:

$$\bar{y}_{X,t} = \frac{y_{X,t-m} + y_{X,t-m+1} + \dots + y_{X,t} + \dots + y_{X,t+m-1} + y_{X,t+m}}{2m+1},$$

⁹² 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).

⁹³ When interpreting the results, one must bear in mind that the HP filter is merely an approximate and imperfect method of estimating the output gap.

⁹⁴ 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.

where $y_{X,t} = (X_TR_t - EA_TR_t)^2$ is the square of the deviation of country X from the implied rate for the EA, and period length m is set to two quarters. The deviations are calculated in percentage points from the euro area implied rates.

To follow developments over time, $\bar{y}_{X,t}$ is calculated in six different quarters: 2002 Q1, 2004 Q1, 2006 Q1, 2008 Q1, 2010 Q1 and 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 data cover the period 2000 Q4–2012 Q1, which enables identification of shocks for 2002 Q1–2012 Q1. The source of the data is Eurostat.

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. When interpreting the results, one should keep in mind that the estimated shocks need not always correspond to the traditional concept of demand and supply shocks. When working with real data of limited length, a demand shock, which should have a temporary effect on GDP growth (e.g. the decline in economic activity due to the crisis) may be identified by the model as a supply shock.

The calculation of the correlation of shocks between the group of new EU Member States and the current euro area members and the euro area as a whole 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:

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

where sh_A^i is the percentage share of the i -th sector in value added as a whole in country A and sh_B^i is the percentage share of the i -th sector in value added as a whole in country B. The calculation is performed separately for each selected period. In our case, it is based on annual

data. The 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 $SL/100$.⁹⁵ The modified coefficient takes values in the range $[0, 1]$. 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 differential vis-à-vis the euro area is used to analyse the convergence of interest rates in the Czech Republic, Hungary, Poland, Slovenia and Slovakia.⁹⁶ 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 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 start in January 2002, except in the case of five-year interest rates in Slovakia and Slovenia, which start in February 2002 and August 2005 respectively. The time series terminate in June 2012 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 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. The compared data cover the period between January 2002 and June 2012 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.⁹⁷ 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.

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

$$^{95} SL = \sum_{i=1}^n \sqrt{\left(I_{sh^i} \cdot 100 - I_{sh^b} \cdot 100 \right)^2 \cdot \left(\frac{I_{sh^i} \cdot 100}{100} \right)} = 100 \sum_{i=1}^n \sqrt{\left(I_{sh^i} - I_{sh^b} \right)^2 \cdot I_{sh^i}} = 100 \cdot I_{SL}$$

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

⁹⁶ 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.

⁹⁷ The same method is used in Castrén and Mazzotta (2005).

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

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

The analysis covers the period from 1 January 2002 to 28 August 2012 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:

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

where σ is the standard deviation, r_t is the daily return and T is the number of working days in the period of six months (126 for a year with 252 working days). We use the following relationship to translate the standard deviation of logarithmic daily returns to an 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, EURLSKV6M, 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 Eurostat (2000–2012 H1, monthly data).

The source of 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.⁹⁸ Data on the inflow of foreign direct investment (FDI) from euro area countries and the outflow of direct investment (DI) to euro area countries were used. The GDP data are from Eurostat.

⁹⁸ The data for Slovakia are preliminary.

1.2.2 Intra-industry trade

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

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

GL_t is the ratio of the absolute value of intra-industry trade to foreign trade turnover. X_{it}^k and M_{it}^k 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 total exports and imports to and from the euro area in the countries under review.⁹⁹ 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.

The value of the GL index depends, among other things, on the level of aggregation 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,¹⁰⁰ resulting as expected in a higher value of this indicator for all countries. 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.¹⁰¹

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):

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

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_{ij}^k) in the unit value of imports (UVM_{ij}^k) for this category does not exceed 25%, i.e.:

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

⁹⁹ 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.

¹⁰⁰ This is particularly so in SITC 7 (Machinery and transport equipment).

¹⁰¹ 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.

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

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

Quarterly financial accounts data published by national central banks and the ECB are used as the input data for the analysis of the alignment of the structure of the financial assets and liabilities of non-financial corporations and households. The quarterly financial accounts are compiled according to ESA 95 methodology. In line with national accounting, a unified classification of **institutional units** and **financial instruments** is being promoted. As regards institutional units, the analysis provides a detailed examination of real sectors, i.e. non-financial corporations (S.11) and the merged sector of households (S.14) and non-profit institutions serving households (S.15). The analysis distinguishes five main types of financial instruments: currency and deposits, securities other than shares, loans, shares and other equity, and other accounts receivable/payable including insurance technical reserves and financial derivatives.

The analysis works with **outstanding amounts of financial assets and liabilities** as at the end of the period (quarter) under review. Consequently, the effect of transactions, revaluation and other changes in the volume of assets/liabilities on the change between the initial and final balance in each quarter is not explicitly taken into account. The analysis discusses the net positions of the aforementioned sectors in detail. The net position, expressed as **net financial assets**, is obtained as the balance of financial assets and liabilities and indicates the sector's financing ability or financing needs.

A detailed look at the structure of financial assets and liabilities is provided by **balance sheet indicators**, which capture the degree of risk arising from any mismatch between individual items of the financial balance sheet. The main indicators are:

Liquidity	= $(\text{currency} + \text{deposits}^{102} + \text{short-term securities} + \text{short-term loans provided}) / (\text{short-term debt securities issued} + \text{short-term loans accepted})$...measures the maturity mismatch by the ratio of short-term assets to short-term liabilities; an entity is able to pay its short-term liabilities if this indicator exceeds 100%.
Solvency	= $\text{total financial assets} / \text{liabilities excluding equity}$...measures the risk of overall insolvency
Share of short-term liabilities	= $(\text{short-term debt securities issued} + \text{short-term loans accepted}) / \text{total liabilities}$...the share of short-term liabilities in total liabilities
Debt/equity	= $(\text{bonds issued} + \text{loans accepted} + \text{other liabilities}) / \text{equity issued}$...measures the risk of mismatch between capital structure and excessive debt

For non-financial corporations, liquidity and the share of short-term liabilities may be affected by omission of the short-term component of other liabilities. In the case of the liquidity indicator, this omission is less problematic, as it is reasonable to assume that the shares of short-term other assets and liabilities (trade credits etc.) are approximately equal.

The debt/equity ratio cannot be used for the household sector. Given its insufficient information content with regard to the objective of the analysis, the liquidity indicator for the household sector was also excluded.

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 spread of client and market rates is used to analyse convergence of interest rates in the Czech Republic and the countries under review to the euro area average. Average weighted interest rates on new business, which reflect the rates agreed for all new business during the month, and three-month money market interest rates were used in the calculation.

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

¹⁰² Strictly speaking, only transferable deposits (excluding other deposits) should be included. However, this breakdown is not available for most countries or for the euro area.

Czech Republic and selected Central European countries, namely Poland, Hungary and Slovakia, and an assessment of the effects of the debt crisis on households' trust in the euro were performed using a survey conducted by Oesterreichische Nationalbank and published in 2012 Q2.

1.3.5 Financial market integration

Price-based measures

These measures use the concepts of beta-convergence and sigma-convergence (Adam et al., 2002).¹⁰³ 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 ¹⁰⁴ and a selected reference territory (a benchmark, B) at time t , Δ is the difference operator, α_i is a dummy variable for the respective country, L is the maximum lag (four weeks) 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 $\beta = 0$ or $\beta = -2$, 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:

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

where Y is the asset yield, \bar{Y}_t is the mean value of the yield over time t and i stands for the individual countries ($i = 1, 2, \dots, N$). For the purposes of this analysis, we 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.¹⁰⁵ In theory, σ takes only positive values. The lower is σ , the higher is the level of convergence. In theory, full integration is achieved when the standard deviation is

¹⁰³ 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).

¹⁰⁴ $Y_{i,t} = [\ln(A_{i,t}) - \ln(A_{i,t-1})]$ 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.

¹⁰⁵ For pairs of countries, the calculated values in each period are essentially equal to half the square of the yield differential.

zero,¹⁰⁶ 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 $\lambda = 270,400$.

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 2002 to July 2012. 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. The relevant time series were adjusted for exchange rate effects.

Thomson Datastream codes for the data sources used:

¹⁰⁶ This occurs on the money and foreign exchange markets for countries entering the euro area on a given date.

	Money market	Forex market	Bond market	Stock market
CZ	PRIBK3M	PRUSDSP	BMCZ05Y-(RY)	CZPXIDX
AT	-	-	BMOE05Y-(RY)	ATXIDX
DE	-	-	BMBD05Y-(RY) ^{b)}	DAXIDX
PT	-	-	BMPT05Y-(RY)	POPSI20
HU	HNIBK3M	HNUSDNB	BMHN05Y-(RY)	BUXIDX
PL	POIBK3M	POUSDSP	BMPO05Y-(RY)	POLWIGI
SI	-	SJUSDSP	-	SLOESBI
SK	SXIBK3M	SXUSDSP	SXGOVT1-(RY)	SXSAX16
EA	BBEUR3M ^{b)}	USECBSP ^{b)}	-	DJES50I ^{b), a)}

Note: ^{b)} benchmark; ^{a)} 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 cyclicity. 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. Three of the five macroeconomic bases used are labour market variables, and 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 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 "The 2012 Ageing Report: Economic and Budgetary Projections for the EU-27 Member States (2010–2060)" (European Commission, 2012c).

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, Hycklak and Johnes, 1992, or Babecký, 2008):

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

where w_t is the wage component of nominal unit labour costs at time t , p_t is the HICP index, u_t is the standardised unemployment rate (all variables in natural logarithms), Δ is the difference operator and ε_t is a random term. 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, as inflation is included in the explanatory variables and the inflation coefficient c_3 is not statistically different from 1. 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 the Eurostat database. To assess its evolution over time, wage cost elasticity is calculated for the period 2002 Q1–2008 Q2 and 2008 Q3–2012 Q1.

2.2.2 Inflation persistence

Inflation persistence is measured by three different methods. Quarterly data on HICP inflation (annual HICP changes) from 2002 Q1 to 2012 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 medium-term inflation value and T is the number of observations. Medium-term inflation is approximated using the Hodrick-Prescott (HP) filter. As the HP filter gives a biased trend estimate at the beginning and the end of the time series, the data for 2003 Q1 to 2011 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 the coefficients of the autoregressive terms are estimated. The modelled process used in Method 2 is described as

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

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

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

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

Method 3

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

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

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

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

where π_t^T is medium-term inflation (or the central bank's implicit inflation target), π_t^P is the inflation target perceived by the public, η_{1t} and ε_{1t} represent independent white noises, L^i is the lag operator and $\sum_{i=1}^4 \varphi_i$ is the sum of autoregressive coefficients. Inflation π_t is the observed variable and medium-term inflation π_t^T is approximated with the inflation time series smoothed using the HP filter. The Kalman filter and Bayesian estimation 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 twelve 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 München, 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 München, 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 II or NUTS III) and the evolution of the coefficient of variation over time can be used for comparison. The source of the data is Eurostat.

The CZSO publishes the volume of **internal migration** (movement between municipalities). Data on registered internal migration in other countries are published in statistical yearbooks. In the Czech Republic, migration of foreigners with long-term residence (over 1 year) is included in the statistics.

2.3.2 Structural unemployment

The NAIRU analysis presented in the main part of the text focuses on the medium-term NAIRU concept,¹⁰⁷ 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 prices. 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. The unemployment gap, i.e. the difference between the unemployment rate and the NAIRU, can be regarded as representing demand pressures in the equation.

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

$$u_t^* = u_{t-1}^* + v_t, \quad v_t \sim N(0, \sigma_v^2).$$

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 and x_t represents short-term supply shocks.

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.

¹⁰⁷ 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.

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).

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 (2012b).

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 (2012).

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 (2012b).

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 (Galušćák and Pavel, 2007). The calculations have been updated using the parameters valid in 2011.

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.¹⁰⁸

¹⁰⁸ For details on the stress testing methodology, see Financial Stability Report 2011/2012 (CNB 2012b).

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