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

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CNB CZECH NATIONAL BANK

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A INTRODUCTION

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

This set of analyses of the Czech economy's alignment with the euro area in 2010 has been drawn up in line with the Czech Republic's Updated Euro-area Accession Strategy and assesses the current state of economic alignment and flexibility in individual areas. The only exception is fiscal variables, where the future outlook is also assessed which is, however, predetermined to some extent by the current situation. This set of analyses is a follow-up to the documents of the same name published by the CNB in previous years. Besides the usual text, this year's document contains two boxes. The first discusses the fiscal crisis in euro area countries in detail and outlines its potential implications for euro adoption in the Czech Republic. The second box describes the CNB's latest findings on the interest rate transmission channel in the Czech Republic and assesses the effect of the global financial and economic crisis on its functioning.

The analyses themselves are divided into two basic groups according to the type of question they try to answer. The section entitled "Cyclical and Structural Alignment" indicates the size of the risk of different economic developments in the Czech Republic compared to the euro area and hence the risk of the single monetary policy being highly suboptimal for the Czech economy. The section entitled "Adjustment Mechanisms" answers the question of to what extent the Czech economy is capable of absorbing the impacts of possible asymmetric shocks using its own internal adjustment mechanisms.

These analyses are aimed at assessing the evolution of the alignment indicators over time and in comparison with selected countries. Those countries either are euro area members already (Austria, Germany, Portugal, Slovakia and Slovenia) or aspire to such membership in the future (Hungary and Poland).[1] All the analyses attempted to make comparisons with all the

[1] The selection of euro area countries includes both the 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.

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-16 level.[2]

[2] The EA-16 comprises the euro area Member States as of 1 January 2009, i.e. Belgium, Finland, France, Ireland, Italy, Cyprus, Luxembourg, Malta, Germany, the Netherlands, Portugal, Austria, Greece, Slovakia, Slovenia and Spain. Only in exceptional cases, owing to data unavailability, do the data not cover all EA-16 countries.

B EXECUTIVE SUMMARY

The Czech Republic's future entry into the euro area ensues from the commitments associated with EU membership. Adoption of the common European currency should lead to the elimination of exchange rate risk in relation to the euro area and to a related reduction in the costs of foreign trade and investment. This should further increase the benefits accruing to the Czech Republic from its intense involvement in the international division of labour. Besides the aforementioned benefits, however, adoption of the euro will simultaneously imply certain costs and risks arising from the loss of independent monetary policy and exchange rate flexibility vis-à-vis the Czech Republic's major trading partners. These negatives will be affected by the characteristics and situation of 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. The key factors for the Czech economy will be flexibility and resilience to shocks as well as sufficient overall economic and structural similarity to the euro area. The analyses presented in this document assess the similarity of the long-term economic trends, the medium-term development of economic activity and economic structure, the adjustment capacity of fiscal policy and the labour and product markets, and the functionality of financial markets.

Since the Czech Republic's original **Euro-area Accession Strategy** was adopted (i.e. since 2003),[3] the Czech economy had gradually been catching up with the average euro area economic level and had also been showing some signs of alignment with the euro area over the business cycle. In the last two years, however, this trend has been strongly affected by the global financial and economic crisis. As a consequence, the Czech and euro area economies have gone into recession and recorded a considerable deterioration in public finance. Interest rate differentials and exchange rate volatility have increased and financial market integration has loosened. The convergence trend of the domestic price level towards the euro area has been interrupted and cyclical and structural unemployment has risen. In the light of domestic developments, and taking into account the fiscal problems in the euro area over the last year and the persisting elevated financial market volatility, the current situation does not seem conducive to future euro adoption in the Czech Republic or to taking steps towards it.

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, its close trade and ownership links with the euro area, and the achievement of long-term convergence of the inflation rate. The recession caused the level and volatility of nominal interest rate differentials vis-à-vis the euro area to increase temporarily. However, the convergence of nominal interest rates can be regarded as sufficient, based on fundamentals, and therefore sustainable.

The second group comprises **areas which, in terms of euro adoption in the Czech Republic, pose a risk of macroeconomic costs, but which have shown some improvement in recent years.** The positive developments include the fact that until 2008 the Czech Republic was showing real economic convergence to the euro area. This convergence will

[3] An updated strategy for the accession of the Czech Republic to the euro area was adopted by the government in 2007. This stated, among other things, that the CNB would continue to draw up an analytical document every year assessing the Czech Republic's economic alignment with the euro area.

probably resume as soon as the domestic economy recovers from the recent economic contraction and the consequences of the planned consolidation of public finance. As measured by GDP per capita, the Czech Republic is more advanced than some euro area countries although this is evidently no guarantee of future smooth functioning of the economy in the monetary union. Compared to the euro area average, moreover, a clear difference persists in the price level. The previous price level convergence trend was interrupted in 2009 as a result of a sharp (but probably only temporary) depreciation of the koruna. The cyclical alignment of economic activity between the Czech Republic and the euro area has recently increased significantly, but this reflects the recent extreme global developments and has probably not increased the probability of greater future alignment of the business cycle in normal global economic conditions. The favourable developments also include a halt in growth in overall labour taxation and in the last few years also a rise in the ratio of the minimum wage to the average wage. In 2009, corporations responded to the sharp fall in demand by freezing or cutting nominal wages to a larger extent. This indicates an ability to adjust nominal wages, but in real terms there has been no increase in wage flexibility so far. The business environment is also showing some gradual improvement. In terms of labour market flexibility, the positive developments 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 the current economic downturn.

The third group consists of **areas which have recently recorded adverse developments in terms of future euro adoption**. The public finance deficit has deteriorated markedly as a result of the economic slump and the anti-crisis fiscal measures adopted. The overall fiscal deficit was 5.8% of GDP in 2009 and the structural deficit increased substantially. Austerity measures adopted for 2010 and planned for 2011 are likely to lead to a fall in the government deficit in the near future, but without fundamental reforms in subsequent years their impact will be of limited duration. Imminent rapid growth in government debt servicing costs and long-term challenges associated with population ageing pose significant risks to the evolution and sustainability of public finance in the longer run. The impacts of the economic downturn are starting to be felt in a rise in long-term unemployment. A new adverse factor in terms of future euro adoption is the fiscal and economic problems in the euro area, which are fostering financial market uncertainty and higher volatility. A renewed lack of financial market confidence in the euro on the one hand would increase the costs incurred by the Czech economy in satisfying the Maastricht exchange rate criterion and on the other hand would reduce the economic benefits of introducing the single currency. The activities of European institutions in reaction to the problems that have occurred are intended to strengthen the fiscal discipline rules in the euro area and limit the risk of similar situations arising in the future. However, they are still the subject of political negotiations.

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

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

Cyclical and Structural Alignment

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 decrease 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 gradually converging towards the euro area in real terms. However, this trend has halted– probably only temporarily – as a result of the financial and economic crisis. In 2009, similarly as in the previous two years, GDP per capita in the Czech Republic was 73% of the euro area average. The convergence process was also interrupted in the case of the price level of GDP. In 2009, this dropped to 65% of the euro area price level and it therefore remains below the level corresponding to the performance of the economy. The wage level in the Czech Republic in 2008 was roughly 36% of the average euro area level when converted using the exchange rate and just above 50% when calculated using purchasing power parity data. The real exchange rate of the koruna (on an HICP basis) appreciated on average by 3.3% a year between 1998 and 2009, 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 2.0–3.4% a year can be expected over the next five years. Continuing real appreciation of the exchange rate following euro area entry would therefore initially mean an increase in the inflation differential vis-à-vis the euro area and related lower (or even negative) real interest rates.

Alignment of economic activity and similarity of economic shocks will increase the likelihood that the single monetary policy in the monetary union will be appropriately configured from the perspective of the Czech economy. The analyses indicate increased correlation of overall economic activity between the Czech Republic and the euro area recently; the same goes for activity in industry and export activity. The significant recent rise in the monitored correlations, including supply shock correlation, should be taken with a large dose of caution, since these indicators have been strongly affected by the global economic downturn and the subsequent gradual recovery in economic activity proceeding in parallel in the Czech Republic and the euro area. The observed increased correlations are therefore not necessarily a good indicator of future developments.

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. Of the other countries under review, Slovakia has a comparable economic structure. 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 asymmetry.

Fast convergence of **nominal interest rates** in the immediate run-up to joining the euro area acted as an asymmetric shock in some economies in the past, generating macroeconomic imbalances and risks to financial stability. For a country planning to enter the monetary union, earlier gradual interest rate convergence is therefore an advantage. The fact that the difference between Czech and euro area short-term market interest rates was close to zero for a long time (i.e. between 2002 and 2007) is favourable from this perspective. However, a modest positive interest rate differential opened up in the second half of 2008. This widened further during 2009 owing to the eruption of the global financial crisis and because the European Central Bank – unlike the CNB – started to use unconventional monetary policy instruments. Government bond yield differentials peaked at the start of 2009 and also increased slightly in connection with the Greek crisis in 2010 Q2.

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

The Czech economy's strong **trade and ownership links** with the euro area magnify the benefits arising from the elimination of potential fluctuations in the exchange rate. Following Slovakia's entry, the euro area is the partner for approximately 70% of Czech exports and more than 60% of Czech imports, a level comparable to, or even higher than, in the other countries under review. The high share of trade was maintained despite a decline in the overall volume of Czech foreign trade in 2009. The Czech economy's ownership links with the euro area on the direct investment inflow side are relatively strong and growing apace. In 2009, the inflow of foreign direct investment from the euro area to the Czech Republic fell substantially as a result of the global crisis, but in 2010 it is starting to rise again.

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 in the Czech Republic is roughly 55% of GDP, or approximately one-third of the value for the euro area. However, the current level of the aforementioned indicators in the euro area is not necessarily an ideal worth following, since in many countries it is more a reflection of private (and also public) sector overleveraging.

The structure of the financial assets and liabilities of Czech non-financial corporations and households is gradually converging to that of euro area entities, but still shows differences. The difference is particularly visible in a higher share of trade receivables in corporate assets and a higher share of currency and deposits in household assets. The indebtedness of Czech corporations and households is still significantly lower than in the euro area countries under review. Net financial assets of households represent around 55% of GDP. 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. According to the current analyses, the global financial and economic crisis has led to slower transmission of monetary policy interest rates to the Czech economy owing to growth in the interbank market premium and some client risk premia. The interest rate sensitivity of new loans to non-financial corporations is

similar to that in the euro area. The low degree of **spontaneous euroisation** in the Czech Republic is due to economic agents' confidence in the domestic currency and to sustained low inflation and low interest rates. The use of foreign currency is thus 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 on the Czech financial markets was increasing in the pre-crisis period and the level of convergence did not differ much from that of the 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. 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. However, a gradual improvement in the situation has been observed since mid-2009, although the pre-crisis integration values on certain markets have not been reached so far.

Adjustment Mechanisms

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 practically identical to the structural component.

The government's fiscal policy, reflected in the evolution and size of the **structural balance**, was more often pro-cyclical in the period under review. Additional tax receipts in 2006–2008 were not consistently employed to reduce the fiscal deficit, but instead tended to be used to generate new public expenditures. Similarly, tax cuts affecting the revenue side were not ultimately accompanied by corresponding austerity measures on the public expenditure side, even during years of solid economic growth. The structural deficit recorded a further considerable deterioration in 2009 as a result of government anti-crisis and other measures. The situation improved somewhat in 2010, when the structural deficit was considerably reduced by budget austerity measures, which, however, will be in place for only a limited time. According to the CNB's current estimate for 2011, the government's consolidation measures as set out in the state budget bill for 2011 would lead to a further improvement in the structural deficit.

The **cyclical component** played only a slightly negative role in the total budget balance in 1998–2005. The action of automatic stabilisers, which respond to the business cycle and smooth its fluctuations, was very limited in the Czech Republic in this period.[4] The business cycle did not start to have a major effect until 2006 and 2008, when favourable economic growth gave rise to extraordinary tax revenues. This was reflected in a positive effect of the cyclical component of the budget balance on the total deficit. However, the cyclical component recorded a change of trend in 2009 owing to the economic slump. According to the CNB's current forecast, the cycle will foster a slight deepening in the total deficit in 2010–2011.

Although the Czech Republic's **total government debt** is lower than that of many EU countries, it has started growing significantly because of decline in GDP. In addition to the amount of debt, the high share of mandatory expenditure combined with the expected effect

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

of demographic changes on pension and health care system expenditures poses a risk to public finance sustainability in the context of the current economic slowdown. Besides the Czech Republic, almost all EU countries have faced a dramatically worsening fiscal situation in the wake of the global economic crisis. The problems of the EU and euro area countries in the fiscal area and their implications for the functioning of this integration group and for euro adoption in the Czech Republic are examined in a special box in this part of the document.

Wage flexibility can enhance the economy's ability to absorb shocks to which the single monetary policy cannot respond. The analyses indicate that real wage elasticity in the Czech Republic was low in the past, as in the other countries under comparison. In 2007–2010, however, nominal wages responded to the evolution of economic activity in the appropriate direction and quite sensitively. Initially, in 2007–2008, the rate of growth of nominal wages rose sharply in a situation of buoyant economic growth. In 2009–2010, conversely, wage growth slowed noticeably, dampening the impact of the recession on the Czech labour market. Differences in **inflation persistence** in the monetary union countries could lead to different impacts of the single monetary policy. Inflation persistence in the Czech Republic is medium-low among the countries under comparison.

The Czech **labour market** situation reflects the impacts of the recent economic downturn. As in the other countries under comparison, unemployment is rising. Long-term unemployment has also been rising since 2009 H2 and this process can be expected to continue in 2010 and 2011. Structural unemployment is hovering around 6%. This is one of the lowest figures among the countries under comparison. However, the Czech Republic has persisting relatively large regional differences. A large gap between households' supply of labour and businesses' demand for labour is also apparent for some professions.

Although the **international mobility** of Czech workers is not very high, the increase in foreign employment in the Czech Republic until 2008 H1 and its subsequent decline as a result of the economic slump can be regarded as an ability of economic adjustment. 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.

The flexibility of the labour market is determined to a great extent by its **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. In the following two years, however, it decreased. This is important above all in low-skilled jobs, for which the negative impact of a high minimal wage on wage flexibility can be greater. The costs of dismissing employees in the Czech Republic are relatively high, particularly for open-ended short-term contracts. In contrast to permanent employment, employment protection is low in the case of temporary employment. Despite a reduction in labour taxation owing to a tax reform introduced in 2008, overall labour taxation remains high in the Czech Republic. Implicit tax rates are affected by health and social insurance contributions more than by income tax. The financial incentives to accept a job in the initial phase of unemployment in the Czech Republic are among the higher ones. However, in the case of long-term unemployment the incentives are small, particularly for low-income households with children. In the last two years, partial legislative changes have been made to taxes and benefits. According to simulations, however, these changes have not resulted in any major improvement in the incentive to work.

In the area of **product market flexibility** the situation is showing a gradual partial improvement. In particular, gradual steps are being taken to simplify the procedures for setting up businesses and carrying on business activities. However, the domestic business

environment continues to be more burdened with administrative obstacles than that in most of the countries under comparison, partly because of a concurrent gradual improvement in the business environments in those countries. As in the other countries under comparison, the corporate taxation rate has been declining recently, but the overall tax burden on Czech corporations is higher than in Portugal, Hungary, Poland and Slovakia.

Stability and effectiveness of the banking sector is a precondition for the sector to be able to assist in absorbing economic shocks. Despite the sharp economic decline and related growth in credit losses, the Czech banking sector was able to generate sufficient operating revenues and achieved high profitability by European comparison again in 2009. Czech banks had created a sufficient capital buffer to deal with potential shocks by retaining a part of their previous earnings. In mid-2010, the aggregate capital adequacy of the banking sector in the Czech Republic was almost 15% (well above the regulatory threshold of 8%) and no bank reported a ratio below 10%. The stability of the domestic banking sector, and hence its ability to absorb external shocks and not generate shocks for the domestic economy, is also being fostered by high balance sheet liquidity, which is based on an excess of primary deposits over loans, and therefore by minimum dependence on funds raised on foreign markets. The results of stress tests conducted by the Czech National Bank on banks' portfolios as of 30 June 2010 indicate that the Czech banking sector is also sufficiently resilient to extremely adverse macroeconomic and financial developments.

Box 1: The fiscal crisis and its implications for the euro area

The global financial and economic crisis revealed structural weaknesses in some economies and their public finances, as well as low institutional readiness of the EU and the euro area to resolve such situations. This finding may be an important part of the deliberations regarding the Czech Republic's accession to the euro area. This box therefore documents the causes, course and circumstances of the fiscal crisis in euro area countries and outlines its implications for the future functioning of this integration group and for euro adoption in the Czech Republic.

The financial sector bailout and measures to support economic activity

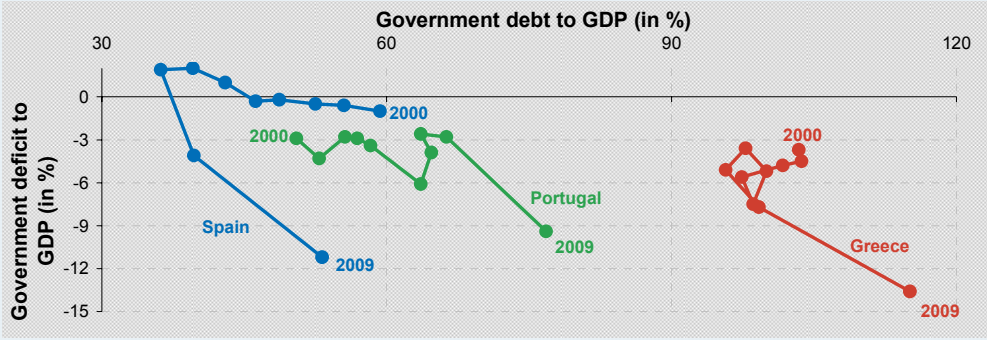
Following the collapse of US investment bank Lehman Brothers in September 2008, confidence in the global financial system was seriously harmed and the system was in real danger of complete collapse. In response, many governments of EU and euro area countries adopted financial sector stabilisation measures in autumn 2008. The scale of the assistance from public sources was extraordinary. In most cases, however, the assistance involved financial transactions or guarantees, so the impact on the public finance deficit reported under national accounts methodology was not significant. The impact on government debt, however, *was* significant. This was because governments – having no free funds of their own – were often forced to borrow such funds. The overall government transactions balance is not yet closed and will be known only in the future.

Subsequently, attention turned to the adoption of various anti-crisis measures to support the real economy. In autumn 2008, the European Commission therefore prepared a *European Economic Recovery Plan* as an additional instrument for the coordination of EU countries' economic policies. This plan formulated key expenditure areas into which the EU Member States' anti-crisis fiscal measures were to be channelled. In addition, automatic fiscal policy stabilisers were to be given

complete freedom to act. According to the plan, the anti-crisis measures were to total EUR 200 billion, or around 1.5% of EU GDP.[5]

The peak, immediate solution and context of the fiscal crisis in the southern periphery of the euro area

The discretionary measures to alleviate the economic crisis, the action of automatic stabilisers and the bailout operations in the financial sector led to a rapid deterioration of public finances in the euro area and the EU as a whole. As a result, the excessive deficit procedure (EDP) – the main component of the corrective part of the *Stability and Growth Pact* (see later in this box) – was opened against 23 EU states during 2008–2010. In the euro area alone, the EDP was imposed on 15 states. The bad fiscal situation in many countries generated financial market concerns about public finance sustainability and the ability to finance government debt. In late 2008 and early 2009, the interest rates at which European governments borrow money on the financial markets increased quite dramatically, and CDS spreads, which reflect the perceived risk of government bonds, increased sharply. The rise in government bond yields thus reduced the effectiveness of monetary policy easing by central banks.



As the economic slump bottomed out in 2009, the situation in the worst-hit countries seemed to stabilise. However, the fiscal problems of the southern periphery of the euro area escalated again in connection with the situation in Greece. There, the problems with rising government debt started intensifying in autumn 2009 and culminated in spring 2010, among other things after discrepancies were repeatedly uncovered in Greece's statistics and budget system. At the time, Greece was able to find buyers for its bonds on the market only at prohibitively high and unsustainable interest rates. In April 2010, it officially requested financial aid. The conditions of the joint assistance programme of the IMF, the European Commission and the ECB[6] were published in early May.

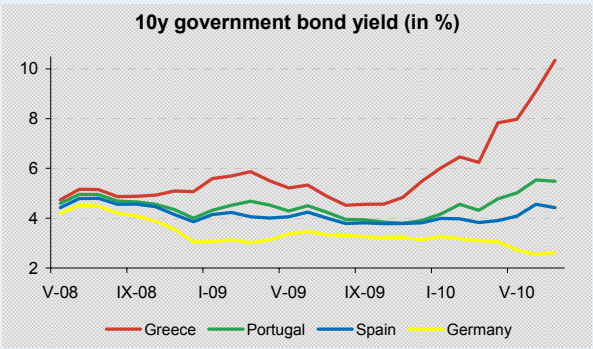
The nervous markets have turned their attention to the sustainability of the fiscal situation in Spain and Portugal as well, even though these countries are not as deeply in debt as Greece and their reputation has not been so battered by unreliable statistics. Here too, CDS spreads and government bond yields have increased and ratings have been downgraded. Both countries have now also introduced austerity measures.

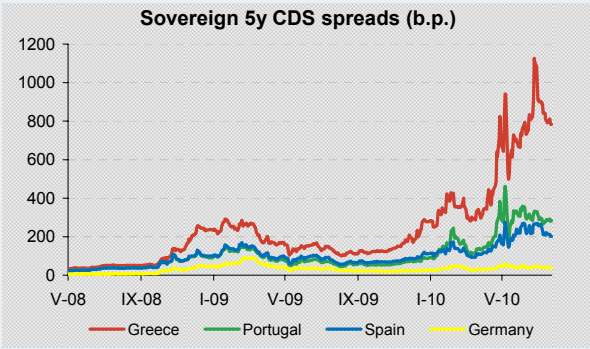
The problems of Greece and the other southern European states uncovered the euro area's structural weaknesses – the heterogeneity of its economies, its high debt levels and its unfavourable demographic trends. In response, the euro weakened (temporarily) by around 20% against the dollar

[5] Of the total amount, fiscal expenditure by the Member States accounts for EUR 170 billion, i.e. around 1.2% of EU GDP, and expenditure from the EU budget and by the European Investment Bank accounts for EUR 30 billion, i.e. around 0.3% of EU GDP.

[6] A total of EUR 110 billion is to be provided to Greece over the following three years (EUR 30 billion from the IMF and EUR 80 billion from the euro area countries). According to the terms of the programme, it is vital in the longer term to improve the competitiveness of the economy and to restructure economic activity towards a greater growth contribution from investment and exports. Fiscal consolidation needs to be implemented and the balance of payments needs to be balanced. Last but not least, the institutions are demanding improvements in the quality of reporting and statistics.

between the start of December 2009 and the start of June 2010. The situation also intensified the debate about strengthening economic policy coordination in the EU. Likewise, the question of whether the euro area truly is an *optimal currency area* (see parts A and C of this document), participation in which supports fast yet sustainable convergence and stability of the member countries, is returning with more urgency than ever before.





The southern states – Greece, Spain and Portugal – are showing clear signs that their economic alignment with core of the euro area is not high enough and their adjustment mechanisms are not effective enough. In recent years, these countries have been exposed to the (for them) too easy single monetary policy and to expansionary domestic fiscal policies. The adoption of the single currency in these countries weakened the market pressure for fiscal discipline. This greatly reduced their competitiveness in European and global markets, leading to wide current account deficits. These countries lacked the option of currency weakening as a mechanism of adjustment and of economic policy correction pressure. They also recorded growth in loans due to a fall in nominal interest rates, the elimination of exchange rate risk in the euro area and a decline in sovereign risk premium. Higher inflation in these countries led to an even greater fall in real interest rates, which have been zero or even negative in recent years. The inflow of funds from abroad was used largely to finance government deficits.

The current economic policy coordination and disciplining framework in the EU and the euro area, and the problems with that framework

The cornerstone of economic policy coordination ensuring fiscal discipline in EU countries is the *Stability and Growth Pact (SGP)* .[7] This document, adopted in 1997, provides for both the prevention of excessive government deficits and debt and the correction of situations where EU countries breach fiscal discipline. The key preventive measure is the medium-term fiscal objectives (*Medium Term Objectives* – MTOs) which the EU countries should strive to achieve.[8] These objectives are meant to ensure that countries have a sufficient safety margin with respect to the 3% of GDP reference value for the government deficit in the medium term. The main element of the corrective arm of the SGP is the *excessive deficit procedure (EDP)*. An EDP is commenced against a country if its real or planned government deficit exceeds the reference value, unless the circumstances are considered unusual or temporary. On the basis of a report from the Commission, ECOFIN decides whether an excessive deficit exists, sets a deadline for its elimination and issues recommendations as regards measures to reduce it. ECOFIN is also authorised to impose sanctions if the country concerned does not comply with the deadlines and recommendations.

[7] Under the Treaty on the Functioning of the European Union (formerly the Treaty establishing the European Community), the Member States should avoid excessive government deficits. The Treaty further states that the EU Member States shall regard their economic policies as a matter of common concern and shall coordinate them within the EU Council. The conclusions of the Growth and Stability Pact were enacted in Regulation Nos. 1466 and 1467/1997 as amended.

[8] These objectives, which differ between countries and also take into account in recent years the implicit future costs of population ageing, are defined for the structural (cyclically adjusted) public budget deficit as a percentage of GDP.

The revision of the SGP in 2005 reflected the problems of some large euro area states (Germany and France) with fulfilling its provisions. The specific strategic objective of this revision was to better account for the budgetary impacts of below-trend economic performance in the recommendations. In the preventive arm of the SGP this was reflected in the official blessing of systematically lower fiscal efforts to achieve the MTOs. However, it led to an easing of the rules for commencing an EDP and its individual phases, as the definition of a "severe economic downturn" justifying an excess over the 3% limit for the government deficit was relaxed. Finally, the deadline for taking corrective action and terminating excessive deficits was extended (in practice well into the phase of fast economic growth). The result, in reality, was constant deferral of sanctions. The EDP thus became a toothless instrument. Combined with little effort by countries to steer towards the MTOs in economic good times it led to absolute laxity of budgetary discipline in the EU as a whole.

Solutions currently under discussion

The problems in the EU and the euro area led in May 2010 to the establishment of a Task Force headed by the new full-time President of the European Council Herman Van Rompuy and consisting of the finance ministers of the EU Member States. It is tasked with finding a new economic governance setup for the EU. The Task Force is proposing to reinforce the preventive and corrective arms of the SGP. New measures in the future will include semi-automatic sanctions for any EU country whose government deficit is not heading towards the MTO. The role of the debt criterion in assessing public finance in each country[9] is also to increase. As regards macroeconomic surveillance, consideration is being given to the creation of a system of competitiveness assessment indicators including early identification of unsustainable or dangerous trends. If any euro area country failed to show a satisfactory trend in the relevant area, the new sanctions would apply to them.[10]

A necessary condition for change for the better is that governments themselves must identify with their commitments to other EU countries so that confidence in public finance sustainability is restored as soon as possible throughout the EU. Similarly, governments should be able and willing to accept the political and other costs of implementing necessary and often painful structural reforms, particularly in countries long afflicted by uncompetitiveness. In these countries, it is necessary to renew export performance, boost domestic savings and ensure external balance. Last but not least, countries should take care to ensure that all their economic policies are mutually consistent, including with regard to their participation in the common monetary policy area, where market pressure is by definition lower than in countries that have their own currency.

Implications for euro adoption in the Czech Republic

The above facts are absolutely crucial to future euro adoption in the Czech Republic. To date, domestic economic parameters have been emphasised during the setting of the new target date for euro adoption and in the related assessment of the Czech Republic's alignment with the euro area. Based on the latest experience, however, it will be necessary more than previously to take analyses and considerations of the euro area itself into account as well. More specifically, it will be necessary to consider whether the area we are to enter is in a suitable condition (not only economically, but also institutionally and politically) to ensure that euro adoption will be of real benefit to the Czech Republic. By adopting the euro, the Czech Republic will give up the benefits ensuing from its relatively successful economic and political setup, which has allowed it to achieve and maintain low

[9] Moreover, a new work arrangement – the "European semester" – is being established to integrate all procedures relating to the budgetary discipline, macroeconomic stability and structural reforms of EU countries. Equally important new elements include ensuring compliance of national budgetary rules and MTOs with the SGP and ensuring statistical data quality.

[10] However, it is evident that any change in multilateral budgetary surveillance in the EU must be accompanied by significantly increased enforceability of the fulfilment of obligations by the Member States, including "merciless" imposition of sanctions for breaching fiscal discipline. As stated earlier, it was the toothlessness of the set mechanisms that turned out to be the main obstacle to effectiveness of the SGP.

and stable inflation and has led to high confidence in the domestic currency, relatively low household and corporate debt, low interest rates, and external economic stability. These are assets which it would be beneficial to give up only on condition that, in exchange, the economy will reap the benefits of participating in a sustainably functioning and internally cohesive European currency area.

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.[11] This theory is one of the approaches often used to determine the appropriate exchange rate regime and, in particular, to determine whether the countries included in the analysis are good candidates for introducing a single currency. In the context of the creation of the single European currency, knowledge of this theory is often used to assess the appropriateness of adoption of the single currency by the existing euro area countries and the suitability of the same step for the new EU Member States.

Generalising somewhat, one can say that economists agree on the set of fundamental benefits and costs of the single currency, although this set can change over time or depending on the specific features of individual economies. The main benefits are improved functionality of money and reduced transaction costs (including, for example, greater usability of the single currency, easier-to-compare prices, lower transaction costs and the elimination of exchange rate risk and the costs of hedging against it) and potentially also in increased macroeconomic and financial stability, reflected in a more favourable investment environment (thanks to the elimination of excessive exchange rate fluctuations, financial market integration and potentially an overall increase in the credibility of the monetary authority).[12]

The costs can be broken down into two groups. There are the costs associated with the change of legal tender, including the physical exchange of money, the conversion of all contracts to the new accounting unit, and similar costs, i.e. costs which can be viewed, to a large extent, as non-recurring.[13] The main long-term costs include a reduction in the effectiveness of domestic macroeconomic policies and the risk of greater volatility in output and consumption, because with transition to the single currency the economy will lose its independent exchange rate and interest rate policies. The single monetary policy will not be able to respond sufficiently to shocks which affect only a small part of the currency area's economy. The costs of this loss will depend on the extent to which the exchange rate of the national currency absorbs real shocks or, on the contrary, generates real and/or financial shocks, on the degree of alignment of the business cycle with the cycle to which the monetary policy of the currency area responds, and on the ability of the economy to employ other adjustment channels.[14]

However, despite the more than 40-year history of this theory, the consensus is that there is no unambiguous 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

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

[12] The enhanced macroeconomic stability and lower risk should facilitate a low and relatively stable interest rate level and higher investment growth. Greater 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 limit the pressure for macroeconomic discipline in individual countries, with negative consequences (see Box 1 in part B).

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

[14] For new EU members planning to join the euro area, another possible cost is fulfilment of the Maastricht criteria prior to entry, especially the price stability criterion. A potential cost for converging countries is a persisting inflation differential, which can be reflected in a rise in nominal client rates and a fall in real client rates and can adversely affect the economy (welfare cost of inflation theory – Lucas, 2000, and Ireland, 2008).

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

One of the key properties determining the appropriateness of joining a currency area is the degree of the openness of the economy and its economic links with the other countries of the currency area. The greater the integration, the higher the potential benefits of the single currency against which the costs are gauged. These benefits reflect above all the elimination of exchange rate risk in economic relations, which will reduce the costs of foreign trade and foreign investment and may lead to a strengthening of such relations (e.g. Rose, 2000). Micco, Stein and Ordonez (2003) have found this effect to be economically significant for the euro area countries. Baldwin (2006), on the other hand, points out that euro area accession cannot be expected to have such an upward impact on foreign trade as implied by the results set out in the earlier literature.[15]

Other properties tend to reduce the negative aspects of the loss of certain macroeconomic adjustment instruments at country level, and can be summarised under the heading of symmetry and flexibility (De Grauwe and Mongelli, 2005). The traditional optimum currency area criteria therefore also include similar economic structure and economic shocks, output and consumption diversification, a similar inflation rate, stable terms of trade, mobility of labour and other production factors, price and wage flexibility, and fiscal and political integration.[16]

Crucial to the discussion of the benefits and costs of the single currency was the formulation of the opinion that not only can the ability to benefit from a monetary union and the risks of unbalanced developments in a monetary union be affected by appropriate reforms, but that large shifts also seem to result from the very introduction of the single currency (the "endogeneity hypothesis", Frankel and Rose, 1998). According to this hypothesis, the adoption of the single currency should lead to a strengthening of the free market (Engel and Rogers, 2004) and growth in trade with partners in the monetary union. Moreover, greater trade integration can lead to greater business cycle correlation (Frankel and Rose, 1997).[17] As regards the introduction of the euro in the new Member States, however, this channel acting via an increase in the share of mutual trade is likely to be fairly weak (Baldwin, 2006).

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[15] A meta-analysis of this literature (Havránek, 2009) in fact demonstrates that the effect of euro adoption on trade is significantly insignificant and with high probability is less than 5%.

[16] In the event of an asymmetric shock, fiscal policy can assist by means of either automatic stabilisers or discretionary measures. However, discretionary measures can give rise to further fluctuations (Feldstein, 2002). What is more, research has shown that a fiscal expansion can have a much lower impact on demand than expected (Blanchard and Perotti, 2002). Nevertheless, discretionary fiscal measures regained importance during the recent financial and economic crisis (see Box 1 in part B).

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

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

De Grauwe and Mongelli (2005) review the literature on the endogeneity of foreign trade, financial integration, symmetry of shocks and product and labour market flexibility. Based on developments to date in the euro area, they conclude that it is more likely that the endogeneity hypothesis holds, i.e. that the similarity of economic shocks probably increases with greater economic integration. By contrast, Giannone, Lenza and Reichlin (2009) state that euro adoption has not significantly changed the characteristics of member countries' business cycles. In their opinion, countries with lower long-run volatility retain this characteristic after euro area entry. Likewise, the trend in countries with historically higher volatility in economic activity and lower business cycle correlation with the euro area average persists. According to Lane (2006), the introduction of the euro had a clear impact in terms of increasing the integration of the euro area financial markets[18]; however, there was growth in foreign trade with both members and non-members of the euro area, hence it can be expected that this channel did not unambiguously cause a reduction in the probability of asymmetric shocks.

The empirical literature analysing the nature of economic shocks hitting the euro area countries is divided. Giannone and Reichlin (2006), Eickmeier (2007) and Stavrev (2008) find the significance of common shocks to be decisive in explaining the variability of economic output. The increase in the significance of common shocks is attributed to the effect of the single monetary policy on the synchronisation of cycles. The GDP growth differences among the euro area countries are mostly due to idiosyncratic shocks, i.e. shocks characteristic of individual countries. However, different transmission of common shocks, i.e. shocks hitting the entire euro area, can also have an asymmetric effect. However, the effect of this channel is found to be rather small. In this regard, European Commission (2008) sees risks mainly in the effect and spillover of global imbalances, demand for commodities and their prices, and in the implications of population ageing. By contrast, Artis et al. (2007) argue that the euro area cannot be considered homogeneous from the point of view of response to external shocks. European Commission (2006), in addition to the importance of common shocks, emphasises the significance of idiosyncratic shocks affecting individual countries, in particular a fall in the risk premium after euro adoption, an easing of the monetary conditions, and the development of productivity in the tradable and non-tradable sectors. As a result of the monetary policy response, these shocks can also have secondary impacts on other countries.

On the occasion of the 10th anniversary of the euro area, numerous papers focused on assessing its real benefits (see, for example, Mackowiak et al. (eds.), 2009). The undoubted benefits include the achievement of price stability. In other areas, however, the assessment is less clear-cut. European Commission (2008) arrived at a generally positive assessment, while admitting that the growth potential of the euro area remained low and significant differences persisted in inflation and unit labour costs across the individual countries. Giannone et al. (2009) found that the growth of the euro area in 1999 had been lower than would correspond

[18] However, the experience of the recent global financial and economic crisis suggests that increasing financial market integration is not necessarily an unequivocally appropriate feature for the healthy functioning of an economy in a monetary union.

to historical experience and the observed evolution in the USA. At the same time, there had been no change in the correlations of economic cycles between individual countries. Hurník et al. (2010) also point to an absence of the expected benefits for the real economy. The latest literature critically examines the experience of the euro area during the recent crisis and the efforts to strengthen fiscal policy coordination (Gros and Alcidi, 2010; Wyplosz, 2010 a,b).

D RESULTS OF THE ANALYSES

1 CYCLICAL AND STRUCTURAL ALIGNMENT

Greater similarity in the structure economic of activity and the business cycle between the Czech Republic and the euro area will lead to lower euro adoption costs.[19] For the Czech economy, the risk of time misalignment or a suboptimal intensity of the response of the single monetary policy to economic shocks will decrease. The functioning of the monetary policy transmission mechanism will also converge. The direct indicators of alignment (describing various aspects of convergence with the euro area) and the effect of international relations and the financial sector (which can increase or decrease alignment) are both monitored.

1.1 Direct alignment indicators

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

1.1.1 Real economic convergence

The degree of real convergence, as measured by GDP per capita at purchasing power parity and the relative price level of GDP, is a fundamental indicator of an economy's similarity to the euro area. A high degree of real convergence is not a necessary condition for joining the monetary union, but a low degree of real convergence could indicate some challenges for the adoption of the single currency. The real convergence process is often associated with the alignment of price levels and relative prices with more advanced countries. The related real appreciation of the exchange rate vis-à-vis the euro may make the fulfilment of the Maastricht convergence criteria more difficult and, in the run-up to joining the euro area, necessitate a combination of economic policies which will move the economy away from equilibrium.[20] This departure from equilibrium can be viewed as a type of asymmetric shock acting primarily in the initial years of monetary integration. Following the adoption of the euro, price convergence will imply a positive inflation differential compared to the euro area average because the option of a real strengthening of the exchange rate through nominal appreciation will be closed. One of the consequences, given the elimination of the risk premium thanks to

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

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

euro adoption, will be lower real interest rates compared to both the current period and the euro area average. Real interest rates may even be negative in some cases. Low interest rates can have many favourable impacts (investment support etc.). However, as the experience of many converging economies with fixed exchange rates prior to the current economic and financial crisis shows, they can also create some challenges to macroeconomic and financial stability and thus raise questions about the appropriateness of the single monetary policy for an accession country.

As Table 1 shows, the Czech economy is converging gradually towards the euro area in terms of **GDP per capita** from the long-term perspective, although the convergence process has halted – probably temporarily – during the current financial and economic crisis. With this indicator currently at almost 75% of the euro area average, the Czech Republic ranks between Slovakia and Portugal on the one hand and Slovenia on the other, i.e. it has a standard of living comparable with the least advanced countries of the monetary union. The Czech Republic is more advanced in this regard than the other new EU Member States outside the euro area (Hungary and Poland). However, it still lags well behind the wealthier euro area countries (Austria and Germany).

Table 1: GDP per capita at purchasing power parity (EA-16 = 100)

	1998	2003	2004	2005	2006	2007	2008	2009
CZ	61.4	65.8	68.2	69.1	70.0	72.7	73.4	73.4
AT	114.9	114.4	115.5	112.7	112.7	111.8	112.8	113.8
DE	107.0	104.5	105.5	106.4	105.5	105.5	106.4	106.4
PT	69.3	71.2	70.0	71.8	71.8	70.9	71.6	71.6
HU	47.4	56.8	57.3	57.3	57.3	57.3	58.7	57.8
PL	42.1	44.1	46.4	46.4	47.3	49.1	51.4	56.0
SI	69.3	74.8	78.2	79.1	80.0	80.9	83.5	78.9
SK	45.6	49.5	51.8	54.5	57.3	61.8	66.1	66.1

Sources: Eurostat, CNB calculations.

Table 2 illustrates the **price level of GDP** compared to the euro area. In the case of the Czech Republic this indicator, too, shows almost continuous convergence towards the euro area, although this trend was also interrupted during the financial and economic crisis.[21] The Czech Republic still lagged significantly behind not only Austria and Germany, but also Portugal and Slovenia as regards price level in 2009. In the case of Slovenia, which entered the euro area in 2007, price convergence continued even after this date, accelerating further as a result of the inflation differential. Consequently, the gap between this country and the Czech Republic is currently much the same as it was before Slovenia adopted the euro. It is also worth mentioning that Slovakia's price level surpassed the Czech Republic's for the first time in 2009. This was due to the strong conversion rate set during euro adoption in Slovakia and to depreciation of the Czech koruna compared to the previous year. Of the countries under review, only Hungary and Poland have slightly lower price levels than the Czech Republic.

[21] The other exceptions were 1999 and 2003, when the nominal exchange rate saw corrections after previous strong appreciations.

Table 2: Average price level of GDP (EA-16 = 100)

	1998	2003	2004	2005	2006	2007	2008	2009
CZ	43.6	50.4	51.5	56.0	59.5	60.9	67.8	64.6
AT	103.2	101.3	100.4	103.2	102.9	104.9	105.1	106.5
DE	111.2	104.9	102.9	101.0	100.7	100.9	101.0	100.6
PT	78.0	80.8	82.2	79.7	79.5	80.5	79.2	80.0
HU	44.3	54.4	57.6	60.4	58.5	63.4	62.7	58.5
PL	47.9	47.9	47.2	54.1	56.9	59.3	64.7	53.1
SI	70.8	72.1	70.2	71.2	73.1	76.5	77.6	78.7
SK	40.6	46.1	49.4	51.4	54.0	59.5	63.7	64.9

Sources: Eurostat, CNB calculations.

An analysis of the empirical relationship between the price level of GDP and GDP per capita at purchasing power parity for 32 European countries (see the *Methodological Part*) reveals that the Czech price level in 2009 continued to lie below the level corresponding to the performance of the economy. According to the estimated relationship, the Czech price level should be roughly 16 percentage points higher in relation to the euro area price level.

Table 3 presents the **evolution of the real exchange rate** vis-à-vis the euro. Between 1998 and 2009, the real exchange rate of the koruna appreciated roughly by 43%, i.e. at an average rate of 3.3% a year. The rate of real appreciation of the Czech currency is distinctly higher than in the current euro area countries under comparison except Slovakia. In the case of Austria and Germany, the real exchange rate depreciated somewhat. The Hungarian forint and particularly the Polish zloty appreciated less in real terms than the Czech koruna.

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

	1999	2003	2004	2005	2006	2007	2008	2009	Annual rate of appreciation
CZ	98	115	115	122	129	132	151	143	3.3%
AT	100	98	98	98	98	98	98	98	-0.2%
DE	100	97	97	96	96	96	96	96	-0.4%
PT	102	107	107	107	108	108	108	106	0.6%
HU	104	125	131	135	129	143	147	137	2.9%
PL	98	103	101	114	116	120	131	110	0.9%
SI	100	103	102	102	102	104	106	107	0.6%
SK	98	128	140	146	154	170	185	193	6.2%

Sources: Eurostat, CNB calculations.

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

According to numerous studies,[22] continued equilibrium real appreciation can be expected for the currencies of the countries striving to join the euro area (the Czech Republic, Hungary and

[22] For example, Čihák and Holub (2003; 2005) and Brůha and Podpiera (2007). For more details, see the *Methodological Part*.

Poland) or which have joined the euro area in recent years (Slovakia and Slovenia). Table 4 presents the range of the estimates of the future equilibrium real appreciation, derived using two alternative methods (see the *Methodological Part* for details). In the case of the Czech koruna, this range is 2.0%–3.4% annually. Its midpoint is distinctly higher than those of most current euro area members, including Slovenia. Only in the case of Slovakia are the estimates similar to those for the Czech Republic. For converging countries outside the euro area, i.e. Hungary and Poland, the estimates are also comparable to those for the Czech koruna. 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 around 2%, inflation in the Czech Republic could therefore increase to about 4.0%–5.4% during the initial years following euro area entry, similarly to the other countries of the region. This would mean a marked increase in inflation compared to the 2% target set by the Czech National Bank from 2010 until euro area entry.

Table 4: Estimate of equilibrium real appreciation (p.p.; annual average for 2011–2015)

	Method 1		Method 2	Range of
	Min	Max		estimates
CZ	2.0	2.8	3.4	(2.0 ; 3.4)
AT	0.3	0.8	n.a.	(0.3 ; 0.8)
DE	0.3	0.6	n.a.	(0.3 ; 0.6)
PT	0.4	0.5	n.a.	(0.4 ; 0.5)
HU	1.8	2.2	3.8	(1.8 ; 3.8)
PL	2.4	3.1	2.9	(2.4 ; 3.1)
SI	1.0	1.3	0.5	(0.5 ; 1.3)
SK	1.7	2.2	3.4	(1.7 ; 3.4)

Source: CNB calculations.

As a result, the Czech Republic and the other countries of the region would face lower **real interest rates** (see Table 5) compared to the average in the euro area and most of the selected Member States (Austria, Germany, Portugal and Slovenia) as well as to the real interest rates they have been facing on average up to now. Their short-term real money-market interest rates would very probably be negative. In the Czech Republic, the three-month real interest rate would drop to a range from -1.6% to -0.2% on average.[23] On the other hand, the Czech Republic has in the last five years had the advantage of relatively low real interest rates, which reduces the need for future adjustment towards the post-euro adoption situation.

[23] Three-month interest rates were selected due to the availability of data for all the countries under review for the entire monitored period (see the *Methodological Part*). Twelve-month interest rates would be more appropriate from the economic point of view, but the differences compared to three-month rates are small on average. Twelve-month real interest rates for the Czech Republic following euro area entry would be estimated at -1.4%–0.0%, as compared to an average of 1.5% for the last twelve years and 0.3% for the last five years.

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

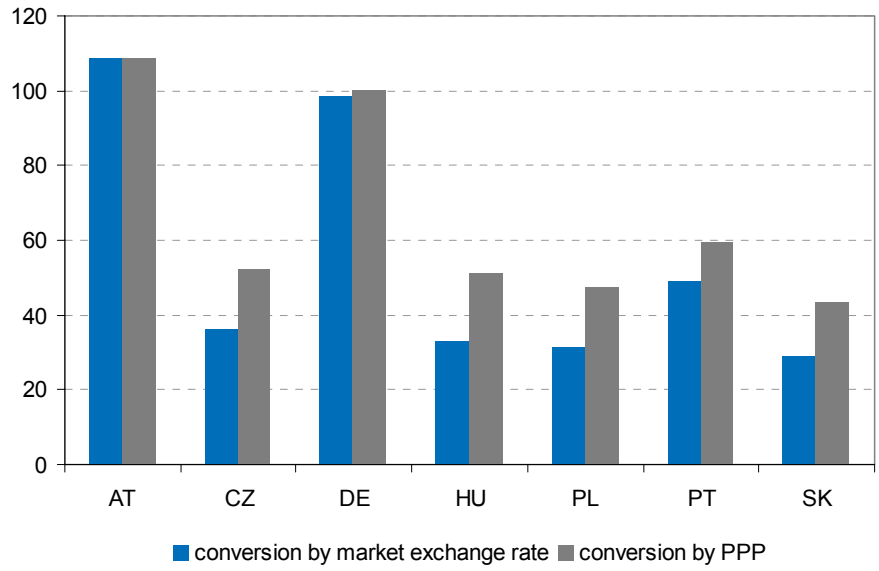
	1998	2003	2004	2005	2006	2007	2008	2009	Average	Outlook[a)]
CZ	4.2	2.4	-0.2	0.4	0.2	0.1	-2.1	1.6	1.3	(-1.6 ; -0.2)
AT	2.8	1.0	0.1	0.1	1.4	2.0	1.4	0.8	1.5	(1.0 ; 1.5)
DE	2.9	1.3	0.3	0.3	1.3	1.9	1.8	1.0	1.7	(1.2 ; 1.5)
PT	2.1	-0.9	-0.4	0.1	0.1	1.8	1.9	2.1	0.7	(1.3 ; 1.4)
HU	3.3	3.6	4.4	3.1	3.1	0.0	2.6	4.9	3.0	(-2.0 ; 0.0)
PL	7.7	4.9	2.5	3.0	2.9	2.1	2.1	0.4	4.8	(-1.3 ; -0.6)
SI	2.2	1.0	0.9	1.5	1.1	0.5	-0.8	0.3	1.1	(0.5 ; 1.3)
SK	13.5	-2.0	-2.6	0.1	0.0	2.4	0.2	0.3	1.5	(-1.6 ; 0.1)

Note: [a)] Estimated real average interest rate for the next five years derived from the range of the estimated pace of equilibrium real exchange rate appreciation as set out in Table 4, assuming an unchanged nominal exchange rate and a zero risk premium. The nominal rate assumed in the outlook is 3.8% (the sum of the estimated equilibrium real interest rate in the euro area of 1.8% and the inflation rate just below 2% in line with the ECB's definition of price stability).

Source: Eurostat, CNB calculations.

Wages are another aspect of economic convergence. The evolution of the wage level in market economies is related mainly to labour productivity growth and the share of the service sector in the economy. Chart 1 compares the average annual wage with the figure for the euro area in 2008. The purchasing power of wages on the domestic market is described by the PPP indicator, while the data at current prices reveal the external purchasing power and wage competitiveness of the economy. The chart shows a large difference between the average wage level in the euro area as a whole and in Germany and Austria and the rest of the countries under comparison, i.e. the new Member States and Portugal. The wage level in the Czech Republic is around 36% of the average euro area wage level when converted using the exchange rate and just over 50% using purchasing power parity data.

Chart 1: Average annual wage in 2008 (EU-15 = 100)

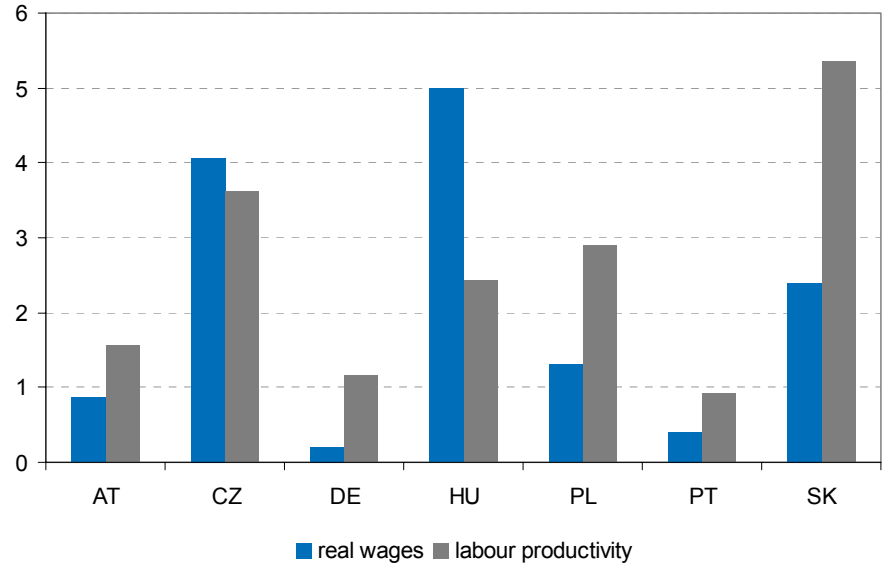


Source: OECD.

Chart 2, comparing labour productivity growth and real wage growth in 2001–2008, reveals that both these variables grew much faster in the new Member States than in the original euro area countries. However, labour productivity grew faster than wages in the original euro area countries under review, and especially in Germany, which significantly increased its price competitiveness. As regards the remaining countries, the same applies only to Slovakia and

Poland. Wage growth exceeded productivity growth slightly in the Czech Republic and considerably in Hungary in this period. Convergence in the wage area can be expected to continue in parallel with convergence in the GDP and price levels. It is of crucial importance that this convergence is founded on corresponding productivity growth.

Chart 2: Average labour productivity growth and real wage growth in 2001–2008, %



Sources: OECD, CNB calculations.

To sum up, the Czech economy is gradually converging to the euro area level in terms of GDP per capita and the price and wage level in the longer-term perspective. However, this process has been interrupted – probably temporarily – by the current financial and economic crisis. Going forward, there is still substantial room for faster growth of economic activity compared to most of the current euro area countries. The equilibrium real appreciation of the koruna associated with this process may thus still pose a challenge to the functioning of the economy in the euro area, in terms of higher inflation and low or even negative real interest rates.

1.1.2 Correlation of economic activity

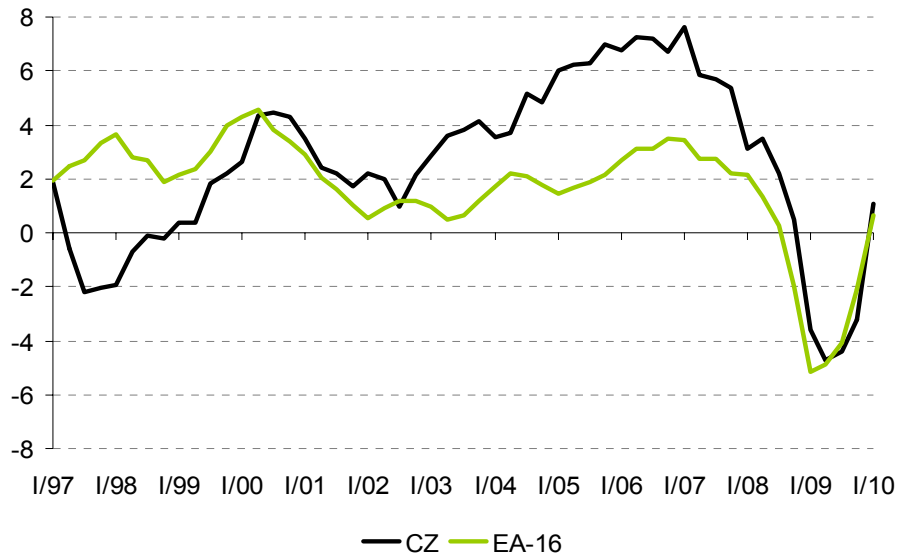
Upon euro area entry, monetary policy decision-making independence will be replaced by the implementation of a single monetary policy responding to economic developments at the monetary union level. For a country that is in a different phase of the business cycle than the euro area average, the monetary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

To measure the cyclical alignment of economic activity in the selected economies with that in the euro area, a simple correlation coefficient and a dynamic correlation method, based on the spectral analysis of time series, have been applied. For comparison, two de-trending methods have been applied to the time series under comparison: year-on-year differences on the logarithm of the original time series (Method 1) and quarter-on-quarter (or month-on-month) differences on the logarithm of the seasonally adjusted time series (Method 2). To monitor the evolution of alignment over time, the data have been divided into two periods. This also enables us to isolate the influence of clearly asymmetric developments at the start of the

period under review which had non-cyclical causes. Supplementary information on the time development of the correlation of economic activity is provided by an analysis of the correlation for moving five-year time periods (rolling correlation). The analysis deals first with the overall economic activity of the countries under review as described by GDP growth. To obtain a more comprehensive picture, the correlation of economic activity in industry (as measured by the industrial production index, IPI) and the correlation of export activity (the correlation of 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 3 illustrates year-on-year real GDP growth in the Czech Republic and the euro area. Different trends are apparent in these economies at the start of the period under review. The economic decline in the Czech Republic during that period was due to the combination of abating transformation problems, structural changes and specific shocks (such as the 1997 monetary crisis). During 2000–2002, the rate of Czech economic growth copied the adverse trend in the euro area to some extent, while the effect of the external slowdown was magnified by appreciation of the exchange rate. The growth of the Czech economy increased significantly as from 2003 thanks to reforms, foreign direct investment inflows and changes on the supply side. Economic growth in the euro area countries also rose in this period, but remained significantly slower than in the Czech economy. Economic growth started slowing in 2007 in both the Czech economy and the euro area. This can be interpreted as a shift to a downward phase following the peak of the business cycle. The originally gradual decline in real GDP changed into a sharp year-on-year fall in both economies in late 2008 and early 2009 as a result of the global financial and economic crisis. Since around 2009 H1, both the Czech economy and the euro area have been gradually recovering, with annual growth switching to positive values in 2010 Q1.

Chart 3: Year-on-year changes in real GDP (%)



Sources: Eurostat, CNB calculations.

Table 6 summarises the results of the **simple correlation analysis** for GDP and the IPI. For the first period, neither of the methods finds a statistically significant correlation between GDP growth in the Czech Republic and that in the euro area. This result is not surprising given the aforementioned trend in the Czech Republic in the late 1990s. By contrast, in the second period the correlation of Czech and euro area GDP shows statistically significant values of 0.7–0.9 according to both methods. The substantial increase in correlation can be

attributed to some extent to an increase in cyclical alignment, although a significant effect of recent observations – characterised by a sharp economic slump and a subsequent recovery – must also be taken into account. The results are also affected by the previous combination of a cyclical recovery abroad and rising trend GDP growth in the Czech Republic. The correlation coefficients for Slovakia, Slovenia, Portugal and Austria also increased substantially in the second period. Nevertheless, statistically significant and relatively high GDP growth correlations can now be identified for all the economies under review. In comparison with other countries, the cyclical alignment of the Czech Republic according to the correlation measured in this phase can be evaluated as average or slightly above average. Given the exceptionally strong global shock in the recent past, however, the results should be taken with a pinch of salt as regards their ability to indicate the future trend reliably.

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

		1997Q1–2001Q4		2002Q1–2010Q1		1999M1–2001M12		2002M1–2010M5	
		GDP		GDP		IPI		IPI	
Method 1	**CZ**	0.09	(-0.30 ; 0.45)	0.92 **	(0.86 ; 0.96)	0.37 **	(0.11 ; 0.59)	0.92 **	(0.90 ; 0.95)
	AT	0.69 **	(0.43 ; 0.85)	0.96 **	(0.93 ; 0.98)	0.90 **	(0.82 ; 0.94)	0.94 **	(0.92 ; 0.96)
	DE	0.92 **	(0.83 ; 0.96)	0.96 **	(0.93 ; 0.98)	0.97 **	(0.94 ; 0.98)	0.99 **	(0.98 ; 0.99)
	PT	0.18	(-0.21 ; 0.53)	0.83 **	(0.71 ; 0.90)	0.54 **	(0.30 ; 0.71)	0.68 **	(0.58 ; 0.76)
	HU	0.69 **	(0.42 ; 0.85)	0.84 **	(0.73 ; 0.91)	0.86 **	(0.76 ; 0.92)	0.94 **	(0.91 ; 0.95)
	PL	0.56 **	(0.22 ; 0.77)	0.68 **	(0.48 ; 0.81)	0.72 **	(0.55 ; 0.83)	0.77 **	(0.69 ; 0.83)
	SI	0.48 **	(0.12 ; 0.73)	0.95 **	(0.91 ; 0.97)	0.66 **	(0.47 ; 0.79)	0.93 **	(0.90 ; 0.95)
	SK	-0.65 **	(-0.82 ;-0.36)	0.90 **	(0.83 ; 0.94)	0.37 **	(0.10 ; 0.59)	0.85 **	(0.80 ; 0.89)
Method 2	**CZ**	-0.03	(-0.37 ; 0.33)	0.71 **	(0.53 ; 0.83)	0.27	(-0.01 ; 0.51)	0.32 **	(0.17 ; 0.46)
	AT	0.37 *	(0.02 ; 0.64)	0.67 **	(0.47 ; 0.80)	0.41 **	(0.14 ; 0.62)	0.39 **	(0.24 ; 0.52)
	DE	0.81 **	(0.63 ; 0.90)	0.70 **	(0.51 ; 0.82)	0.72 **	(0.55 ; 0.83)	0.58 **	(0.46 ; 0.68)
	PT	0.06	(-0.29 ; 0.41)	0.71 **	(0.53 ; 0.83)	0.27	(-0.01 ; 0.51)	0.49 **	(0.36 ; 0.61)
	HU	0.50 **	(0.18 ; 0.72)	0.74 **	(0.57 ; 0.85)	0.24	(-0.04 ; 0.48)	0.19 *	(0.02 ; 0.34)
	PL	0.38 *	(0.03 ; 0.64)	0.48 **	(0.22 ; 0.68)	0.23	(-0.05 ; 0.48)	0.34 **	(0.19 ; 0.48)
	SI	0.08	(-0.28 ; 0.42)	0.92 **	(0.85 ; 0.95)	0.30 *	(0.03 ; 0.54)	0.28 **	(0.12 ; 0.43)
	SK	-0.44 **	(-0.69 ;-0.11)	0.75 **	(0.58 ; 0.85)	0.33 *	(0.05 ; 0.56)	0.26 **	(0.10 ; 0.41)

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.

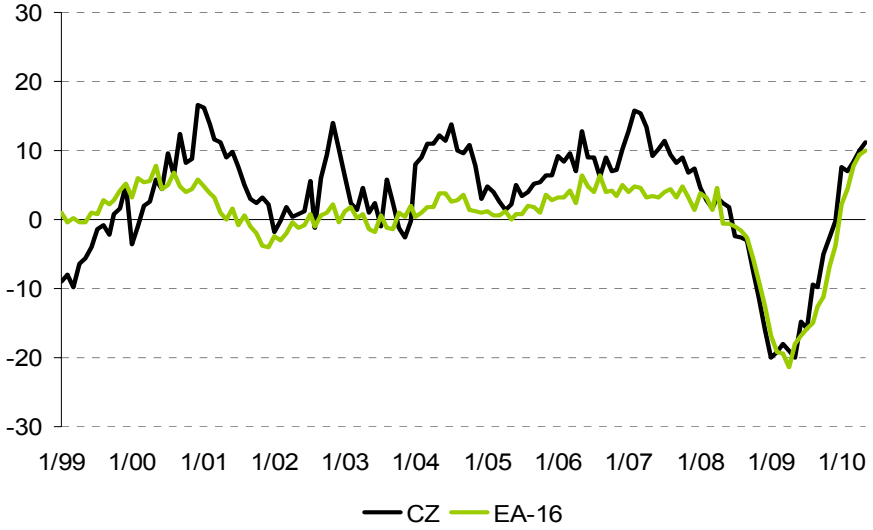
Sources: Eurostat, CNB calculations.

Under Method 1, the correlation analysis of the industrial production index (see Table 6) signals an increase in the correlation between the periods under review for all countries, while under Method 2, shifts in both directions are recorded and the resulting correlations are much lower for all countries compared to Method 1. Generally, however, the positive correlations of the second period are statistically significant in all the countries under review and according to both growth calculation methods.[24] In the second period, the correlation of the industrial production indices of the Czech Republic and the euro area using year-on-year changes is comparably high as for the other countries. The correlation of month-on-month changes between the individual countries differs significantly and the Czech Republic is roughly in the middle of the range of the resulting values of the countries under review. Chart 4 illustrates the annual changes in the **industrial production index** of the Czech Republic and the euro

[24] The information obtained by comparing the correlation of industrial production is only complementary, as industry typically accounts for less than one-third of total output in the advanced economies, and, moreover, the economies of the countries under comparison also differ in terms of structure (see section 1.1.5). Boone and Maurel (1999) criticise the use of the industrial production index for analysing the similarity of economies and business cycles, because of its high volatility.

area. This chart also indicates the strong effect that the synchronised recession and subsequent recovery in both economies has recently had on the measured correlation.

Chart 4: Year-on-year changes in the industrial production index (%)



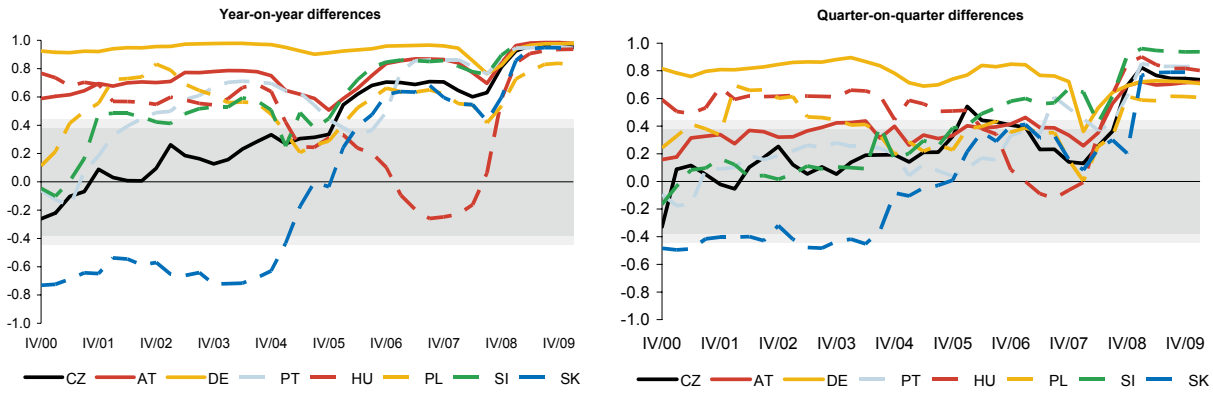
Sources: Eurostat, CNB calculations.

Chart 5 shows the **rolling correlations** of real GDP growth for the two methods. Under Method 1, the alignment has gradually increased over time, the correlation values having been statistically significant since 2006;[25] following a modest decline in 2008, the correlation rose sharply and since 2009 has stayed at high levels. The rolling correlations calculated on the basis of quarter-on-quarter differences show a temporary fall in the originally rising trend in 2007 H2–2008 Q3, after which they resume their increase, as in Method 1.[26] The aforementioned temporary fall can be explained as being a result of the lag with which the global financial and crisis hit the Czech Republic and some other countries in comparison with the euro area average.

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

[26] However, the decline in the rolling correlations remains mostly statistically insignificant.

Chart 5: Rolling correlations of economic activity

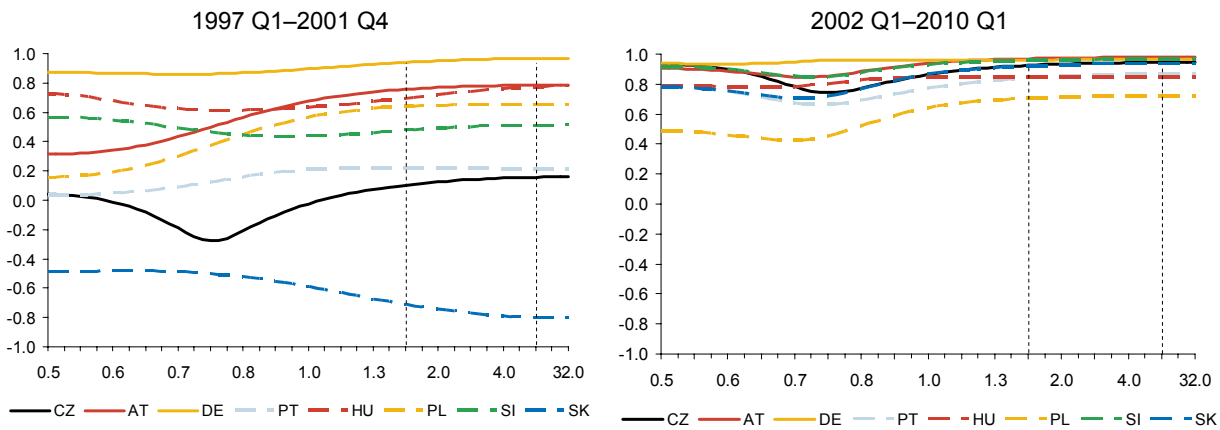


Note: The time data indicate the end of the rolling window of 5 years.

Sources: Eurostat, CNB calculations.

Chart 6 illustrates the results of the **dynamic correlation** using spectral analysis of the time series of annual GDP changes. This method endeavours to separate medium-term economic fluctuations, which correspond to the business cycle, from short-term and long-term movements of the variables describing economic activity. 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 Hungary and Poland, where it was high also in the first period.

Chart 6: 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.

Sources: Eurostat, CNB calculations.

The results of the export performance correlation analysis are summarised in Table 7.[27] 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

[27] Compared to last year's analysis some results saw shifts in the first period due to better availability of data on total exports in national currencies from the IMF database, without the need for conversion from US dollars (see the *Methodological Part*).

methods. The estimated parameters are markedly higher in the second period. The correlations of Czech exports to the euro area with euro area GDP are lower under Method 1, but comparable under Method 2. Compared to the year's analysis, most correlations of export performance continued increasing in the second period. As with the previous indicators, a large part of the increase in the correlation of export performance can be explained by the one-off negative shock in the form of the global crisis and its gradual abatement.

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

		1997M1–2001M12		2002M1–2009M12		1997Q1–2001Q4		2002Q1–2009Q4	
		EXP_{TOTAL}		EXP_{TOTAL}		$EXP_{to\ EA\text{-}16}$ vs. $HDP_{EA\text{-}16}$		$EXP_{to\ EA\text{-}16}$ vs. $HDP_{EA\text{-}16}$	
Method 1	**CZ**	0.76 **	(0.65 ; 0.84)	0.85 **	(0.80 ; 0.89)	0.66 **	(0.37 ; 0.83)	0.78 **	(0.63 ; 0.87)
	AT	0.85 **	(0.78 ; 0.90)	0.96 **	(0.94 ; 0.97)	0.66 **	(0.37 ; 0.83)	0.95 **	(0.92 ; 0.98)
	DE	0.95 **	(0.92 ; 0.96)	0.97 **	(0.96 ; 0.98)	0.68 **	(0.40 ; 0.84)	0.96 **	(0.93 ; 0.98)
	PT	0.74 **	(0.62 ; 0.82)	0.88 **	(0.84 ; 0.91)	0.34	(-0.05 ; 0.63)	0.90 **	(0.83 ; 0.95)
	HU	0.65 **	(0.51 ; 0.76)	0.80 **	(0.72 ; 0.85)	0.30	(-0.09 ; 0.61)	0.74 **	(0.57 ; 0.85)
	PL	0.77 **	(0.67 ; 0.85)	0.54 **	(0.41 ; 0.65)	0.66 **	(0.37 ; 0.83)	0.33 *	(0.04 ; 0.57)
	SI	0.82 **	(0.74 ; 0.88)	0.91 **	(0.88 ; 0.94)	0.49 **	(0.14 ; 0.73)	0.83 **	(0.71 ; 0.91)
	SK	0.42 **	(0.22 ; 0.58)	0.83 **	(0.77 ; 0.87)	-0.08	(-0.45 ; 0.31)	0.85 **	(0.73 ; 0.91)
Method 2	**CZ**	0.25 *	(0.04 ; 0.44)	0.52 **	(0.38 ; 0.63)	0.38 *	(0.00 ; 0.66)	0.48 **	(0.21 ; 0.68)
	AT	0.48 **	(0.29 ; 0.63)	0.66 **	(0.55 ; 0.74)	0.47 **	(0.11 ; 0.72)	0.72 **	(0.54 ; 0.84)
	DE	0.61 **	(0.45 ; 0.73)	0.73 **	(0.64 ; 0.80)	0.33	(-0.06 ; 0.63)	0.82 **	(0.70 ; 0.90)
	PT	0.24 *	(0.03 ; 0.43)	0.49 **	(0.35 ; 0.61)	0.27	(-0.12 ; 0.59)	0.62 **	(0.40 ; 0.78)
	HU	0.33 **	(0.12 ; 0.51)	0.59 **	(0.46 ; 0.69)	0.30	(-0.09 ; 0.61)	0.45 **	(0.17 ; 0.66)
	PL	0.18	(-0.03 ; 0.38)	0.54 **	(0.40 ; 0.65)	0.64 **	(0.35 ; 0.82)	0.03	(-0.27 ; 0.32)
	SI	0.46 **	(0.27 ; 0.61)	0.40 **	(0.25 ; 0.53)	0.42 *	(0.05 ; 0.69)	0.59 **	(0.36 ; 0.75)
	SK	0.33 **	(0.12 ; 0.51)	0.49 **	(0.35 ; 0.61)	-0.15	(-0.50 ; 0.25)	0.50 **	(0.24 ; 0.70)

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.

Sources: Eurostat, IMF, CNB calculations.

To sum up, the cyclical alignment of economic activity in the Czech Republic with that in the euro area is growing over time. This is evidenced both by the simple correlations of overall economic activity, industrial production and exports, and by the rolling and dynamic correlations of economic activity. Given the exceptionally strong global shock in the recent past, however, the results should be taken with a pinch of salt.

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 rate of growth. The opposite effect can be observed with an economy in the opposite phase of the cycle with *ceteris paribus* lower inflation and higher real rates.[28] The divergence of optimum monetary policy settings in the individual countries of the monetary union, or their cyclical positions, from the Taylor rule perspective can be analysed using **implied monetary policy interest rates** estimated on the basis of the Taylor rule.[29] This analysis does not seek

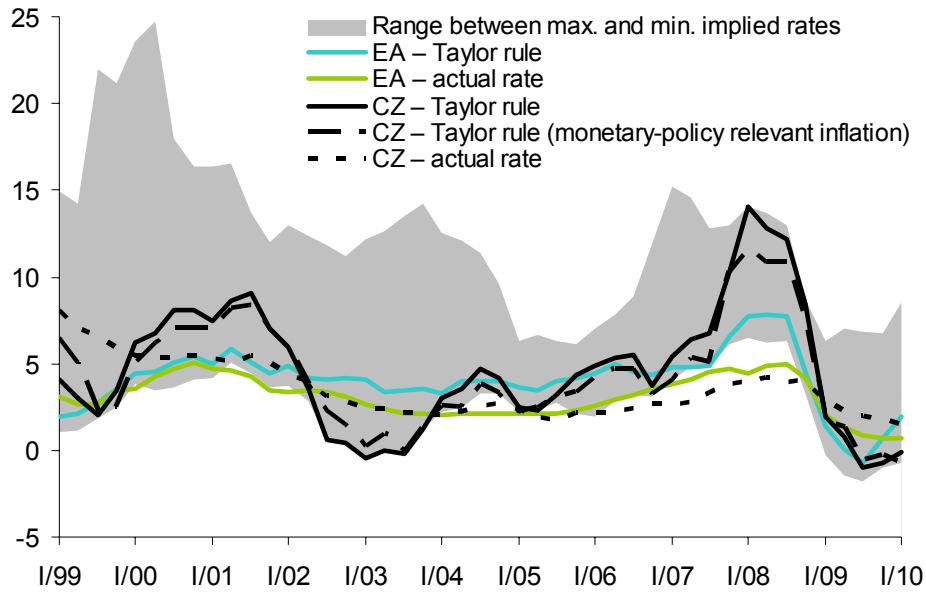
[28] See, for example, Björksten and Syrjänen (1999).

[29] 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 a statistic of the current cyclical position of the economy.

primarily to estimate the optimum rate settings in a particular economy, but rather sets out to identify approximately the cycles of individual economies.[30]

Chart 7 illustrates the overall evolution of the implied monetary policy rates in all the economies under review. The grey area shows the range between the maximum and minimum implied rates for the individual countries under review in the given period. In addition, the implied and actual rates for the Czech Republic and the euro area are illustrated. The trend of a narrowing spread between the maximum and minimum implied rates (a narrowing grey range) can be interpreted as being a consequence of the stabilisation of the transforming economies, for which the Taylor rule prescribed higher rates at the start of the period under review. A narrowing of the spread to around 7 percentage points can be observed from the end of 2007. Since mid-2009, however, there has been an increase to around 9 percentage points, due to unusually low and negative implied rates in some countries during the global crisis.[31] The differences between the implied rates for the entire euro area and the ECB's actual rates reflect the chosen method and its purpose, namely to compare the business cycles of the individual economies, not to estimate the optimum real interest rate settings.[32]

Chart 7: Implied monetary policy rates



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

Sources: Eurostat, CNB calculations.

For most of the period under review, the estimate of the implied rates for the Czech economy is relatively close to the rate implied for the euro area and in the lower half of the grey area,

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However, it is not able to abstract sufficiently from temporary and non-cyclical shocks and to capture the forward-looking nature of monetary policy.

[30] For details, see the *Methodological Part*.

[31] The evolution of the implied rates of the euro area members under review does not indicate a diverging trend and so does not support the specialisation hypothesis (Krugman, 1993).

[32] To some extent, however, the systematically lower than implied rates for the euro area in 2001–2008 may reflect excessively easy monetary policy conditions around the world before the current financial and economic crisis broke out.

even forming its lower boundary in the period from mid-2002 to the end of 2003. More pronounced deviations from the implied rate for the euro area occurred in 2000–2001, 2002 Q3–2003 Q3 and 2007 Q4–2008 Q4. The first of these periods saw a domestic economic recovery replacing the previous recession, amid a concurrent weakening of the previously relatively robust economic growth in the euro area. In 2002 Q3–2003 Q3, the Czech Republic experienced a significant fall in inflation following a strong appreciation of the exchange rate. In the last of the three periods of more pronounced deviations, a fluctuation in the Czech implied rates in the opposite direction was recorded, up to the upper boundary of the range. This can be explained partly cyclically and partly by domestic inflation, which was substantially higher as a result of harmonisation of indirect taxes with the EU, growth in regulated prices and rising world prices of raw materials. The Czech National Bank in reality set interest rates much lower in the given period than the rates implied by the Taylor rule. This was due to the forward-looking nature of monetary policy, which assessed the rise in inflation as temporary and therefore did not need to raise interest rates dramatically.[33]

The average square of the difference between the implied interest rate of a specific country and the implied rate for the entire euro area can be a measure of cyclical deviation (see Table 8). This average of the deviations in the group of countries compared has been gradually decreasing (except in the penultimate period), as has the difference between the old euro area countries (Germany, Portugal and Austria) and the new ones (Slovakia and Slovenia) and candidate countries, including the Czech Republic. In 1999–2006, the average square in the Czech Republic was relatively stable and was initially one of the lower ones among the new member countries. In 2007–2008, however, the deviation increased as a result of faster economic growth and inflation shocks recorded particularly in 2008. In this period, the deviation also increased in some of the other new member countries under comparison. In the period from the start of 2009 the deviation in the Czech Republic fell to an all-time low, owing to similar impacts of the crisis in both economies. Greater alignment of the Czech economy with the euro area until 2007 is indicated by the implied rate deviations calculated on the basis of monetary-policy relevant inflation,[34] which are substantially smaller than those calculated using headline inflation.

Table 8: Average squares of deviations from implied euro area rates

	from 1999 Q1	from 2001 Q1	from 2003 Q1	from 2005 Q1	from 2007 Q1	from 2009 Q1
CZ	6.2	6.8	6.4	6.3	9.8	1.4
CZ (monetary-policy relevant inflation)	4.2	4.1	3.9	3.4	5.0	1.9
AT	0.5	0.5	0.5	0.3	0.1	0.1
DE	0.8	0.7	0.7	0.3	0.2	0.1
PT	2.8	2.7	1.2	1.0	1.3	1.8
HU	56.4	36.9	31.9	30.9	41.9	31.9
PL	30.0	9.7	9.0	10.0	14.2	35.0
SI	33.1	22.7	9.9	7.7	12.2	0.4
SK	58.6	22.7	23.1	3.6	3.4	2.1
CZ (actual rate)	4.8	3.6	4.4	5.3	6.0	3.1
EA (actual rate)	2.0	2.3	2.7	2.8	2.9	1.2

Note: Periods always ending with 2010 Q1.

Sources: Eurostat, CNB calculations.

[33] The backward-looking Taylor rule applied is not able to differentiate between long-term changes in inflation, to which central banks usually respond, and temporary changes, to which central banks mostly do not respond. When analysing the interest rates implied by the Taylor rule, it is important to focus on the medium term and not to assess the appropriateness of the implied monetary policy rates at any given moment.

[34] Monetary-policy relevant inflation is inflation to which monetary policy responds. It is defined as headline inflation adjusted for the first-round impacts of changes to indirect taxes.

To sum up, the estimate of the rates implied by the Taylor rule for the Czech economy is relatively close to the rate implied for the euro area for most of the period under review. In addition, the average square of the difference between the implied interest rate for the Czech Republic and that for the euro area has recently fallen to a historical low, indicating increasing economic alignment and preparedness of the Czech Republic to adopt the euro.

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.[35] 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.

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.[36] The analysis draws on quarterly data for 1996 Q1–2010 Q1. To compare the synchronisation of economic shocks over time, the periods 1996–2001 and 2002–2010 are also assessed separately. The correlation of the shocks can take values within the range of [-1;1]. High positive values indicate that the shocks are symmetric with respect to the euro area. Low or negative values correspond to asymmetric shocks. When interpreting the results, one should keep in mind the possible distorting effect of the excessive exchange rate volatility recorded in some periods on the correlation of demand and supply shocks. Euro area entry would eliminate this volatility.

The resulting **demand shock correlations** are shown in Table 9. The measured correlation of the demand shocks identified for the Czech Republic in relation to the euro area is close to zero, or at statistically insignificant positive levels, both for the overall period 1996–2010 and for the two sub-periods. A comparison with previous years' results shows that the (non-)synchronisation of this type of shock has not changed so far. Nevertheless, a comparison of the results of the analysis indicates that the risk due to demand shock asymmetry is not significantly higher for the Czech economy than for the other countries under review, since their correlations are mostly not statistically significant either.

As regards **supply shocks** (see Table 10), the correlation for 2002–2010 is positive and the coefficients are statistically significant for the Czech Republic, Germany, Portugal and Austria. The economic downturn due to the crisis is interpreted by the model as a significant supply shock owing to its longer-lasting effect.[37] Compared to the previous period, there have

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[35] For example, Frankel and Rose (1998).

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

[37] This interpretation is in line with the gradual downward revision of the rate of growth of potential output in numerous countries, including the Czech Republic, witnessed after the global crisis broke out. In reality, however, this shock was partly a demand shock.

thus been shifts towards higher and statistically significant alignment of supply shocks with the euro area. By contrast, asymmetry of supply shocks has increased in the case of Hungary, Slovakia and Slovenia. The correlation coefficients for these countries are negative and statistically significant for the entire period (except for Slovakia). The measured correlation of the Czech Republic with the euro area has changed from a statistically insignificant value of 0.02 for 1996–2001 to a positive value of 0.51 differing from zero at the 1% significance level for 2002–2010. For the last period, the symmetry of supply-side shocks in the Czech Republic is comparable to that in Portugal and Austria.

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

	1996–2010	1996–2001	2002–2010
CZ	0.10	0.01	0.23
AT	0.12	0.05	0.16
DE	0.45 ***	0.31	0.61 ***
PT	0.10	0.03	0.17
HU	0.30 **	0.35 *	0.28
PL	0.11	0.16	0.03
SI	-0.03	-0.12	-0.02
SK	-0.12	0.11	-0.48 ***

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

Sources: Eurostat, CNB calculations.

Table 10: Correlation of economic shocks vis-à-vis the euro area – supply shocks

	1996–2010	1996–2001	2002–2010
CZ	0.35 ***	0.02	0.51 ***
AT	0.28 **	-0.08	0.40 **
DE	0.79 ***	0.70 ***	0.83 ***
PT	0.39 ***	0.01	0.54 ***
HU	-0.38 ***	-0.07	-0.47 ***
PL	-0.21	-0.32	-0.24
SI	-0.66 ***	-0.31	-0.73 ***
SK	-0.15	0.27	-0.37 **

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

Sources: Eurostat, CNB calculations.

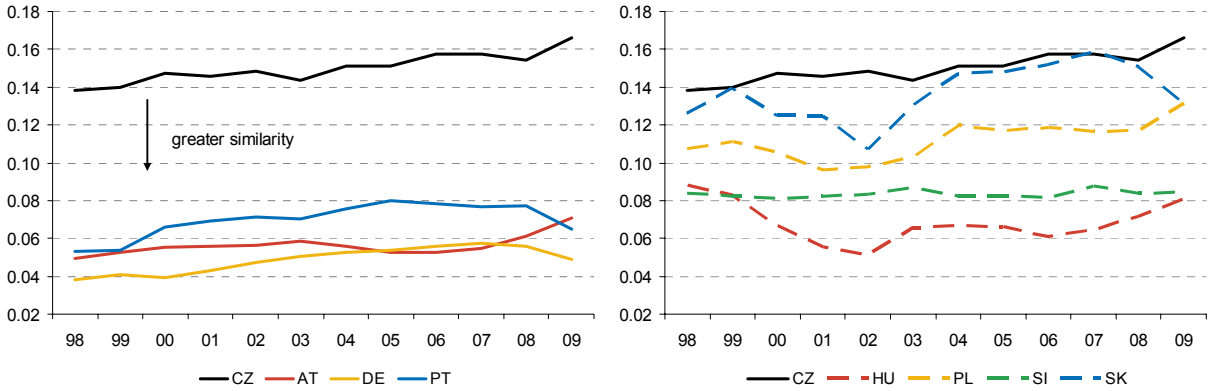
Overall, therefore, the Czech economy, like most of the countries under comparison, faces demand shocks which do not correlate with shocks in the euro area, whereas supply shocks have been very similar to those in the euro area in recent years. This is because the contraction in economic activity during the crisis – given its long duration – is interpreted in the analysis as a supply shock (whereas in reality it was probably at least partly a significant demand shock).

1.1.5 Structural similarity of the economies

Greater similarity of the structure of economic activity between the acceding economy and the other economies of the monetary union decreases the risk of occurrence of an asymmetric economic shock. The structural similarity of the economies of the countries under comparison with the euro area is measured using the Landesmann structural coefficient, which compares the shares of the six main sectors of the economy in total value added in the countries under comparison and the euro area. This coefficient takes values in the range of [0;1]. The closer the coefficient is to zero, the more similar is the structure of the economies under comparison.

Chart 8 shows that the Landesmann coefficient for the Czech Republic is the highest of all the monitored countries over the entire period 1998–2009. The structure of economic activity in the Czech Republic was therefore in 2009 the least similar to the euro area average.[38] Despite this, the index for the Czech Republic is relatively close to the lower boundary of the above interval. The difference in the structure of value added in the Czech economy consists mainly in a high share for industry[39] and in a lower share for services, in particular financial intermediation, real estate and other services (see Table 11).

Chart 8: Structural similarity vis-à-vis the euro area



Sources: Eurostat, CNB calculations.

Table 11: Shares of economic sectors in GDP in 2009 (%)

	A, B	C, D, E	F	G, H, I	J, K	L–P
CZ	2	27	7	22	16	16
AT	1	20	7	21	22	20
DE	1	20	4	16	28	21
PT	2	15	5	23	21	22
HU	3	21	4	18	20	19
PL	3	20	7	24	18	16
SI	2	21	7	19	20	19
SK	2	23	8	22	20	15
EA-16	1	16	6	19	26	22

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

Sources: Eurostat, CNB calculations.

[38] In 2003–2008, Slovakia recorded a similar Landesmann coefficient as the Czech Republic in the context of an increasing share of value added of industry in total value added in combination with a broadly stable contribution of industry to total value added in the euro area. In the final two years, however, the share of value added of industry (sectors C, D and E) in Slovakia decreased in favour of growth in services (sectors G, H and I). In 2009, value added in industry recorded a higher decline in the euro area and in Slovakia than in the Czech Republic. This explains the further increase in the Landesmann coefficient in the Czech Republic last year.

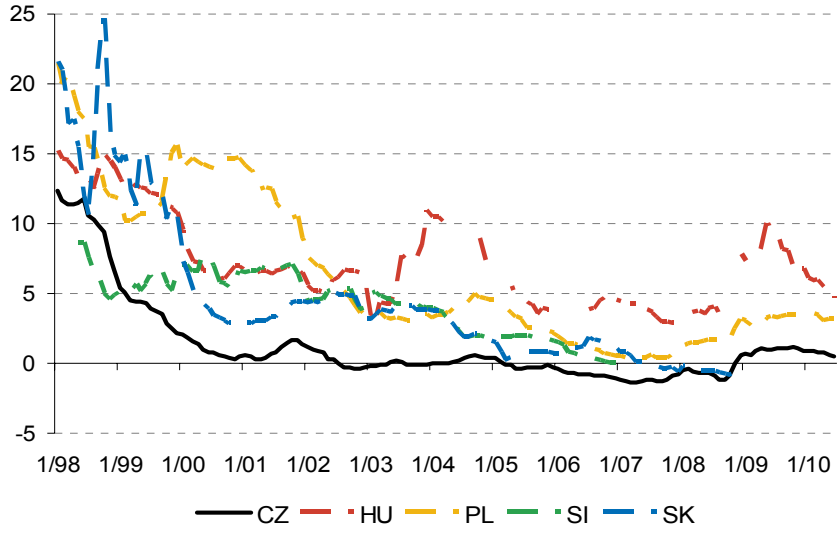
[39] In Czech industry as a whole there is, moreover, a high share for the car industry, which is comparable with Germany and thus higher than the euro area average. In the event of an industry shock, it can thus be assumed that the single monetary policy would not respond to inflationary or anti-inflationary 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).

1.1.6 Interest rate convergence

Some countries entering the euro area in the past faced fast nominal interest rate convergence to the union level, which acted as an asymmetric shock.[40] Therefore, earlier nominal interest rate convergence is better for smoother accession to the euro area, as it will suppress the additional asymmetric shock associated with euro adoption and sudden elimination of the risk premium.[41]

The following comparison of the **nominal interest rate differential** vis-à-vis the euro area reflects the probability of the asymmetric shock described above. The closer the nominal interest rate differential is to zero, the smaller is the risk that joining the monetary union will cause a rapid change in both nominal and real interest rates, which would have a destabilising effect on the economy. Charts 9 and 10 illustrate the interest rate differentials in the Czech Republic, Hungary, Poland, Slovenia and Slovakia vis-à-vis the euro area for three-month rates on the interbank market and five-year government bonds.

Chart 9: Differences in three-month interest rates vis-à-vis the euro area (p.p.)



Sources: Eurostat, CNB calculations.

Chart 9 shows that short-term interest rate convergence proceeded for all the countries under comparison until 2008 Q3. In 2008 Q4, however, the differentials between three-month money market rates in Central Europe and those in the euro area started to rise again. The highest differential – of 10 percentage points – was recorded in Hungary in May 2009.[42] Thanks to IMF–EU–World Bank international assistance programmes and a quick monetary

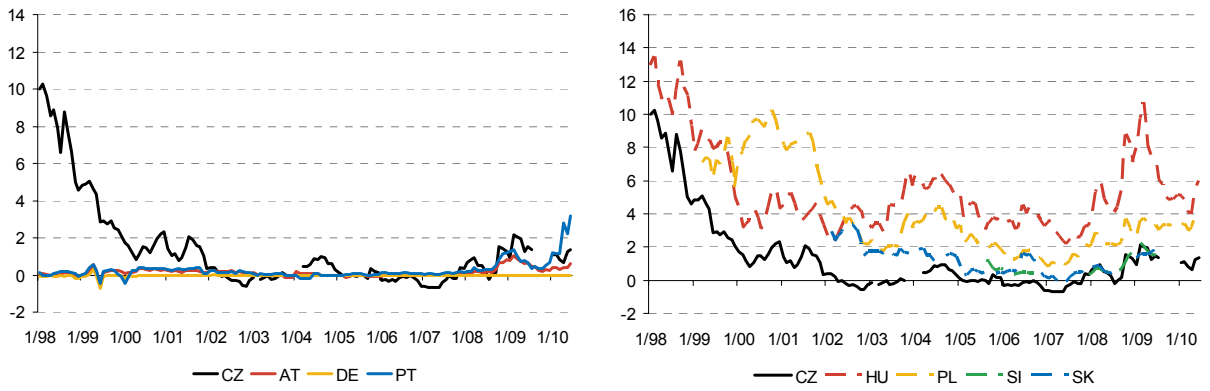
[40] Although real economic activity is affected primarily by real interest rates, nominal interest rates may also have a significant effect via some credit or budgetary constraints (e.g. the loan repayment to financial income ratio).

[41] See also section 1.1.1.

[42] The high values observed in Hungary during 2009 H1 were due both to the crisis, which peaked in that country in October–November 2008, and to different monetary policy decisions (for example, the Hungarian central bank raised the reference interest rate to 11.5% in October 2008 to reverse the forint's depreciation trend). The Hungarian financial market was partially calmed by a combined IMF–EU–World Bank rescue package approved in November 2008. However, reference interest rates on the interbank market remained high as a result of a shortage of liquidity and increased risk aversion.

policy response[43] the situation on the Hungarian interbank market calmed. At the end of 2009, short-term interest rate differentials stabilised or even started shrinking again in other countries as well. In the Czech Republic, short-term differentials turned positive in 2009[44] (a situation last recorded in 2004) and fluctuated around 1 percentage point. In January 2010 they started to decrease again, reaching 0.5 percentage point in June 2010.

Chart 10: Differences in five-year interest rates vis-à-vis the euro area (p.p.)



Note: There are gaps in the time series in months when no new bonds were quoted and no bonds with residual maturity of five years were traded. The euro area interest rates are based on the rates of its current Member States in the individual periods.

Sources: Bloomberg, CNB calculations.

Chart 10 illustrates the differentials for five-year government bond yields between the selected countries and the euro area. The growing differentials for five-year interest rates recorded after the global financial crisis erupted in September 2008 peaked in Central Europe in 2009 Q1.[45] They then started to decrease at different rates across the different countries. In 2010 Q2 they rose slightly owing to the Greek crisis. A similar pattern can be observed for Austria and Portugal, although the differential in Portugal saw a very strong increase to levels exceeding 3 percentage points at the end of the period. In the Czech Republic, the differentials ranged between 1 and 2 percentage points between the start of 2009 and mid-2010 (such values had last been recorded in 2001; in 2004 they were positive but below 1 percentage point). Although this meant a change to positive values from the slightly negative ones registered in 2005–2007, this level is the lowest in the sample of Central European countries.

The interest rate differentials for ten-year government bonds are shown in Chart 11.[46] The chart also provides a comparison with the situation in the euro area countries prior to euro adoption.[47] For Central European countries these differentials show a similar pattern as five-year interest rates, i.e. a gradual increase in 2009 H1, a change in trend in 2009 H2, and a

[43] Besides Hungary, Poland also received financial assistance in April 2009 – in the form of a flexible credit line from the IMF. Between January 2009 and June 2010, monetary policy was gradually eased in all three Central European countries under review.

[44] This occurred despite the fact that monetary policy rates in the Czech Republic were lower than those of the ECB, which achieved a significant decrease in market rates below its main refinancing rate by means of unconventional monetary policy instruments.

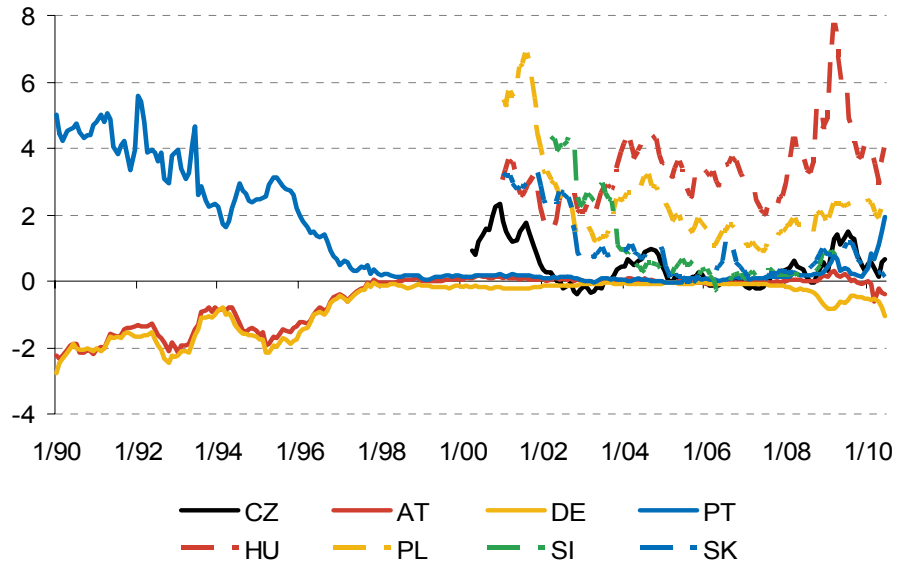
[45] The highest value (of 10.8 percentage points) was again recorded in Hungary in March 2009.

[46] For these interest rates the level compared is defined as a weighted average of yields in euro area countries.

[47] When comparing the levels and evolution of these interest rate differentials, the fact that the structural characteristics of the economies have changed since the 1990s should be taken into account.

modest rise due to the Greek crisis thereafter. The interest rate differential for Czech ten-year government bonds fluctuated around zero between 2005 and 2008, but rose somewhat in 2009. Starting in 2009 H2, Czech long-term interest rates showed a converging trend and were slightly above the values for the euro area countries under review (except for Portugal, where they were higher at the end of the period). Despite the recent modest rise in long-term rates, the Czech Republic is closest to the euro area average among the non-euro area countries under comparison. Poland's interest rate differential is somewhat higher than the Czech Republic's. Hungary traditionally shows the biggest difference in long-term rates.

Chart 11: Differences in long-term interest rates vis-à-vis the euro area (p.p.)



Sources: Eurostat, CNB calculations.

Czech interest rates have long been sufficiently close to euro area rates and so do not create a risk of a rapid fall in rates and related generation of macroeconomic imbalances and risks to financial stability upon euro adoption.

1.1.7 Exchange rate convergence

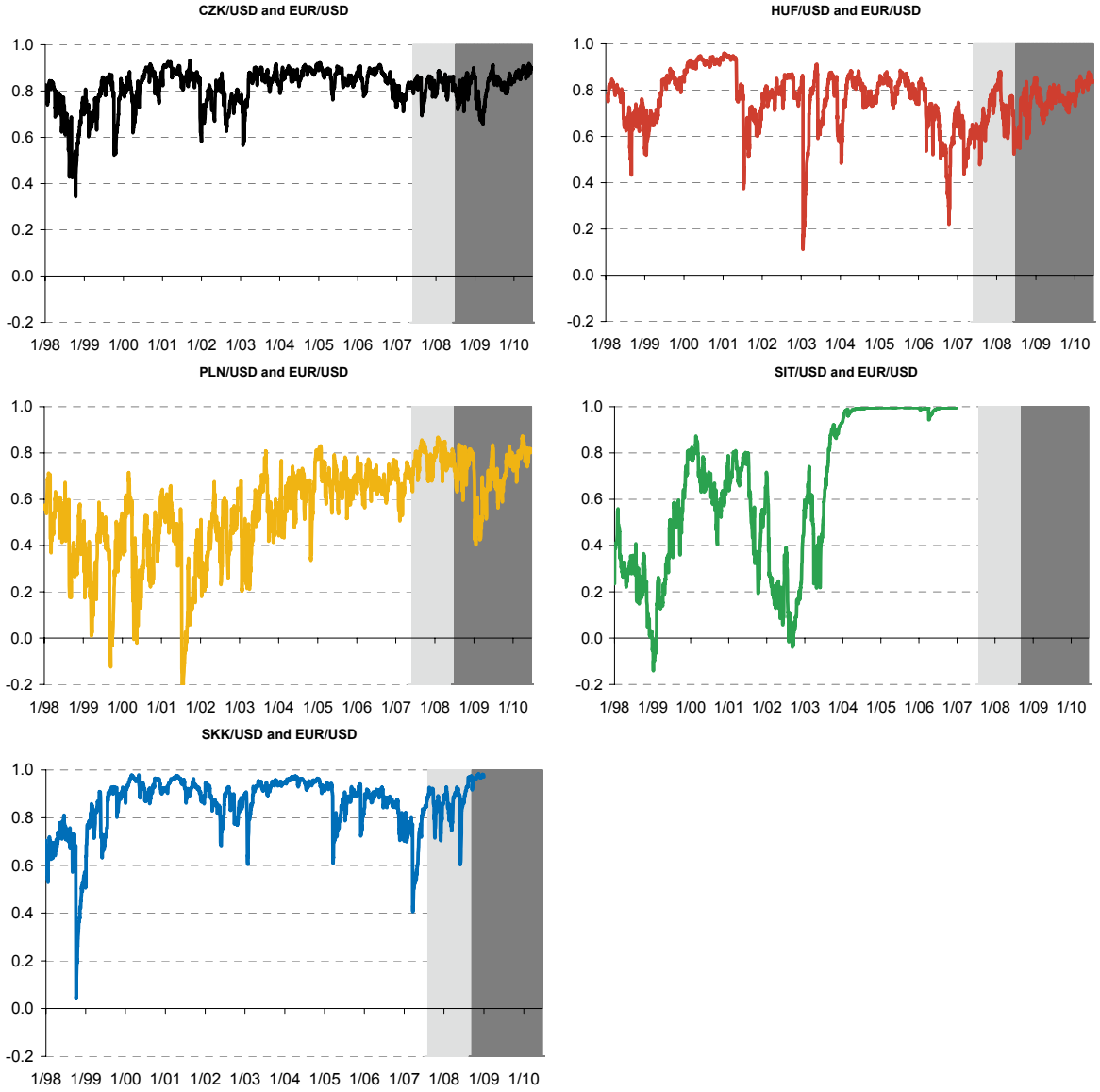
Similar movement in the exchange rates of two currencies in the long term vis-à-vis a third (reference) currency reflects similarity in the factors which affect those exchange rates. A high exchange rate correlation of two currencies vis-à-vis a third currency can thus be an indicator that the two countries can share a single currency.[48] The following analysis uses a GARCH model to estimate the correlation between the exchange rates of the Czech koruna, the Hungarian forint, the Polish zloty, the Slovenian tolar and the Slovak koruna (until joining the monetary union in the last two cases) and the euro vis-à-vis the US dollar. A high degree of correlation reflects high similarity of exchange rate movements and less intense asymmetric pressures; the exchange rate correlation of currencies in a monetary union would be one.

Chart 12 illustrates the development of the correlation coefficients in the new EU member countries under review. Compared to the other currencies under review, the correlation of the Czech koruna vis-à-vis the euro after 2000 can be assessed as relatively high. Declines in the

[48] See Aguilar and Hördahl (1998).

correlation of koruna and the euro exchange rates were recorded in the period of strong appreciation during 2001 and 2002 and in connection with the general surge in global financial market volatility after the fall of Lehman Brothers. In 2008 H2 and 2009 Q1, the Czech koruna, Hungarian forint and Polish zloty were exposed to substantial depreciation pressures, caused largely by external factors (global investment sentiment).[49] In 2010 H1, however, the correlation between the koruna and the euro returned to 0.8–0.9. Of the other countries under comparison only Slovakia had recorded such levels in the past. The correlation of the Hungarian forint and the Polish zloty with the euro remained slightly lower.

Chart 12: Correlation coefficients of exchange rates against the US dollar



Note: The light-grey colour of the background marks the first phase of the crisis; the dark-grey colour marks the period following the failure of Lehman Brothers.

Sources: Thomson Datastream, Eurostat, CNB calculations.

[49] The Slovak koruna avoided this thanks to Slovakia's approaching entry into the euro area on 1 January 2009.

There is a difference in the convergence of the exchange rates of Slovenia and Slovakia during their stays in ERM II. This difference chiefly reflects differences in their foreign exchange regimes and the fact that Slovakia continued to pursue inflation targeting after it joined ERM II (see NBS, 2004). The outbreak of the financial crisis increased the volatility of the correlation between the Slovak koruna and the euro, but the approaching euro changeover date after the central rate had been set helped keep the correlation at high levels.

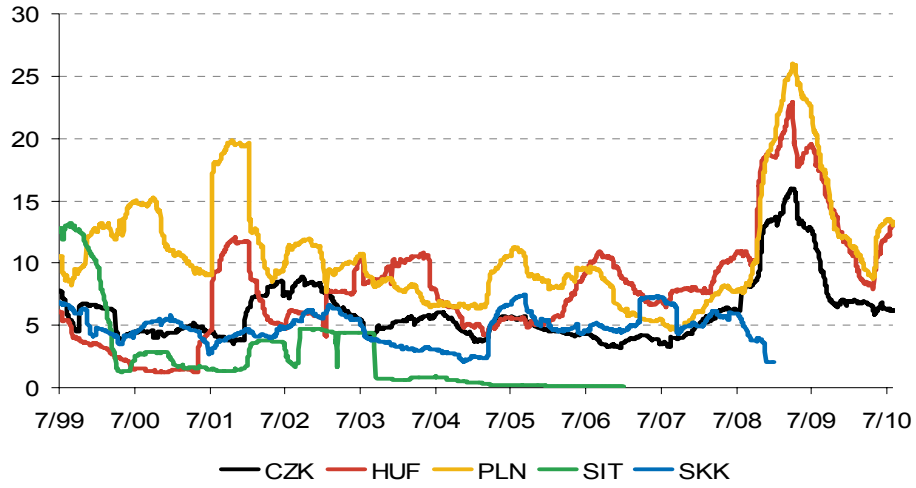
To sum up, therefore, the relatively high and – except during the crisis – sustained correlation between the Czech koruna and the euro suggests that the Czech currency reacts to changes in the external environment outside the euro area similarly as the euro.

1.1.8 Analysis of exchange rate volatility

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

Chart 13 describes the historical volatility of the exchange rates of the new EU member countries under review vis-à-vis the euro between 1999 and 2010.[50] 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 under comparison.[51] The increase in volatility associated with the global financial and economic crisis affected the Czech koruna as well as the Hungarian forint and the Polish zloty. However, the volatility of the Czech koruna was lower than that of the last-mentioned two currencies and did not increase again in connection with the Greek crisis. The volatility of the Slovak koruna in this period was already affected by euro changeover.

Chart 13: Historical volatility of exchange rates vis-à-vis the euro (%)



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

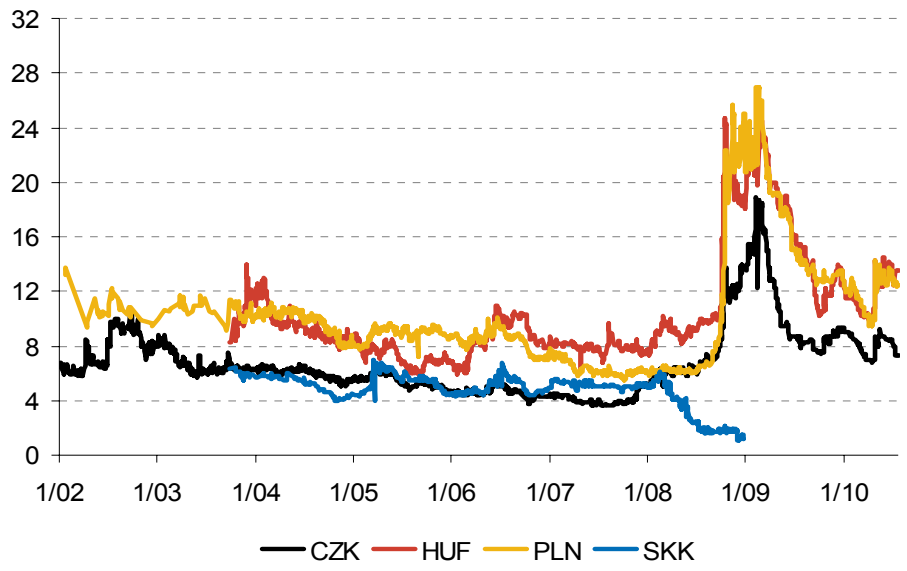
Sources: Datastream, CNB calculations.

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

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

An outlook for exchange rate volatility can also be derived from financial markets data. Chart 14 shows movements in the volatility of the exchange rates under comparison which is expected by the financial markets and reflected in the prices of options for the individual currencies (implied volatility). In 2002–2007, the implied volatility had been falling gradually for all currencies and was always lower for the Czech Republic and Slovakia than for Hungary and Poland. In 2008, the increased uncertainty associated with the financial crisis fostered a sizeable rise in the implied volatility of these currencies, except for the Slovak koruna. In 2009 Q2, the implied volatility of the Czech, Polish and Hungarian currencies started to fall again, but it remains at higher levels than before the crisis.

Chart 14: Implied volatility of exchange rates vis-à-vis the euro (%)



Source: Bloomberg.

Fundamental-based (i.e. theoretically expected) exchange rate volatility can also be used to assess economic preparedness for euro adoption. Based on past determinants of the volatility of the exchange rates of the currencies under review against the euro (in particular the optimum currency area criterion), this indicator estimates their potential volatility and their potential need for exchange rate adjustment in the future.[52] According to this estimate, the exchange rate volatility fundamentals are roughly similar for the Czech Republic, Hungary and Slovenia (for Slovenia and Slovakia the situation is a hypothetical), slightly lower for Slovakia and higher for Poland (for more details see the 2009 Alignment Analyses).

Market data on the volatility of the Czech koruna's exchange rate against the euro and analyses of its fundamentals therefore show frequent exchange rate changes. This variability is partly due to the appreciation trend of the Czech koruna. Nonetheless, the volatility of the koruna's exchange rate against the euro was low and stable, except during the financial crisis.

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

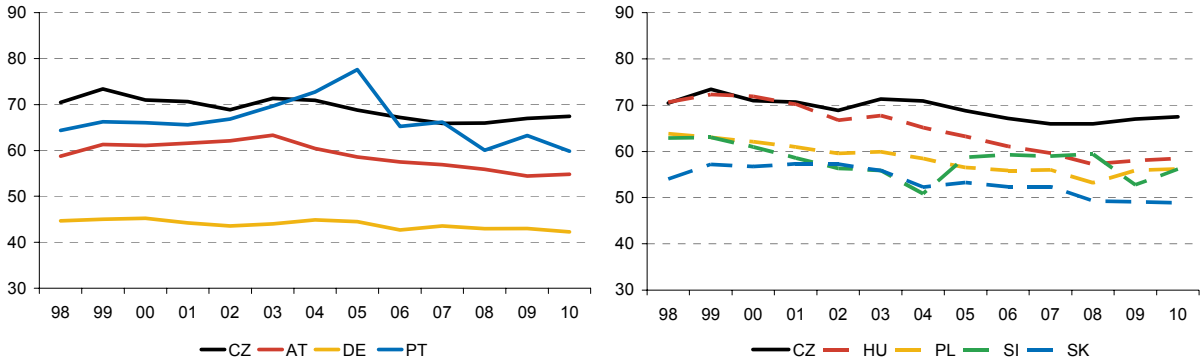
1.2 Effect of international economic relations

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 Integration of the economy with the euro area

Greater economic integration between countries increases the probability of their experiencing similar economic development.[53] It can thus be expected that higher intensity of trade of the countries under review with the euro area (Charts 15 and 16) 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 including Slovakia accounts for almost 70% of the Czech Republic's total exports and more than 60% of its total imports. This is a higher level than that of most other countries under review. The high share of trade with the euro area in the Czech Republic's foreign trade in 2009 was maintained in an environment of a declining total foreign trade volume.[54] Thus there exists a relatively wide channel for transmission of economic impulses from the euro area to the Czech economy.[55]

Chart 15: Shares of exports to the euro area in total exports (%)



Note: The preliminary value for 2010 was calculated from the 2010 Q1 data.

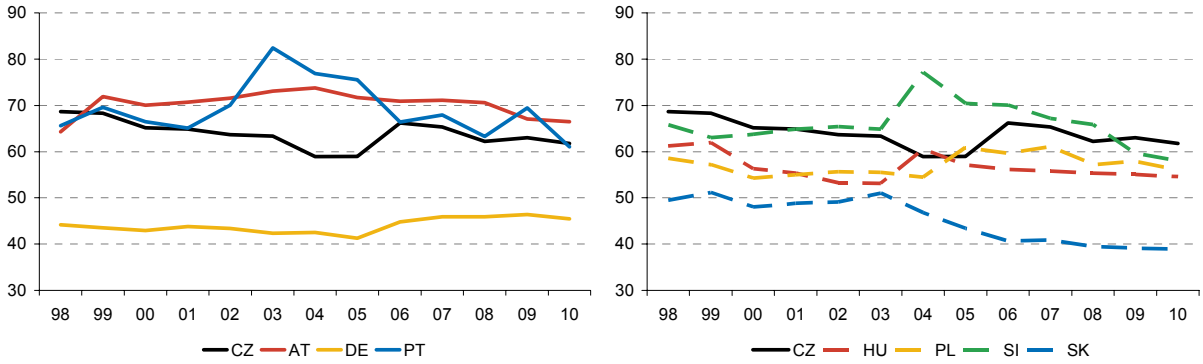
Sources: IMF-DOTS, Eurostat, CNB calculations.

[53] 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).

[54] The Czech Republic trades mostly with six EMU countries. According to 2009 data, the share of Germany in total Czech trade with the euro area was 48.4%. The Slovakia accounted for 12%, Austria, France and the Netherlands for roughly 7.5% and Italy for 6.4%.

[55] The main determinants of the dynamics and structure of Czech foreign trade are analysed in Benáček et al. (2005).

Chart 16: Shares of imports from the euro area in total imports (%)



Note: The preliminary value for 2010 was calculated from the 2010 Q1 data.

Sources: IMF-DOTS, 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.[56] In addition, capital integration between two countries can help to dampen a negative unilateral demand shock.[57] Ownership links with the euro area are measured by the share of foreign direct investment (FDI) from the euro area in the surveyed countries in GDP (see Table 12) and by the share of direct investment (DI) from the surveyed country in the euro area in GDP (see Table 13).

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

	2002	2003	2004	2005	2006	2007	2008
CZ	38.6	35.5	36.2	39.8	41.4	45.9	49.0
AT	12.1	12.3	13.6	17.7	22.1	24.5	24.8
DE	15.2	15.5	14.6	15.0	16.1	16.3	16.4
PT	20.7	19.6	20.3	22.5	27.3	-	-
HU	29.7	35.7	36.5	37.7	40.4	43.0	41.3
PL	16.1	17.7	23.3	23.3	26.0	28.2	23.9
SI	11.4	12.2	14.0	14.9	15.9	22.0	23.7
SK	16.2	31.4	33.0	37.8	41.9	32.9	36.7

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

The Czech Republic's share of foreign direct investment from euro area countries in GDP is – together with Hungary and Slovakia – the highest among the countries under comparison and is showing an upward trend. In 2009, however, FDI inflows from the euro area to the Czech Republic decreased substantially (from CZK 109 billion in 2008 to about CZK 43 billion) owing to the global financial and economic crisis. In 2010, FDI inflows from the euro area have picked up again, exceeding the entire previous year's level in the first half of the year (CZK 62.3 billion). According to the estimates of the Economist Intelligence Unit, the share

[56] 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.

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

of total FDI in GDP is set to rise further in 2010 in all the countries under review except Slovenia, where it may fall slightly again.

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

	2002	2003	2004	2005	2006	2007	2008
CZ	0.2	0.6	0.7	0.8	1.0	2.1	4.1
AT	6.7	7.0	7.3	8.1	11.0	11.8	13.1
DE	11.5	11.3	11.0	12.0	13.5	14.8	15.2
PT	10.1	10.0	10.9	12.0	13.2	-	-
HU	1.2	1.5	2.7	3.9	4.2	4.2	3.5
PL	0.3	0.4	0.6	0.5	1.7	1.6	1.8
SI	1.1	1.3	1.8	1.8	1.9	1.9	1.9
SK	0.3	0.2	-0.3	-0.5	0.3	0.7	0.7

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

Ownership links defined in the other direction, i.e. direct investment from the surveyed countries in the euro area as a percentage of their GDP, are so far still low in the case of the new EU members.[58] However, the Czech Republic's share is gradually increasing. According to the available data, it was the highest of the new member countries under review in 2008.

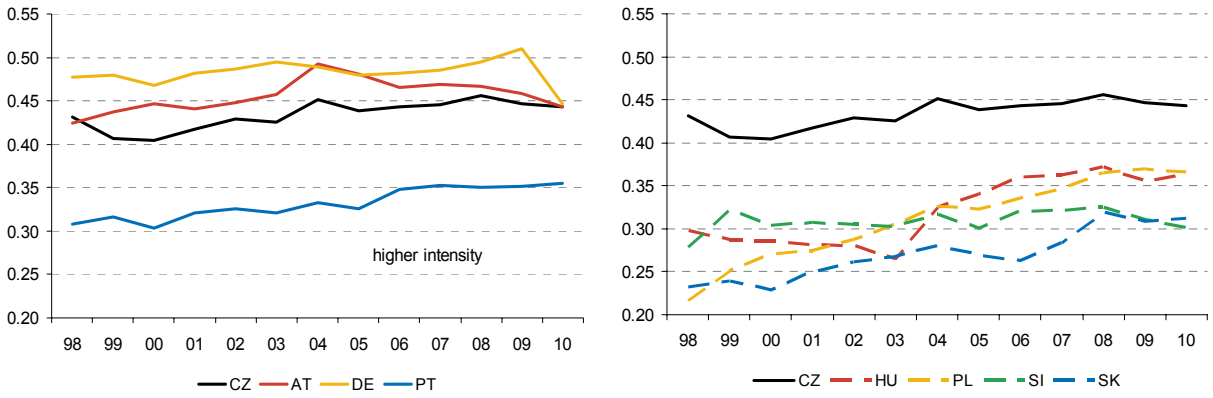
The Czech economy's intensive economic integration with the euro area, coupled with its high degree of openness, increases the probability of alignment and also generates considerable potential for transaction cost savings upon euro adoption. It is therefore one of the most significant arguments for the Czech Republic's joining the euro area.

1.2.2 Intra-industry trade

Intra-industry trade is typical of countries with a similar factor structure and is thus one of many indicators of the structural similarity of economies. Intra-industry trade fosters cyclical convergence[59] and can also affect the economy's ability to absorb economic shocks.[60] The theory of intra-industry trade[61] assumes the greatest intensity of intra-industry trade in capital- and research-intensive industries which can benefit most from economies of scale; as a rule these are industries with high market concentration. The lowest level can be expected in industries associated with certain natural resources. To analyse intra-industry trade we used the Grubel-Lloyd index, which indicates the share of the absolute amount of intra-industry trade in foreign trade turnover. Chart 17 illustrates the evolution of this indicator in the countries under review.

[58] 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.
[59] Frankel and Rose (1997).
[60] Among other things, intra-industry trade growth may have a positive effect on the costs and speed of restructuring, since the transfer of resources may be faster and less expensive if effected within an industry than between industries. A larger proportion of intra-industry trade also acts to refute the specialisation hypothesis based on inter-industry foreign trade.
[61] Krugman (1981) and Hoekman and Djankov (1996)

Chart 17: Intensity of intra-industry trade with the euro area



Note: The results were calculated using the five-digit SITC classification. The preliminary value for 2010 was calculated from the data for January–April 2010.

Sources: Eurostat, CNB calculations.

The SITC5-based Grubel-Lloyd index was flat or slightly falling in most of the countries under review in 2009–2010. In the case of Germany, the estimate for 2010 indicates a more marked decline in the index. This estimate is preliminary, however, and may change after the data for the whole of 2010 are included. The results of an analysis based on the more detailed CN8 classification point to a decline in the Grubel-Lloyd index in 2009 for all the countries under review (see Table 14). This decline is greater than when using SITC5. In 2009 and 2010, the Grubel-Lloyd indices for the Czech Republic were still among the highest of the countries under comparison, and in 2010 they were virtually the same as in Germany and Austria. The Czech Republic therefore continues to be characterised by an above-average share of intra-industry trade compared to the other countries.

Table 14: Grubel–Lloyd indices for 2009 by degree of aggregation

	SITC 1	SITC 2	SITC 3	SITC 5	CN8
CZ	0.79	0.68	0.58	0.45	0.37
AT	0.77	0.68	0.62	0.46	0.39
DE	0.78	0.70	0.63	0.51	0.43
PT	0.65	0.55	0.48	0.35	0.25
HU	0.75	0.63	0.54	0.36	0.28
PL	0.80	0.62	0.51	0.37	0.29
SI	0.72	0.58	0.46	0.31	0.23
SK	0.75	0.60	0.46	0.31	0.23

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

Sources: Eurostat, CNB calculations.

The modest fall in the Grubel-Lloyd index in 2009 and 2010 may suggest that intra-industry trade within the EU was hit harder by the economic and financial crisis than inter-industry trade.[62]

[62] The financial and economic crisis has had an adverse effect on trade within the EU, especially in the area of intermediate consumption and capital goods (see ECB, 2009).

Trade can be classified as horizontal, i.e. trade in goods of similar quality or degree of processing, or vertical, i.e. trade in goods with significant differences in quality or degree of processing.[63] Horizontal intra-industry trade occurs between countries with a similar economic structure and allows for a wider variety of goods. If, however, the level of economic development of the trading partners differs, intra-industry trade is usually vertical, i.e. trade in goods of very different quality or degree of processing. Thanks to a detailed data classification, it is possible to calculate the intensity of intra-industry trade for each type of trade.

Table 15 shows that about 60% of the intra-industry trade of the Czech economy with the euro area countries was vertical and 30% of it was horizontal.[64] Intra-industry trade accounts for 40% of total trade in goods with significant differences in value added between the Czech Republic and the euro area, and for 44% of total trade in goods with similar value added. All the countries under review have a dominant share of vertical trade in intra-industry trade as well as a comparable share of intra-industry trade in classes of goods with different degrees of processing. The intensity of intra-industry trade along both the vertical and horizontal dimensions in the Czech Republic is very similar to the situation in Germany and Austria.

Table 15: Grubel-Lloyd indices for 2009 by type of trade

	Intensity of intra-industry trade			
	Horizontal		Vertical	
CZ	0.44	(31%)	0.40	(59%)
AT	0.46	(28%)	0.40	(58%)
DE	0.47	(32%)	0.45	(61%)
PT	0.31	(21%)	0.32	(42%)
HU	0.29	(28%)	0.29	(49%)
PL	0.36	(32%)	0.33	(53%)
SI	0.29	(27%)	0.30	(49%)
SK	0.27	(25%)	0.30	(51%)

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

The high share of intra-industry trade in total trade between the Czech Republic and the euro area therefore 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 from the point of view of their alignment.

1.3 Financial market

From the viewpoint of the optimum currency area theory it is useful to examine how advanced and how similar the financial sectors and capital markets of the countries considering participation in a single currency area are to the markets within that area.[65] The financial sector and capital market play an important role in the functioning of monetary policy transmission mechanisms, and at the same time they can be a source of asymmetric

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

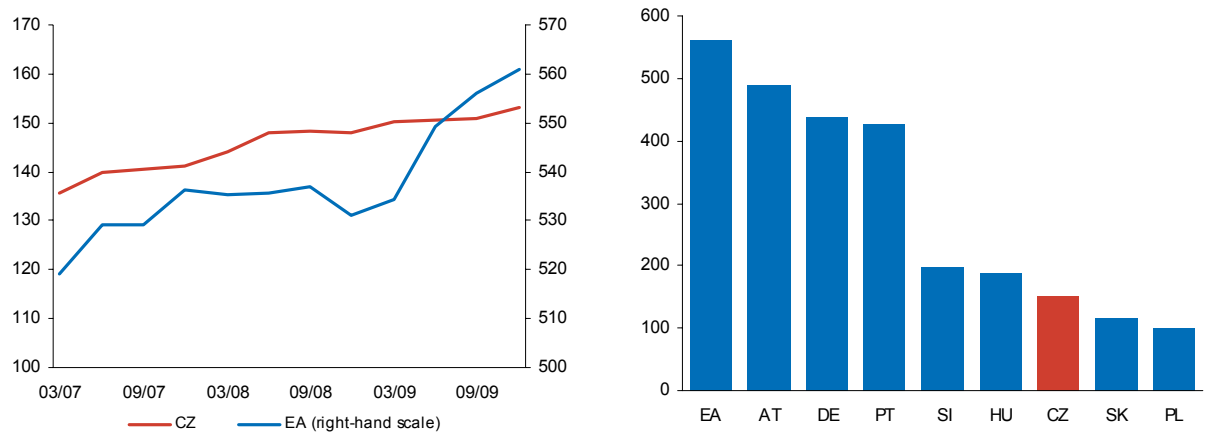
shocks. Their structural similarity in those parameters which can be regarded as desirable and their integration into European markets would be a positive signal in terms of euro adoption. In a situation of asymmetric shocks stemming from the financial markets it is necessary to analyse the differences in structure of national banking sectors, taking into account the prudential rules and the risks undertaken, which affect the functionality and stability of the financial sector.

1.3.1 Financial system

The **depth of financial intermediation in the Czech Republic** has long been well below the average level in the euro area and is more comparable with that in Hungary, Poland and Slovakia (see Chart 18). The assets of financial institutions in the Czech Republic account for about 150% of GDP, compared to roughly 560% in the euro area. However, the current depth of financial intermediation in the euro area is not necessarily an appropriate benchmark, since in some euro area countries it is more a reflection of private (but also public) sector overleveraging. Banks play an important role in the Czech financial system and so in the euro area (in the Czech Republic, banks are strongly focused on lending to the still unsaturated and constantly growing retail segment, particularly households).

Although the Czech financial sector has coped relatively well with the adverse economic situation, the share of assets of financial institutions in GDP was broadly flat until 2009 H2 mainly because of a contraction in economic activity and a subsequent fall in lending growth. By contrast with 2008, convergence to euro area levels halted in 2009, as the depth of financial intermediation grew faster in the euro area than in the Czech Republic.[66]

Chart 18: Depth of financial intermediation (assets of financial institutions as % of GDP, 2009)



Note: The data for Austria, Poland and Slovakia are for 2008. The euro area (EA) has a variable structure and includes the current member countries in the given period.

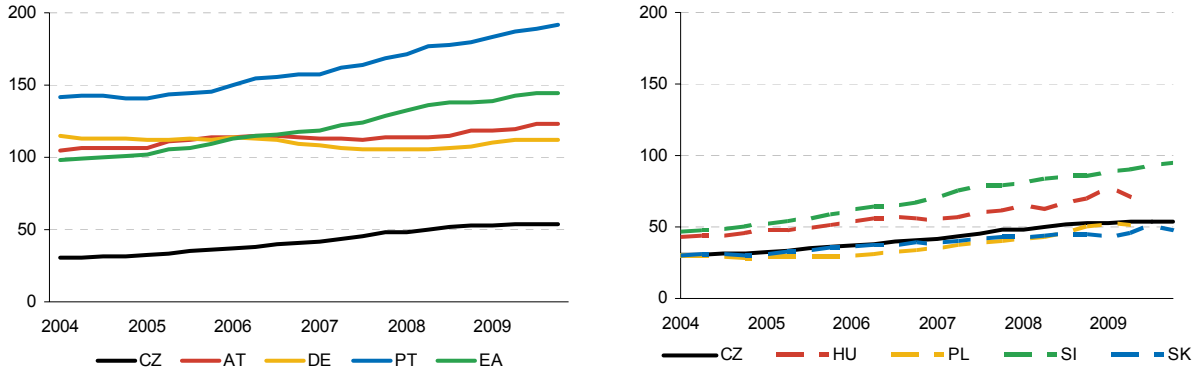
Sources: CNB, ECB, Deutsche Bundesbank.

The shallower financial intermediation in the Czech Republic is mostly a result of lower indebtedness of the Czech private sector compared to the euro area countries (see Chart 19). The indicator of **private sector debt** to banks is substantially higher in the euro area than in

[66] The growth in the balance sheets of financial institutions, particularly euro area banks, may have been partly due to the ECB's liquidity operations in 2008−2009.

the Czech Republic and the other Central and Eastern European countries (145% of GDP in the euro area, 55% of GDP in the Czech Republic). However, this may to some extent reflect the aforementioned overleveraging of the private sector in some euro area countries. Despite this, it can be supposed that private sector debt in the Czech Republic is still below its long-term equilibrium level. Although banks in both the Czech Republic and the euro area were more prudent with regard to lending during the crisis and the volume of new loans decreased, the strong decline in GDP caused an increase in the debt ratio. However, this increase was higher in the euro area than in the Czech Republic, leading – as in the case of total assets of financial institutions – to a halt in the convergence of private sector debt in the Czech Republic to the levels common in most euro area countries.

Chart 19: Private sector debt (as % of GDP)



Note: The data for Poland and Hungary cover the period 2004−2009 Q2. EA represents the average of the current (16) euro area member countries.

Source: IMF IFS.

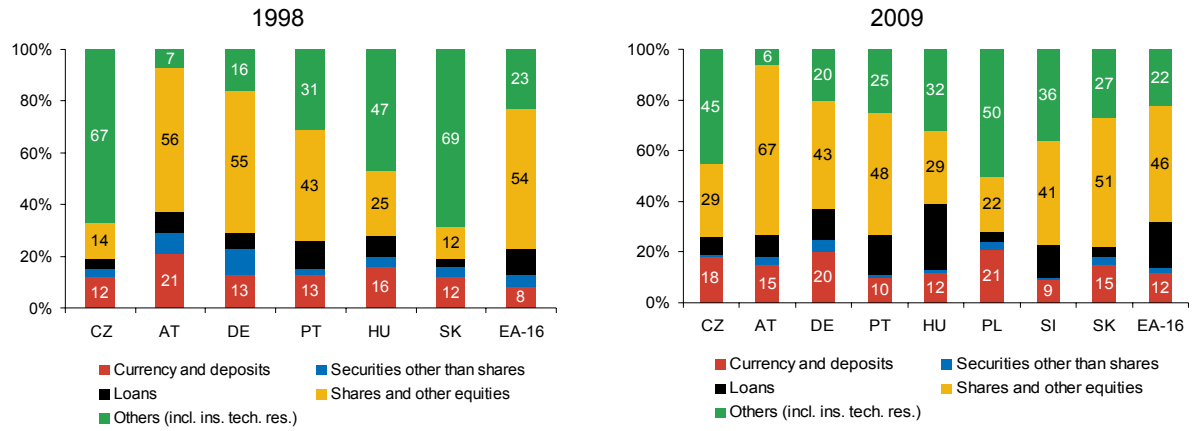
Although the Czech financial sector has a smaller financial sector and shallower financial intermediation than the euro area, this is not a serious problem in terms of euro adoption. At a time of normal economic development the financial sector has a similar effect on the Czech economy as in the euro area, including standard monetary policy transmission channels.

1.3.2 Structure of financial assets and liabilities of corporations and households

The structure of the balance sheets of economic agents affects the monetary policy transmission mechanism and therefore also the symmetry of the effect of the single monetary policy on individual economies.

The structure of **financial assets of non-financial corporations** in the Czech Republic is still somewhat different from the euro area average, despite converging towards it in 1998–2009. The main differences include a high share of other assets, comprising trade receivables, and a lower share of holdings in the equity of other corporations (see Chart 20). These differences are gradually decreasing over time, however. Poland has a similar financial asset structure.

Chart 20: Financial assets of non-financial corporations

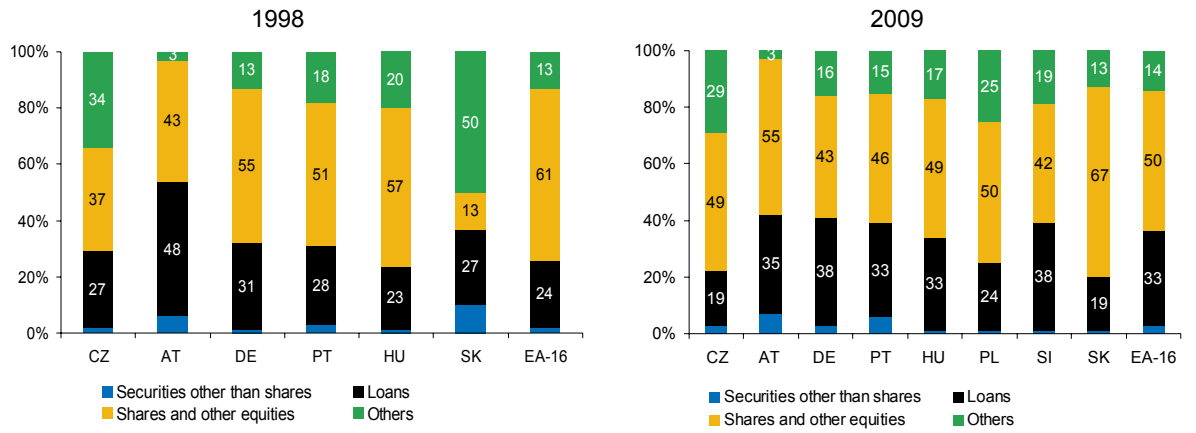


Note: Data for 1998 are available only for the Czech Republic and Slovakia; for the other countries the 1999 data were used (data for Slovenia are not available even for 1999).

Sources: ECB, national central banks, CNB calculations.

The structure of **financial liabilities of non-financial corporations** in the Czech Republic also converged towards the euro area in 1998–2009. All the economies under review showed a downward trend in the share of financial loans and an upward trend in the share of equity in 2009. The decrease recorded for loans was due to a decline in both demand and supply and the rise in the case of equity caused by rising stock market prices.[67] The significance of Czech corporations' own funds is growing steadily and, as in the other countries under review, such funds currently account for about half of liabilities (see Chart 21). By contrast, the share of loans in total liabilities is lower compared to both the euro area average and the individual countries compared except Slovakia. The share of trade credits and liabilities included in other liabilities in the Czech Republic continues to be the highest of all the countries under review. Poland also records a significant share of other liabilities.

Chart 21: Financial liabilities of non-financial corporations



Note: Data for 1998 are available only for the Czech Republic and Slovakia; for the other countries the 1999 data were used (data for Slovenia are not available even for 1999).

Sources: ECB, national central banks, CNB calculations.

[67] According to some empirical studies (Hempell and Sorensen, 2009, "The impact of supply constraints on bank lending in the euro area – crisis induced crunching?") the fall in lending in the euro area was due, in addition to falling demand in the economy, to bank loan supply constraints just after the global financial crisis erupted.

The **debt of non-financial corporations**, as measured by the ratio of loans and debt securities issued to GDP, was flat at 48% in 2009 (see Table 16). Corporate debt increased in 2009 in all the other countries under review except Poland, reflecting the lagged effect of the business cycle and in some countries also a modest rise in corporate financing through debt securities. The debt of Czech corporations is comparable with Slovakia and is still much lower than in the euro area and in the other countries compared except Poland. With regard to the risk of lower economic growth in the long term, this lower debt by comparison with the euro area continues to be an advantage[68] for Czech corporations, and even in the medium term it is not necessarily an adverse factor as regards euro adoption.

Table 16: Debt of non-financial corporations (loans and debt securities, % of GDP)

	1998	2003	2004	2005	2006	2007	2008	2009
CZ	62.9	42.2	44.6	43.3	42.6	43.5	48.0	47.7
AT	68.7	80.9	78.0	78.7	78.4	81.7	83.9	88.8
DE	57.7	72.2	66.7	66.4	67.5	68.6	70.2	71.1
PT	104.1	124.2	120.8	123.5	128.0	138.7	151.7	163.2
HU	41.3	57.3	59.4	67.5	70.5	79.2	84.4	87.9
PL	27.4	34.6	28.9	28.2	32.1	34.5	40.3	38.2
SI	-	55.7	58.8	66.0	68.9	80.8	90.7	96.8
SK	58.6	38.8	51.8	47.8	48.8	50.1	48.4	49.7
EA-16	-	82.7	81.8	84.4	88.2	92.2	97.8	100.8

Note: Loans include loans granted to corporations by domestic banks, financial intermediaries and other corporations, and loans obtained from abroad. The ratio of loans provided to corporations by domestic banks to GDP was about 22% in the Czech Republic in 2009.

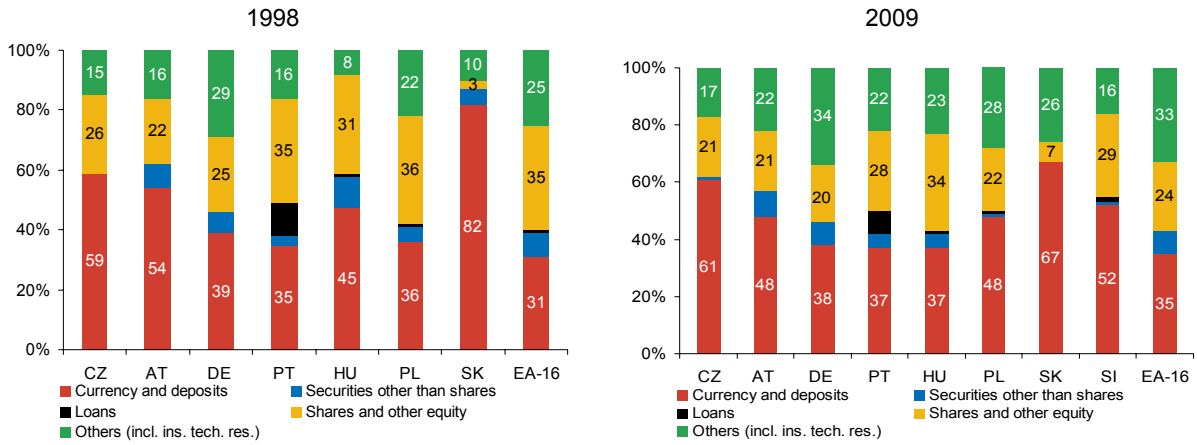
Sources: ECB, Eurostat, national central banks, CZSO, CNB calculations.

The structure of **financial assets of Czech households** also still shows some differences compared to the euro area (see Chart 22). The share of currency and deposits in the Czech Republic is, together with Slovakia, the highest. This is mostly due to Czech households' conservative approach and preferences when deciding on financial investment. Household deposits are banks' main source for financial intermediation in the economy; their ratio to loans strongly exceeds the euro area level. This fact is favourable in terms of the financial stability of both banks and households. In 2009, however, the share of currency and deposits decreased in most of the countries under review as a result of unfavourable labour market developments.[69] The share of household investment in insurance and pension funds (under other accounts receivable) is still substantially lower in the Czech Republic than the euro area average. Austria and Slovenia have similar household financial asset structures.

[68] Nonetheless, Czech corporations have also been showing a rising default rate since 2008, owing to falling external demand. It is expected, however, that the non-performing loan ratio will decrease slowly thanks to the gradual recovery in economic growth.

[69] There is evidence (Oesterreichische Nationalbank, 2010) that a real effect of the global financial crisis in the Central European region was a decline in saving due to the use of part of deposits to cover current consumption expenditure.

Chart 22: Financial assets of households

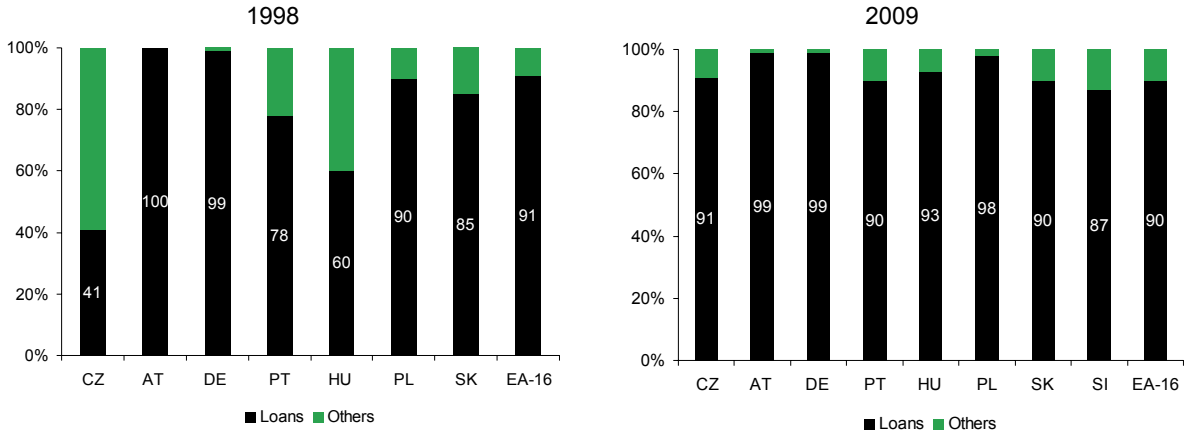


Note: Data for 1998 are available only for the Czech Republic and Slovakia; for the other countries the 1999 data were used (data for Slovenia are not available even for 1999).

Sources: ECB, national central banks, CNB calculations.

In recent years, loans have dominated **households' financial liabilities** in all the countries under review (see Chart 23). The structure of these liabilities is therefore aligned with that in the euro area.

Chart 23: Financial liabilities of households



Note: Data for 1998 are available only for the Czech Republic and Slovakia; for the other countries the 1999 data were used (data for Slovenia are not available even for 1999).

Sources: ECB, national central banks, CNB calculations.

In the Czech Republic, **household debt** – as measured by the ratio of loans to GDP – increased to about 31% in 2009 (see Table 17). A similar trend was observed in the other countries under review. However, debt in the Czech Republic is still lower than in the euro area and is comparable with Poland, Slovenia and Slovakia. The ratio of net financial assets of Czech households to GDP exceeds 50% and that to gross disposable income is just over 100%. Given the current deterioration in the financial situation of households at an aggregate level, the different sensitivity of some categories of households to labour market developments may also pose a risk with respect to debt servicing and its impacts on

consumption. This is currently being reflected in growth in non-performing loans.[70] In addition, the **gross saving ratio** of households is still significantly below the euro area average, although it is above the level in the Central European region (see Table 18).

Table 17: Household debt (bank and non-bank, % of GDP)

	1998	2003	2004	2005	2006	2007	2008	2009
CZ	6.5	11.7	14.7	17.7	20.6	24.9	28.1	30.7
AT	44.2	49.0	51.2	54.5	53.5	53.1	52.0	53.8
DE	69.4	71.8	70.5	69.3	66.9	63.2	61.3	63.4
PT	47.3	72.7	77.2	82.4	87.3	90.4	92.6	97.0
HU	4.0	16.5	19.5	23.1	25.7	29.3	36.3	37.0
PL	6.4	13.0	13.4	15.1	18.5	22.9	30.3	32.3
SI	-	16.3	16.5	19.1	21.8	24.9	26.0	29.1
SK	5.6	10.3	12.4	15.7	17.9	20.7	21.7	24.1
EA-16	-	54.3	56.4	59.4	61.3	62.1	62.7	65.7

Sources: ECB, Eurostat, national central banks, CZSO, CNB calculations.

Table 18: Gross saving ratio of households (% of gross disposable income)

	1998	2003	2004	2005	2006	2007	2008	2009
CZ	9.3	7.5	5.8	8.2	9.6	10.9	10.3	8.8
AT	13.4	14.0	14.2	14.5	15.5	16.1	16.7	-
DE	16.1	16.2	16.3	16.5	16.6	17.1	17.5	-
PT	10.6	10.6	9.8	9.3	8.1	6.2	6.4	8.8
HU	18.3	9.4	11.8	11.0	12.6	9.9	8.5	-
PL	14.4	10.2	10.4	9.6	9.2	9.9	6.5	-
SI	14.0	13.9	15.5	17.5	17.8	15.5	16.5	-
SK	12.4	6.9	6.1	6.8	6.1	7.8	6.9	-
EA-16	-	14.6	14.5	14.0	13.7	14.0	14.1	15.6

Source: ECB.

To sum up, some differences persist in the structure of financial assets and liabilities of economic agents between the Czech Republic and the euro area, in particular a greater share of trade receivables of corporations and a higher share of liquid assets of households. The effects of the global financial and economic crisis on the structure of financial assets and liabilities of corporations and households were similar in the countries under comparison. The indebtedness of Czech corporations and households is lower than in the euro area countries under review, which is an advantage in the present situation. The gross saving ratio decreased in 2009 and is still lower than in the euro area.[71] A comparison of the financial assets and liabilities of non-financial corporations and households in the Czech Republic and the euro area reveals some differences which could affect monetary policy transmission. However, these differences are not fundamental as regards euro adoption.

[70] Net interest paid currently represents around 2% of gross disposable income.

[71] A decline in real interest rates can be expected following euro adoption (see section 1.1.1). This could further increase the indebtedness of some income categories of households and therefore also their debt service costs. It could also put households' ability to repay loans at risk. Moreover, the saving ratio is already now highly differentiated, with low-income households showing low saving ratios and a high debt service burden.

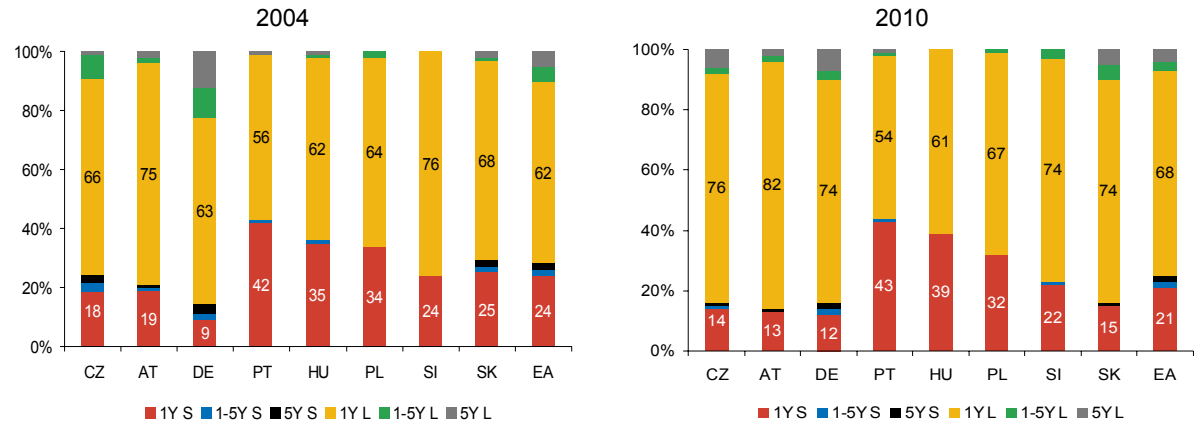
1.3.3 Effect of monetary policy on client interest rates and new loans

A key question related to the **efficiency of transmission of monetary policy to the economy** is the transmission of financial market interest rates to client interest rates and the effect of client rates on the volume of new loans provided to non-financial corporations and households. Some degree of similarity of such mechanisms is important if the single monetary policy is to have a symmetric effect (see Box 2 at the end of this section).

In the Czech Republic, **client interest rates on new loans** with floating interest rates or rates fixed for up to one year are derived mainly from money market rates, according to the results of an empirical analysis (Horváth and Podpiera, 2009). Rates on loans with long interest rate fixations are strongly affected by yields on ten-year government bonds. Short-term and floating rates on loans follow money market interest rates quite quickly (usually within one month), whereas transmission of rates with longer fixations is slower (two to three months). At the end of 2008, in connection with the global financial and economic crisis, there was an increase in risk perceived by banks, which led to a rise in risk premia for all types of loans. In the euro area, client interest rates with short fixations are also derived mainly from money market rates, and long-term rates from long-term government bond yields (ECB, 2007). Faster transmission of financial market interest rates to client rates is also visible for rates with short fixations of up to one year. In 2009, rates on client loans decreased more slowly in the Czech Republic than in the euro area. This was due mainly to a smaller decrease in money market rates. In addition, the global financial and economic crisis affected transmission in both the Czech Republic and the euro area through growth in risk client premia, which, in turn, led to slower transmission of changes in monetary policy rates to market rates.

The **interest rate sensitivity of new loans to non-financial corporations** in the Czech Republic is still similar to that in the euro area. This is indicated by the evolution of interest rates with different fixations and the structure of new loans to non-financial corporations. Empirical analyses suggest that the credit channel magnifies the economic impact of monetary policy interest rates. Corporations in the Czech Republic and in all the other countries under review mainly obtain large loans with floating interest rates or rates fixed for up to one year (see Chart 24), as rates on such loans have long been lower than those on other loans. A different structure persists only in Portugal and, to a lesser extent, in Poland, where small loans with floating interest rates or rates fixed for up to one year are provided as well.

Chart 24: Structure of new loans to non-financial corporations by interest rate fixation

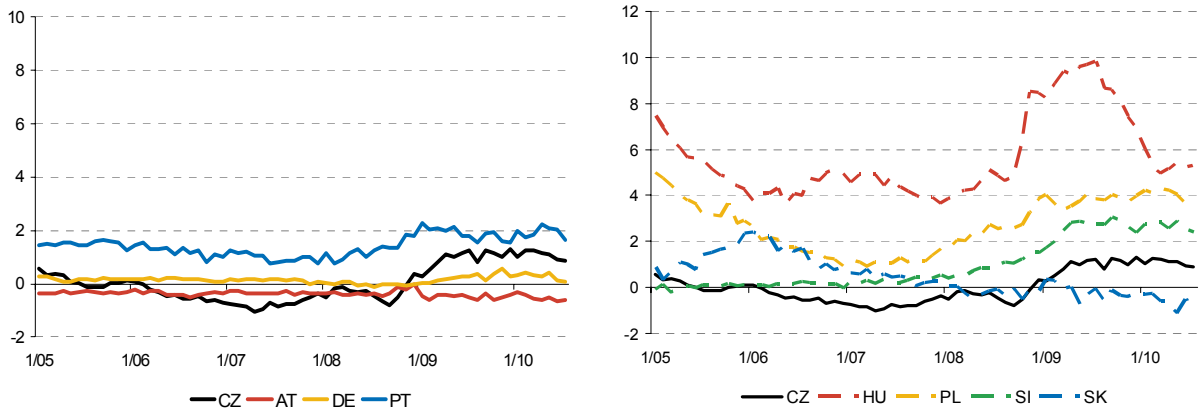


Note: 1Y S and 1Y L stand, respectively, for small and large loans with a floating rate or a rate fixed for up to one year, and the other items in the key denote such loans with longer interest rate fixations. The structure of the euro area total varies according to the number of euro area member countries in each year. The 2010 data are up to July.

Sources: ECB, national central banks, CNB calculations.

In 2005–2008, the **differences in interest rates on loans to non-financial corporations** compared to the euro area were small or falling in most of the countries under comparison, Hungary being the exception (see Chart 25). Since the end of 2008, the difference in interest rates between the Czech Republic and the euro area has increased, mainly because of a slower decline in money market rates and a higher money market interest rate. The differences also increased in all the other countries under review except Austria and Slovakia. In the Czech Republic this difference was the smallest behind Austria, Slovakia and Germany. In 2010, the interest rate differences vis-à-vis the euro-area started to decrease gradually in the countries under review. This reflects a decline in the monetary policy rate in the Czech Republic as compared to a flat monetary policy rate in the euro area and a gradual decrease in the positive differential for the short-term market rate in the Czech Republic by comparison with the euro area.

Chart 25: Differences in interest rates vis-à-vis the euro area, loans to non-financial corporations (new business, p.p.)

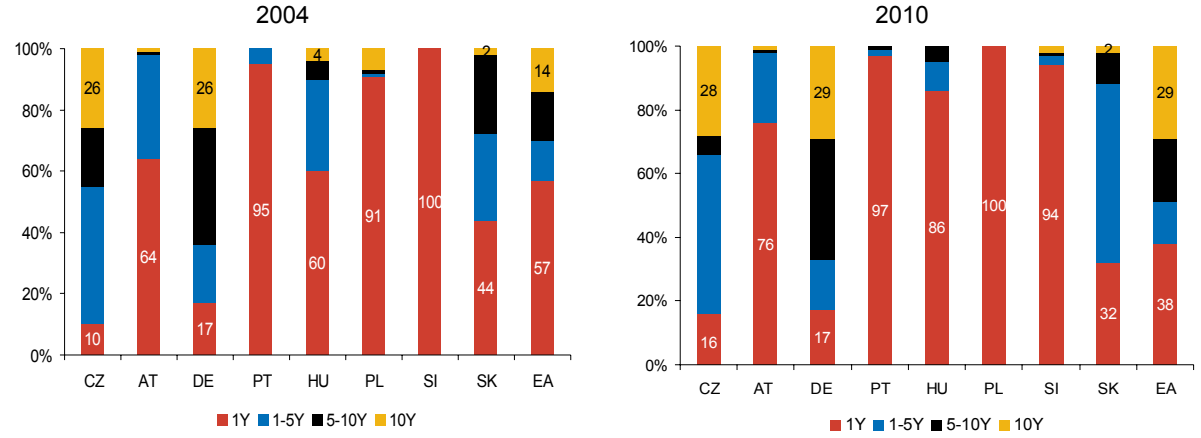


Note: The data for Poland and Slovakia are calculated from interest rates on loans with fixations of up to one year. As from 2009, interest rates on euro loans are used for Slovakia. The differences in interest rates for the Czech Republic, Hungary and Poland are calculated from new loans in their domestic currencies. Hungary and Poland would show smaller differences in the case of interest rates on new euro loans. The 2010 data are up to July.

Sources: ECB, national central banks, CNB calculations.

In the **structure of new loans to households for house purchase** (the main segment of household debt), about 80% of loans in the Czech Republic continue to have interest rate fixations of over one year (see Chart 26). Germany has a similar structure of loans for house purchase. In recent years, convergence to the euro area average has also been observed; this is good news from the point of view of the transmission of monetary policy to this loan segment. By contrast, interest rates in Portugal, Hungary, Poland and Slovenia are mostly floating or fixed for up to one year. This reflects differences in household preferences and in interest rates on individual products compared to the euro area average.

Chart 26: Structure of new loans to households for house purchase by interest rate fixation

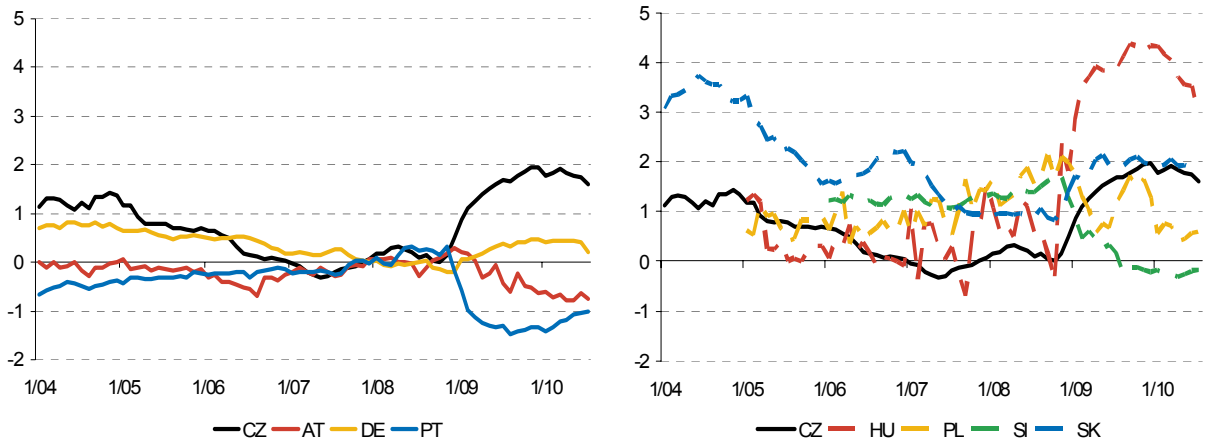


Note: The structure of the euro area total varies according to the number of euro area member countries in each year. The 2010 data are up to July.

Sources: ECB, CNB calculations.

Interest rates on house purchase loans in the Czech Republic converged to the euro area average between 2004 and 2008. However, after the global financial and economic crisis erupted, the difference vis-à-vis euro area rates increased owing to a rise in the Czech ten-year government bond yield in early 2009 versus a roughly flat euro area yield, higher monetary policy rates and growth in the client risk premium differential. House purchase loan rates showed very mixed developments relative to the euro area across countries (see Chart 27). This is because the average interest rate depends – in addition to macroeconomic developments – on the time structure of loans, which varies from country to country. In 2010, the increased differences in house purchase loan rates relative to the euro area are starting to fall slowly, as in the case of loans to non-financial corporations. The trend in the Czech Republic in 2010 reflects a falling monetary policy rate versus a flat euro area rate, and a lower ten-year government bond yield differential and client risk premium differential.

Chart 27: Differences in interest rates vis-à-vis the euro area, loans for house purchase (new business, p.p.)



Note: The 2010 data are up to July. The differences for Hungary and Poland are calculated from interest rates with fixations of up to one year (which have the largest share) on new loans for house purchase in foreign currency. The data for Slovakia are in the domestic currency up to 2008 and then in the euro.

Sources: ECB, national central banks, CNB calculations.

To sum up, the transmission of financial market interest rates to client rates in the Czech Republic is similar to that in the euro area and so represents no serious barrier to future euro adoption. Rate transmission is relatively fast in general (within three months). However, the global financial and economic crisis increased the interest rate differentials of client interest rates on new loans in the Czech Republic vis-à-vis the euro area, chiefly as a result of slightly different market rate developments. Growth in the client risk premium also contributed to a slowdown in the transmission of monetary policy impulses to client interest rates. So far during 2010, client interest rate differentials have decreased slightly in the Czech Republic and in the euro area. The interest rate sensitivity of new loans to non-financial corporations is similar to the situation in the euro area and that of new loans for house purchase is the nearest to the situation in Germany. The other countries under review still show some heterogeneity linked with households' preferences and with interest rates on the individual products.

Box 2: The interest rate channel of monetary policy transmission in the Czech Republic

In this box we examine the functioning of the interest rate channel of monetary policy transmission in the Czech Republic compared to the euro area. In particular, we analyse the extent to which this channel was disrupted during the recent financial and economic crisis and whether the developments in this area were similar in the Czech Republic and the euro area.

A key condition for the functioning of the transmission channel is the link between monetary policy rates, banks' financing costs on the interbank market and client rates on loans and deposits. The transmission between money market rates and short-tem market rates functions in the normal way thanks to the effective no-arbitrage relationship between the two types of rates. Despite optimisation of the cost of capital by banks, interbank rates transmit to rates on deposits of economic agents and to rates on client loans.

Table 19 summarises the results of an analysis of the transmission of changes in financial market rates to client rates in the Czech Republic. The analysis draws on monthly data on banks' client interest rates in 2004–2009. Based on a correlation analysis, a reference rate approximating the product funding costs was chosen for each type of client rate examined. As expected, this choice reflects the maturity of the products. The analysis itself was then conducted using an error-correction model. This allows us to estimate the degree of short-term (during one month) and total transmission of a change in market rates to client rates and the speed of return of client rates to the initial equilibrium.

Table 19: Transmission of financial market rates to client rates

		Approximating financing costs	Short-term transmission α_0	Total transmission β_1	Speed of return β_0	Speed of return in months $(\beta_1-\alpha_0)/\beta_0$
Loans	**to corporations – small**					
	Floating and rate fixation up to 1Y	6M PRIBOR	0.64***(0.15)	0.75***(0.04) ↓	-0.43***(0.09) ↓	1M
	Rate fixation over 1Y	10Y govt bond	0.33 (0.27) ↓	1.19***(0.15)	-0.4***(0.11)	3M
	to corporations – large					
	Floating and rate fixation up to 1Y	6M PRIBOR	0.62***(0.19)	0.82***(0.03) ↓	-0.6***(0.09)	1M
	Rate fixation over 1Y	10Y govt bond	0.67 (0.99)	0.83***(0.11)	-0.64***(0.13) ↓	2M
	to households for housing	10Y govt bond	-0.09 (0.07)	0.91***(0.04) ↑	-0.28***(0.03)	3M
	to households for consumption	*cointegration relation not found*				
Deposits	With agreed maturity up to 2Y	1M PRIBOR	0.63***(0.09)	0.93***(0.02) ↓	-0.35***(0.07)	1M
	With agreed maturity over 2Y	10Y govt bond	-0.04 (0.26)	0.73***(0.07) ↓	-0.47***(0.09) ↓	2M

Note: ***, ** and * denote 1%, 5% and 10% significance levels respectively; the analysis covers the period 2004–2009. Standard deviations in parentheses. ↓ denotes parameters which have lower statistical significance (in absolute terms and at the 10% level) than the parameters estimated for 2004–2008. ↑ denotes the parameter which has higher statistical significance (at the 10% level) than the parameter estimated for 2004–2008. The other parameters are not statistically significantly different. The speed of return has been rounded to whole months.

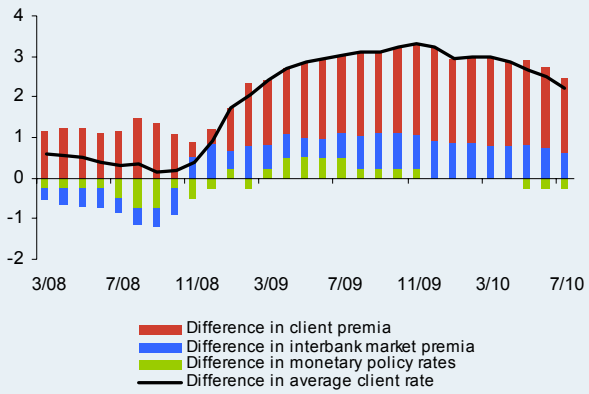
The results reveal that the transmission of market rates to client rates is relatively fast (except for interest rates on consumer credit) and almost full for mortgage loans and short-term deposits. By contrast, the reaction of small corporate loans with rate fixations of over one year is somewhat stronger than the change in rates on government bonds would suggest. This may be due to other factors which jointly affect both types of rates and are not included in the regression.

An important finding emerging from the analysis is that the recent global financial and economic crisis seems to have changed the interest rate transmission in the Czech Republic. A slowdown in the relationship between market and client rates is indicated by a comparison of the results described above with the results of the same model for the period 2004–2008. In Table 19, statistically significant differences between the periods are marked with arrows in the appropriate direction. The results suggest that the transmission in this segment slowed and weakened somewhat. We can say that this weakening largely reflected the rise in client risk premia resulting from the extraordinarily unfavourable cyclical developments and banks' increased prudence in providing loans.

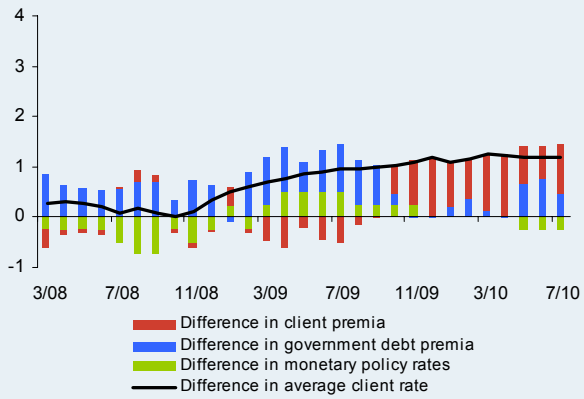
In addition to client risk premia, the different evolution of loan interest rates in the Czech Republic (see Charts 23 and 25 in the main text) may reflect the different monetary policy response to the economic situation during the crisis as well as the not fully aligned increase – and subsequent decrease – in the difference between monetary policy and market rates. This was another source of the slowdown in monetary policy transmission. These two additional sources of the different evolution of client interest rates would probably cease to be significant after euro adoption, whereas the differences in the evolution of client risk premia could persist and generate misalignment in the monetary policy transmission area. It is therefore useful to break down the overall differences in average client rates vis-à-vis the euro area into their components (see Chart 28). It can be said that the different evolution of interest rates on loans to non-financial corporations in the Czech Republic and in the euro area largely reflected the different evolution of the interbank market premium. This was linked with the ECB's unconventional monetary policy, which pushed interbank rates in the euro area well below the ECB's official key monetary policy rate. The effect of client risk premia in this loan segment was only small. In the case of loans to households for house purchase, by contrast, client rate differentials were more strongly affected by the non-alignment of client premia in addition to the different evolution of market interest rate premia.

Chart 28: Decomposition of differences in average client rates vis-à-vis the euro area

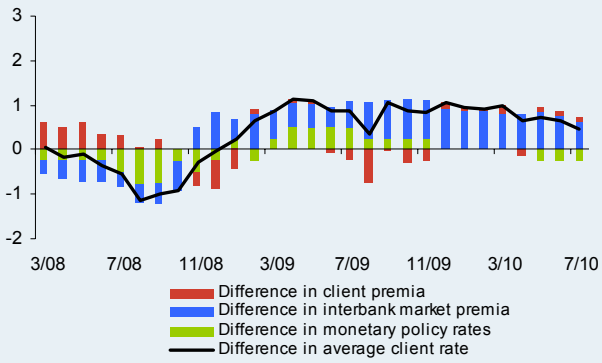
House purchase loans with rate fixation up to 1Y



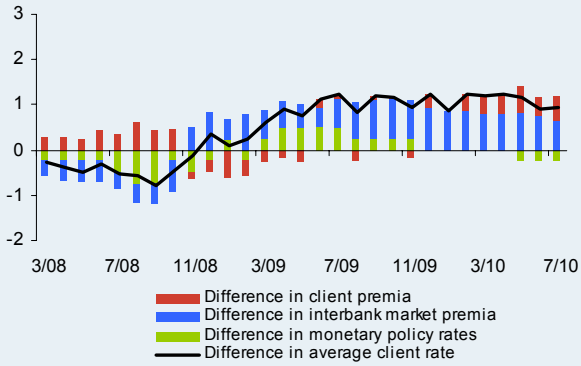
House purchase loans with rate fixation over 1Y



Small loans to non-financial corporations



Large loans to non-financial corporations

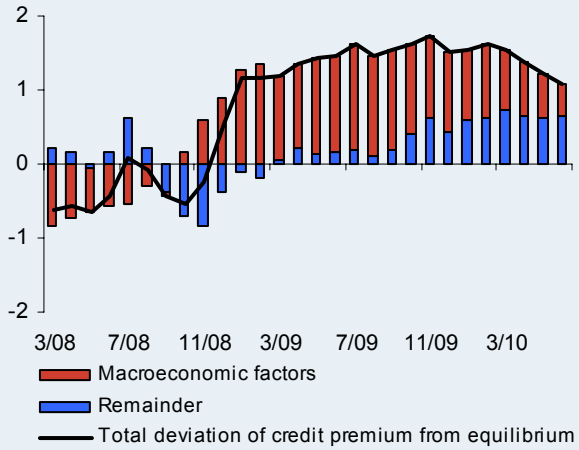


Note: The differences are expressed for Czech rates versus euro area rates in percentage points. Monetary policy rates are represented by the CNB's two-week repo rate and the ECB's one-week repo rate, interbank market rates by the three-month PRIBOR and the three-month EURIBOR, and rates on government debt by the ten-year government bond for the Czech Republic and the interest rate convergence criterion for the euro area.

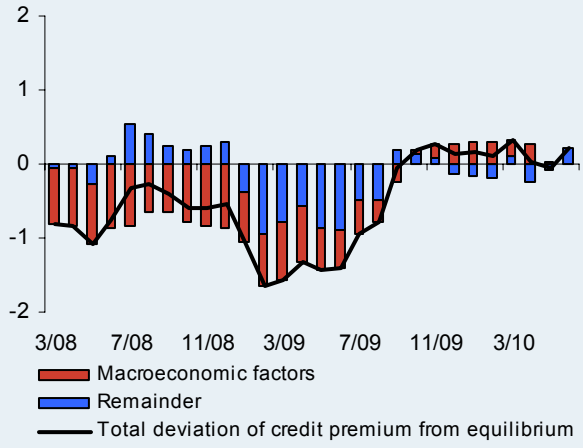
For monetary policy it is also important to distinguish whether the above evolution of client credit premia reflected the business cycle or a tightening of credit standards independently of the cycle (see Chart 29). The results of an empirical model describing the evolution of interest rates relative macroeconomic variables capturing the position of the economy in the business cycle showed that, as expected, the client rate on house purchase loans in the Czech Republic and its premium are affected – unlike interbank market rates – chiefly by the unemployment rate. Rates with shorter fixations are also influenced by economic sentiment as measured by confidence indicators. However, the increase in the client premium for loans for house purchase with shorter fixations was more pronounced than that implied by past relationships. This may be due to the extraordinarily deep economic crisis, which also had a strong effect on the labour market, the real estate market and the creditworthiness and riskiness of household clients. As for loans to corporations, the premia show little sensitivity to the business cycle in the case of large loans and higher sensitivity in the case of small loans with longer fixations. The only major difference for rates on loans to corporations vis-à-vis the euro area is that the Czech rates are more volatile. This can be explained by a smaller market and a smaller number of loans.

Chart 29: Client premia factors for rates on house purchase loans

House purchase loans with rate fixation up to 1Y



House purchase loans with rate fixation 5Y−10Y



To sum up, the transmission of monetary policy rates via the interest rate channel in an environment affected by the global financial and economic crisis slowed and weakened somewhat, mainly because of growth in interbank market premia and client risk premia. The empirical data suggest relatively symmetric evolution of client risk premia in the Czech Republic and the euro area for loans to

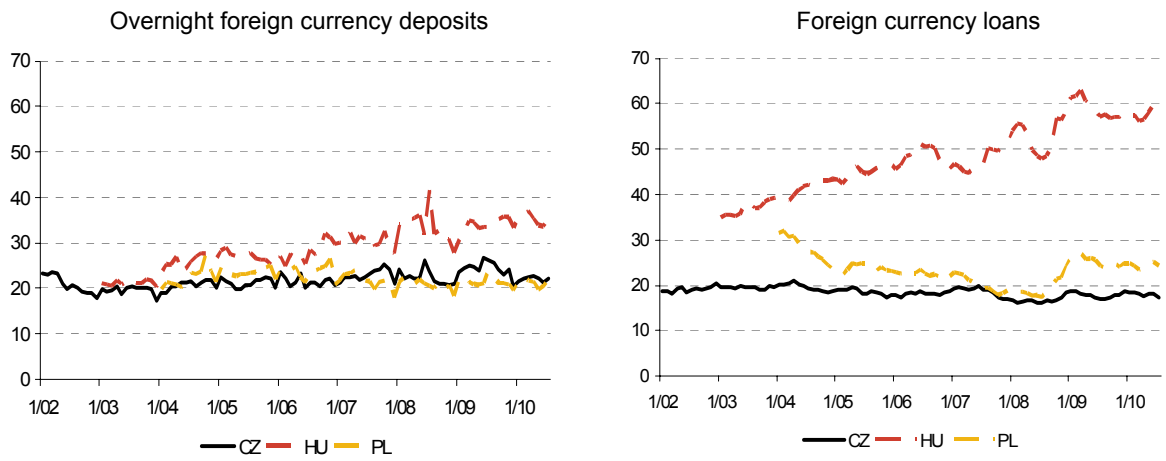
corporations. Conversely, a different response of Czech client premia to the business cycle is visible for house purchase loans with shorter fixations. As the external financing of economic agents in the Czech economy, like in most euro area economies, is based on intermediation by banks, we believe that minor differences in the functioning of the monetary policy transmission mechanism due to the only partly aligned interest rate channel will persist even after potential euro area entry.

1.3.4 Spontaneous euroisation

Spontaneous euroisation can reduce the effectiveness of independent monetary policy. It is usually signalled by rising foreign currency demand among economic agents, manifesting itself in an increase in the share of foreign currency loans and deposits.

The use of foreign currency by **non-financial corporations** in the Czech Republic reflects the openness of the Czech economy. The share of overnight foreign currency deposits in total domestic overnight deposits, which indicates the degree of use of foreign currency in corporate transactions, has been fluctuating around 20% since 2002 (see Chart 30). Euro overnight deposits account for about 19% of that figure. The use of overnight foreign currency deposits in the Czech Republic is similar to that in Poland, but lower than in Hungary. The share of foreign currency loans of corporations in their total loans drawn in the Czech Republic also remains at around 20%. This is slightly lower than in Poland and much lower than in Hungary. The share of foreign currency in the loans drawn by Czech corporations abroad is about 70%. Such loans are drawn mainly by foreign-controlled corporations, most of them exporters, for which euro-denominated debt is a natural hedge, reducing their sensitivity to exchange rate volatility.

Chart 30: Overnight foreign currency deposits and loans of non-financial corporations (shares in total overnight deposits and loans of non-financial corporations with domestic banks, %)



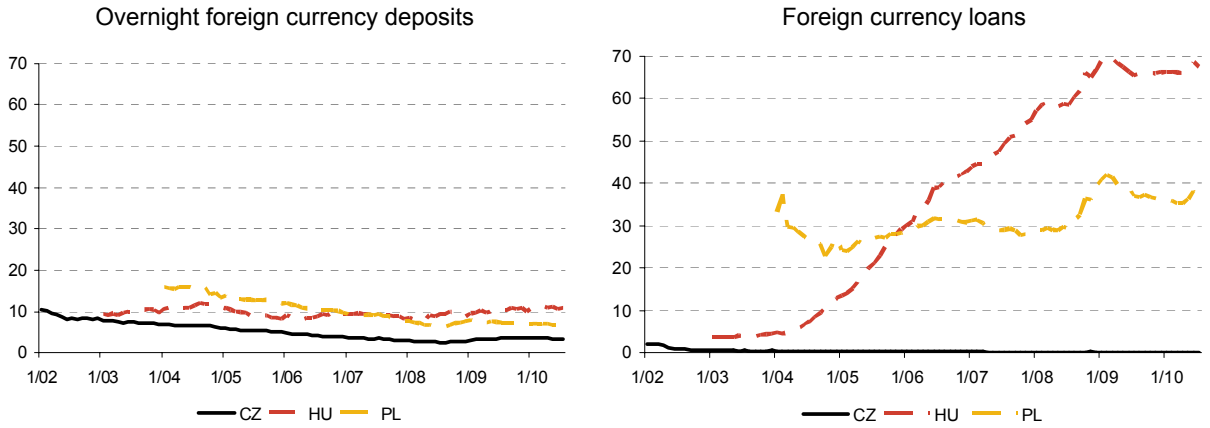
Sources: ECB, CNB calculations.

The substitution of the domestic currency with foreign currency, or the euro, is still much lower for Czech **households** than for corporations. The share of overnight foreign currency deposits of households has been declining steadily since 2002. In mid-2010 it was about 3% (see Chart 31).[72] The depreciation of the Czech koruna in late 2008 and early 2009 and the global financial crisis had no fundamental effect on foreign currency deposits in the Czech

[72] Foreign currency savings deposits with agreed maturity have long been below 10%.

Republic.[73] The proportion of household foreign currency loans has long been virtually zero. In Poland, and particularly in Hungary, the proportion of foreign currency loans to households is significant owing to high nominal interest rates on house purchase loans in the domestic currency. However, its growth halted in connection with the economic crisis.

Chart 31: Overnight foreign currency deposits and loans of households (shares in total overnight deposits and loans of households with domestic banks, %)



Sources: ECB, CNB calculations.

To sum up, the use of foreign currency in Czech entities' financial transactions is concentrated in the sector of corporations, owing to their involvement in foreign trade.[74] Czech households make minimal use of foreign currency in domestic transactions. Spontaneous euroisation in the Czech Republic is limited by economic agents' confidence in the domestic currency, by low inflation (reflected in low interest rates) and by exchange rate volatility, which deters agents (except for exporters) from substituting the domestic currency with foreign currency. Consequently, spontaneous euroisation represents neither a barrier to effective independent monetary policy nor an argument in favour of euro adoption beyond the framework of high trade integration with the euro area.

1.3.5 Financial market integration

Financial market integration has been achieved when financial assets having similar risk factors and yields are priced identically by the markets no matter which country they are traded in. This follows from the law of one price. If the law of one price did not apply, there would be room for arbitrage. If we assume a fully integrated market with no barriers (economic, legal, cultural, etc.), then any investor will be able to use this arbitrage opportunity, causing the law of one price to apply again.

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 financial asset prices will be affected by common factors rather than by national factors. It can also be assumed that with

[73] The results of an Oesterreichische Nationalbank (2010) survey ("Real effects of crisis have reached CESEE households: Euro Survey show dampened savings and changes in borrowing behavior") suggest that in the case of households' financial assets the degree of euroisation is virtually unchanged as a result of the global financial crisis. By contrast, the crisis has increased households' perceptions of the exchange rate risk relating to foreign currency loans in countries with higher use of such loans.

[74] According to a CNB survey of selected non-financial corporations, the shares of foreign currency payments and receipts in total domestic payments and receipts are around 15% and 8% respectively.

increasing integration the individual national financial market segments will become a less likely source of asymmetric shocks, although there is a greater possibility that they will become a source of symmetric shocks.

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.[75]

Price-based measures use the concepts of beta-convergence and sigma-convergence[76] (see Adam et al., 2002). The concept of beta-convergence enables identification of the speed at which differences in yields are eliminated on individual financial markets (national vis-à-vis the euro area), or the speed of convergence. 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. The concept of sigma-convergence focuses on the dispersion of the yields on identical assets in different countries at a given moment in time and thus identifies the degree of integration vis-à-vis the euro area achieved at that moment in the individual financial market segments in the countries under review. Sigma convergence increases as the sigma parameter falls to zero. If there is beta-convergence, sigma-convergence may, but need not, arise at the same time. There may even be sigma-divergence. For this reason, the two concepts must be tracked concurrently when assessing financial integration.

News-based measures of financial integration are based on the assumption that prices of individual national assets of integrating financial regions respond to common news rather than to local news (see Baele et al., 2004). This method 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. The sensitivity of asset prices to global news is measured by gamma, which shows the extent to which a country's asset prices respond to news in the same way as the benchmark asset.[77] Higher gamma values signal greater integration of the asset markets under comparison. Values greater than 1 indicate a multiplication effect, i.e. a stronger response of the price of a local asset relative to the benchmark asset. Negative values express an asymmetric response to news (shocks).

The periods under review differ depending on the availability of data for the individual markets. The longest series cover the period from January 1995 to July 2010. The results of the analysis for the individual financial market segments are shown in Table 20 for beta-convergence, in Chart 32 for sigma-convergence and in Chart 33 for gamma. When interpreting the results, we take particular account of the financial crisis period, which was marked by generally high market price volatility.

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

[76] 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).

[77] Asset prices are monitored at an aggregate level and it is assumed that the benchmark asset responds to global news only.

Table 20: Beta coefficients

	Money market		Foreign exchange market		Bond market		Stock market	
	1/99–7/07	8/07–7/10	1/95–7/07	8/07–7/10	1/01–7/07	8/07–7/10	1/05–7/07	8/07–7/10
CZ	-0.57	-0.38	-0.93	-0.90	-0.73	-0.69	-0.79	-0.77
AT	-	-	-	-	-1.12	-0.93	-0.88	-0.62
DE	-	-	-	-	B	B	-0.78	-1.07
PT	-	-	-	-	-0.81	-1.22	-0.92	-1.00
HU	-0.79	-0.95	-0.87	-0.97	-0.87	-0.62	-0.81	-0.95
PL	-0.68	-0.72	-0.87	-1.01	-0.82	-0.78	-0.82	-0.88
SI	-	-	-	-	-	-	-0.78	-0.82
SK	-0.75	-0.56‡	-1.07	-0.60	-0.99‡‡	-0.89	-0.72	-0.97
EA	B	B	B	B	-	-	B	B

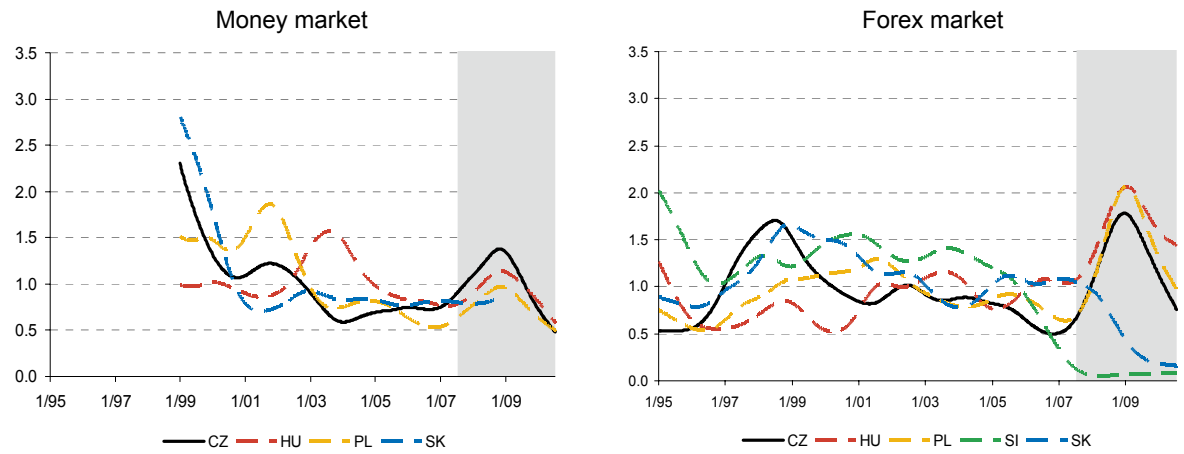
Note: The closer the value of the beta coefficient is to -1, the higher is the speed of convergence; the first time interval in the analyses is the period before the outbreak of the financial crisis (up to August 2007); the second is the period containing the impacts of the financial crisis. Other symbols: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

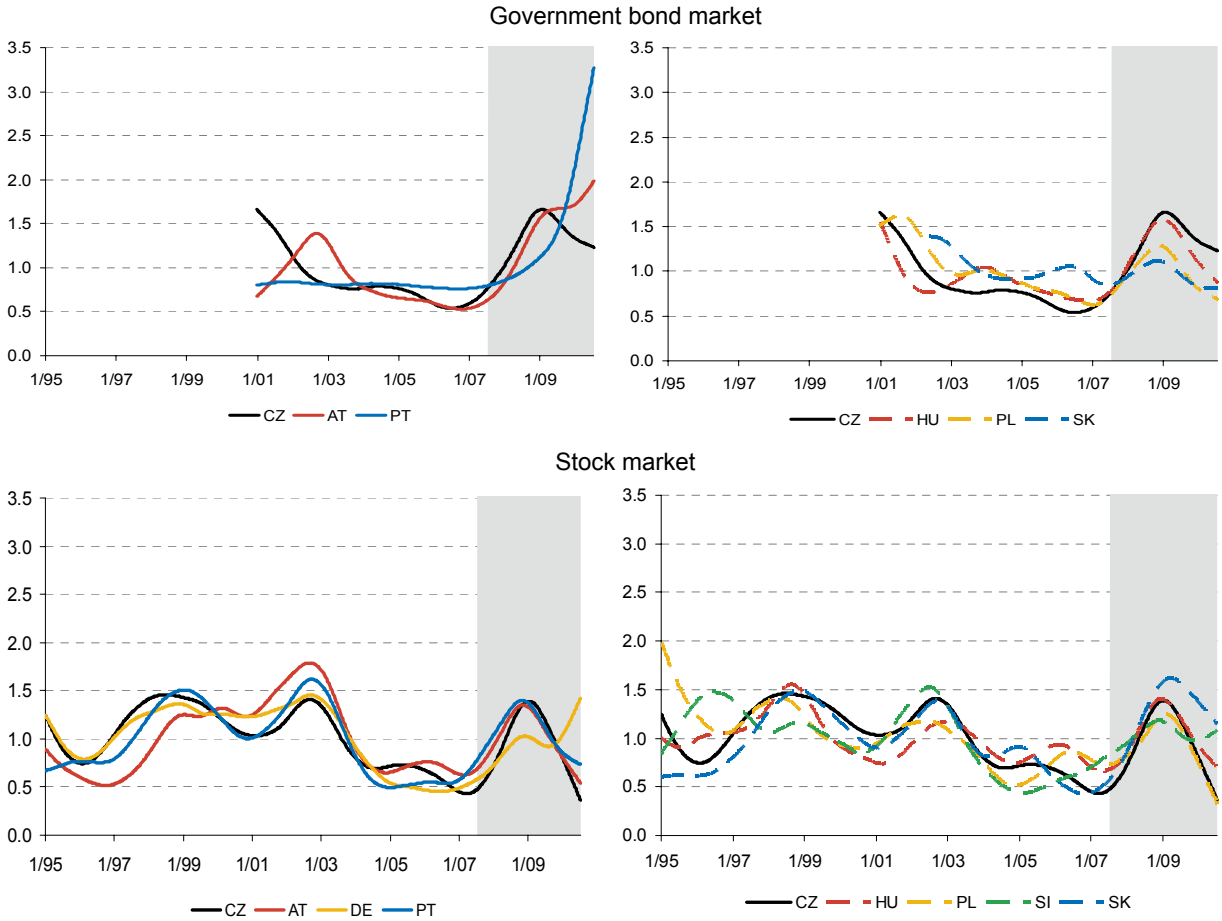
Sources: Thomson Datastream, CNB calculations.

The results of **price-based measures** signal that in the pre-crisis period the speed of price adjustment on the stock, bond and foreign exchange markets of the countries under review vis-à-vis the euro area (or Germany in the case of the government bond market) was relatively high (beta coefficients close to -1; see Table 20) and the level of convergence achieved did not differ much across the countries in the case of these markets (sigma coefficients; see Chart 32). Among the Central European countries, the Czech Republic achieved the highest degree of integration for these three markets.

The speed of integration of the money market in the new member countries under review was already lower in the pre-crisis period compared to the other markets. This may reflect the relatively strong effect of specific regional news on this market. This is mainly due to different monetary policy settings, as these are the primary determinants of money market asset yields. Among the countries compared, Poland achieved the highest degree of money market integration (as evidenced by the gamma coefficients; see Chart 33). However, the fastest convergence was recorded by the Hungarian money market. The level of integration of the Czech money market has remained broadly unchanged since 2002.

Chart 32: Sigma coefficients





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

Sources: Thomson Datastream, CNB calculations.

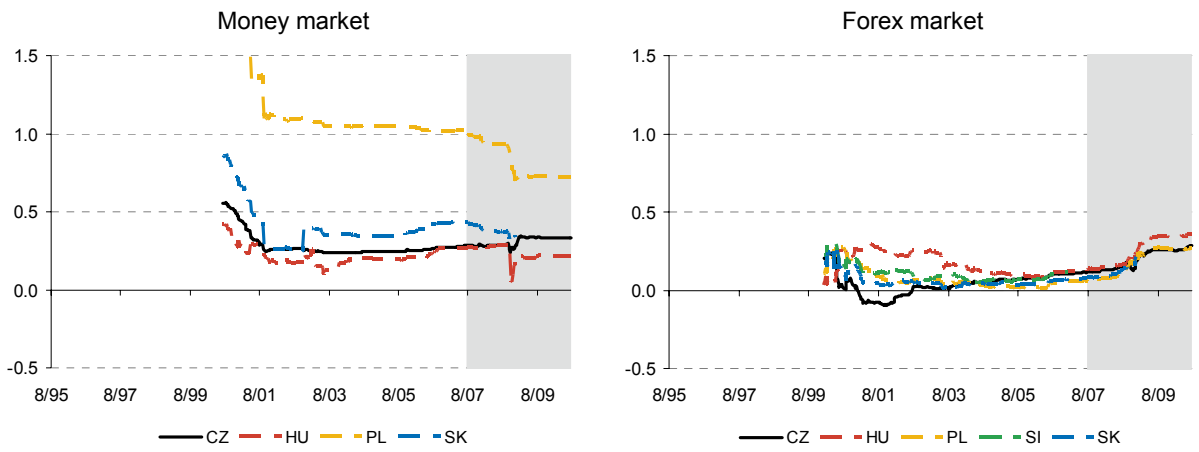
The results of **news-based measures** indicated that the local factors affecting the national markets were already quite significant in the pre-crisis period (see Chart 33). For the Czech Republic, the highest degree of integration measured using the above method was obtained for the government bond market, where higher sensitivity to the transmission of global news can be expected, however. The integration was perceptibly lower than in the case of Austria and Portugal, where the gamma coefficients were close to one.[78] Unlike in the government bond markets, the reaction to common news in the other markets in the Czech Republic, and in the other countries under review, was quite low until 2009. It can thus be concluded from the comparison with the degree of integration measured using sigma-convergence that the koruna market responded to common global news in the same manner as the euro market, but its response was very weak. Overall, the gamma results show that the degree of integration was stable in the period between the candidate countries' accession to the EU and the start of the crisis, albeit at rather low levels.

[78] The degree of financial market integration in Austria and Portugal measured using the beta and sigma coefficients was low, however. In the case of Austria, the divergence reflects among other things the greater exposure of the Austrian financial sector to the Balkans (e.g. Bulgaria) and Eastern Europe (e.g. the Ukraine).

Both methods signal that the **financial crisis** had a significant impact on the financial market integration of all the countries under review with the euro area. Chart 32 shows that the divergence started at the outbreak of the crisis and lasted almost to mid-2009 (the grey area), when the situation on the financial markets started to calm gradually.[79] Since the outbreak of the financial crisis, there has been a prevalence of asymmetric, country-specific, shocks. This is linked with the higher market volatility, the different impacts of the crisis on each country under review, and the different crisis resolution methods adopted. The rate of decline in integration was comparable across both the new and original EU Member States. Chart 33 shows, however, that the financial crisis also resulted in a sudden change in national markets' sensitivity to global news. Except for the government bond market, the gamma coefficients increased after the events of September 2008, when was already clear that the financial crisis had spread to global markets.

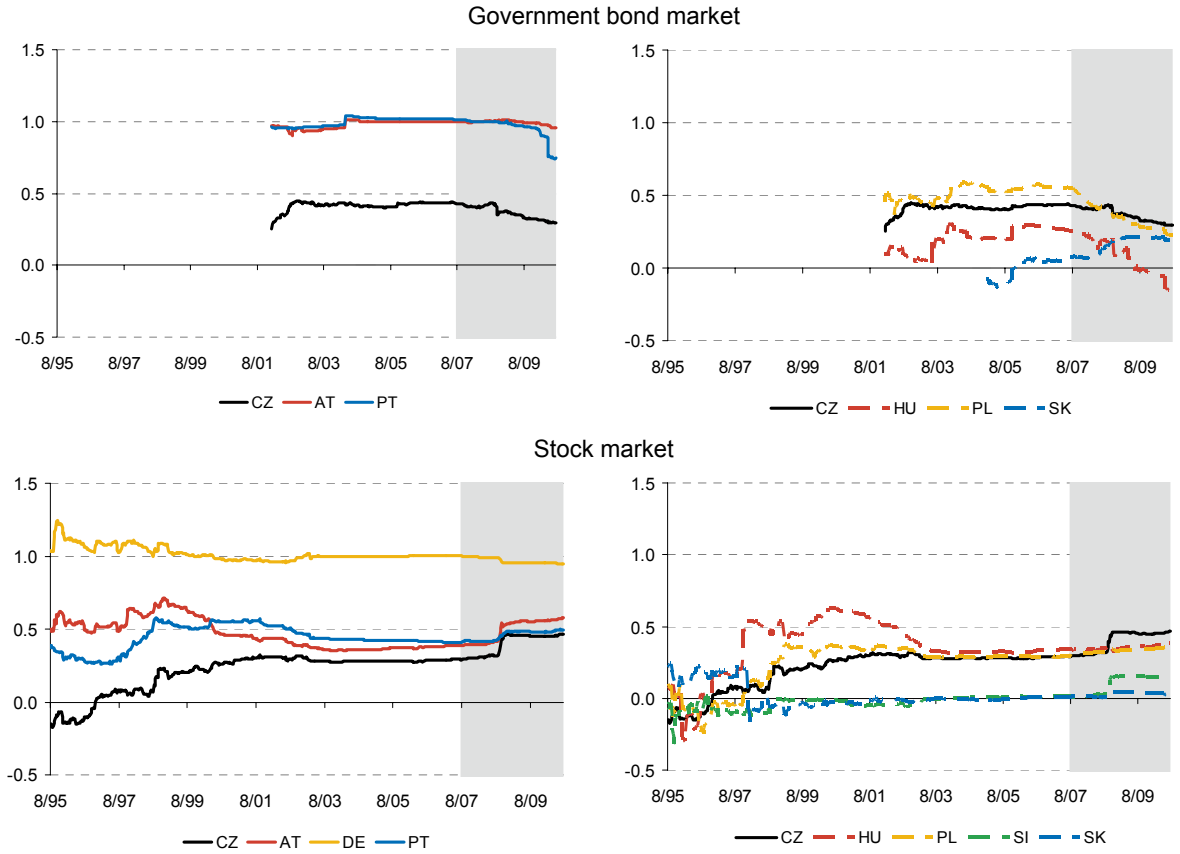
In the Czech Republic, Hungary, Poland and Slovakia, sigma-convergence returned to all the markets under review in mid-2009, although the pre-crisis levels have not yet been regained. In the euro area member countries, by contrast, the sigma coefficients are signalling divergence for the Austrian and Portuguese government bond markets and for the German stock market. The continuing divergence on the government bond markets of the euro area member countries is associated with public debt developments in those countries. German government bonds are still accepted by the markets as highly liquid and high-quality assets, but the same no longer applies to the other euro area countries owing to the gradual downgrading of government ratings and their outlooks.[80] The strengthening effect of local factors on the government bond market is confirmed by falling gamma coefficients for all countries. To sum up, the impacts of the financial crisis on financial integration no longer seem as unfavourable as in the past two years, but the degree of financial integration is still below the pre-crisis level.

Chart 33: Gamma coefficients



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

[80] The divergence on the government bond market is confirmed by developments on the government bond hedging derivatives market. At the end of 2007, CDS spreads on the Austrian sovereign debt had been the same as in Germany (with Czech and Portuguese spreads being almost three times higher than the German one), whereas at the end of August 2010 the Austrian sovereign CDS spread was the same as the Czech spread.



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

Sources: Thomson Datastream, CNB calculations.

2 ADJUSTMENT MECHANISMS

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

2.1 Fiscal policy

After the loss of independent monetary policy, the stabilising effect of fiscal policy may 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. However, the negative experience of the advanced countries in the 1970s is an argument against the wider application of discretionary measures under activist fiscal policy, since such policy failed to produce the desired and provable results or was counterproductive.[81] This was also reflected in a paradigm shift in theoretical economics, with belief in the effectiveness of discretionary measures being replaced by a hypothesis that adherence to pre-defined rules is more effective. In the fiscal area, such rules consist primarily in a simple, relatively stable tax system, consolidated and sustainable public finance and predictable government expenditure based on fiscal discipline. However, numerous discretionary measures of a fiscal nature have been adopted during the current financial and economic crisis, since the real and expected economic decline was so large that the political representation considered automatic stabilisers to be insufficient on their own. Nevertheless, the current assessments of the effectiveness of these discretionary measures signal that, in addition to positive impacts, the growth in fiscal deficits induced by such measures entails costs in the form of upward pressure on long-term interest rates, which may lead to crowding out of private expenditure by government expenditure. The EU fiscal rules – a tightening of which is being currently discussed (see Box 1 in Part B) – therefore consider the optimal situation to be a broadly balanced government budget policy within the

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

economic cycle and the free operation of automatic fiscal stabilisers, which can moderate shocks without the need for ad hoc discretionary fiscal measures. In a period of recession, public finances thus stimulate aggregate demand by means of deficits. By contrast, in a period of expansion they should subdue demand by creating fiscal surpluses. In order for the automatic function of public budgets to work, while avoiding – except in very exceptional cases – breaches of the maximum agreed deficits, public finance must be balanced or in surplus during a growth phase of the business cycle. This reasoning serves as the basis for the convergence criterion for the general government deficit as a percentage of GDP, where the 3% limit is considered sufficient to allow free functioning of automatic stabilisers in the event of a minor, i.e. normal, economic downswing. If the recession is deeper, a greater likely impact on the deficit is assumed, and so an exemption from fulfilling this criterion is applied.

The influences of the macroeconomic environment and of interventions by the government on public budgets can be differentiated by decomposing the fiscal balance into the 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 an even more precise assessment of the nature of the government's fiscal policy in a given period, the "structural balance" is generally used. In addition to fluctuations caused by the economic cycle, this takes into account the effects of temporary or one-off fiscal measures that are not related to the long-term orientation of fiscal policy.

Chart 34 shows the CNB's current estimates of the **Czech Republic's general government balance broken down into its cyclical and structural components**. In order to improve the information content, the estimates are carried out using both the European Commission's methodology and the ESCB's methodology (see the *Methodological Part*).

The assessment of the trend in the structural component and its share in the overall deficit is basically the same for both methodologies (despite some differences in individual years). The structural balance indicates that the government's fiscal policy was pro-cyclical for most of the period under review, since additional tax receipts were not consistently employed to reduce the fiscal deficit, but instead tended to be used to generate new public expenditures. Similarly, tax cuts affecting the revenue side were not accompanied by corresponding austerity measures on the public expenditure side, even during years of solid economic growth. The structural deficit recorded a further considerable deterioration in 2009 as a result of government anti-crisis and other measures. The situation improved somewhat in 2010, when the structural deficit was considerably reduced by budget austerity measures, which, however, will be in place for only a limited time. According to the CNB's current estimate for 2011, the government's consolidation measures as set out in the state budget bill for 2011 would lead to a further improvement in the structural deficit.

The cyclical component played only a slightly negative role in the total budget balance in 1998–2005. The action of automatic stabilisers, which respond to the business cycle and smooth its fluctuations, was very limited in the Czech Republic in this period.[82] The business cycle did not start to have a major effect until 2006–2008, when favourable economic growth gave rise to extraordinary tax revenues. This was reflected in a positive effect of the cyclical component of the budget balance on the total deficit. However, the cyclical component

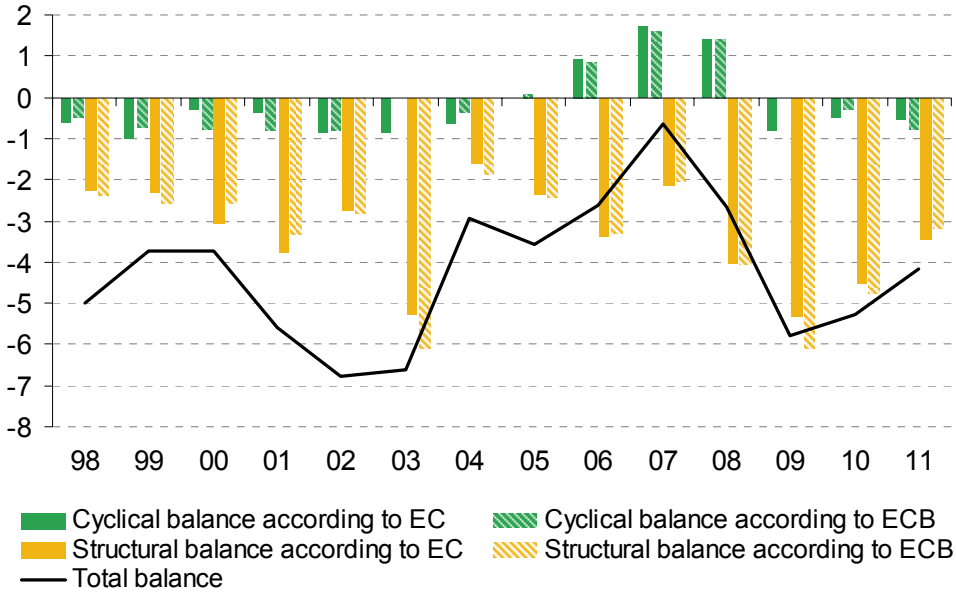
[82] Automatic stabilisers act in the direction of a deterioration in the fiscal balance at a time of economic recession and in the direction of an improvement in years of economic growth.

recorded a change of trend in 2009 owing to the economic slump. According to the CNB's current forecast, the cycle will foster a slight fall in the total deficit in 2010–2011.

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 practically identical to the structural component.

It was mainly due to the negative effect of government fiscal policy that the overall budget deficit in 2009 was well above the reference value of 3% laid down in the Stability and Growth Pact. 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. It is therefore important that fiscal consolidation continues into 2011 and beyond, so that the deficit reduction is of an enduring nature and based on fiscal measures affecting the structural component. Fiscal policy should therefore be focused on achieving the medium-term objective, which has been set at 1% of GDP for the Czech Republic's structural deficit, and not settling for a mere decline of the deficit below the limit of the relevant Maastricht convergence criterion.

Chart 34: Decomposition of the fiscal balance into 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.

Sources: CZSO, CNB calculations.

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

Ensuring medium-term balance, or long-term sustainability, of public budgets is a precondition for effective use of their stabilising function and an important condition for the ability of the Czech Republic to fulfil its commitments under the Stability and Growth Pact in the long term. The ability of fiscal policy to react discretionarily or automatically to unforeseen shocks, while observing these commitments, is determined primarily by the gap

between the general government structural deficit and the reference value of 3% of GDP and by the gap between the government debt and the reference value of 60% of GDP. The fiscal policy objective in the run-up to euro area accession should be to take the public budgets close to a zero balance (or close to the Medium Term Objective – MTO)[83] so that sufficient room is left for stabilising fiscal policy in less favourable times. Table 21 sums up the spring 2010 figures and forecasts of the European Commission regarding the **fiscal balance** for the countries under review. The left-hand side of the table provides information on the total (unadjusted) government sector balance, while the right-hand side contains the structural balance calculated according to the European 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 21: General government balance, European Commission estimate (% of GDP)

	Total balance				Structural balance			
	2008	2009	2010	2011	2008	2009	2010	2011
CZ	-2.7	-5.9	-5.7	-5.7	-4.5	-5.4	-4.9	-4.9
AT	-0.4	-3.4	-4.7	-4.6	-1.7	-2.4	-3.6	-3.6
DE	0.0	-3.3	-5.0	-4.7	-1.1	-1.7	-3.6	-3.5
PT	-2.8	-9.4	-8.5	-7.9	-3.8	-8.1	-7.7	-7.0
HU	-3.8	-4.0	-4.1	-4.0	-4.7	-2.2	-2.3	-3.0
PL	-3.7	-7.1	-7.3	-7.0	-4.6	-7.2	-6.3	-5.7
SI	-1.7	-5.5	-6.1	-5.2	-4.8	-3.7	-4.4	-3.8
SK	-2.3	-6.8	-6.0	-5.4	-4.7	-6.6	-5.4	-4.7
EU-16	-2.0	-6.3	-6.6	-6.1	-2.8	-4.7	-5.0	-4.8
CZ [a)]	*-2.7*	*-5.8*	*-5.3*	*-4.2*	*-4.1*	*-5.3*	*-4.5*	*-3.5*

Notes: 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 2010) for 2008 and 2009, and the CNB's estimates for 2010 and 2011 from Inflation Report IV/2010. 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 (2010a), CNB.

Following extraordinarily favourable economic developments in 2005–2007, reflected at the peak of the cycle in 2007 in a significant improvement in the total general government balance in all the countries under review, most countries saw a deterioration in 2008 as a result of the financial crisis and the subsequent economic downswing. Table 21 shows that due to automatic stabilisers and discretionary fiscal measures taken to boost the economy, all the countries under review recorded a public finance decline into deep deficit in 2009–2010. The decline persists in the outlook for 2011 despite moderating somewhat in some countries. This confirmed in practice that positive budget performance based mainly on extraordinary revenues due to cyclical and other temporary factors (including windfalls) and only partly on reform measures is not sustainable beyond the short term and does not create sufficiently

[83] The originally uniform requirement of balanced finances has been replaced under the amended European fiscal rules by country-specific medium-term objectives (MTOs), which differ from economy to economy depending on the existing level of public government debt and the prospects for economic growth. Fast growing economies with a low general government public debt level may, instead of maintaining balanced public sector accounts, reach a deficit of up to 1% of GDP. This is also the medium-term objective for the Czech Republic; however, the January 2010 Convergence Programme does not set a deadline for achieving this objective, as it goes beyond the timeframe of the Convergence programme (i.e. 2012) under the current government financial position.

stable conditions for the economy. In this respect, the fact that the structural deficit in the countries under review remained relatively high at a time of favourable economic developments and buoyant growth in 2005–2007, except for a slight decline in 2007 due to non-standard factors, is a cautionary tale.

In addition to other effects, the government's room for manoeuvre for the application of stabilising fiscal policy is determined by the **nature of fiscal expenditure**. While the adoption of a government resolution or a change to a statutory instrument is sufficient to allow a change in some expenditures, changes to other expenditures require time-consuming and politically difficult amendments to laws or international treaties. From the economic perspective, the classification into mandatory, quasi-mandatory and non-mandatory expenditures is therefore a classification of the speed at which the government is able to alter such expenditures if the need arises.[84] Mandatory expenditures are the least flexible; nevertheless, most of them can be modified by means of suitable legislative amendments in the shorter or longer term. Following a decline in the share of mandatory expenditure in total expenditure in 2007, the share increased again in 2008−2009 (see Table 22) as a result of adverse cyclical effects and the impact of the government's budget austerity measures for 2010. Moreover, the current data based on the government's draft state budget for 2011 imply a further rise in the share of mandatory expenditure. The planned austerity measures rely to a large extent on a reduction of non-mandatory expenditure, leading to an increase in the weight of mandatory expenditure in total expenditure. Last but not least, the rising share of mandatory expenditure is a result of an increase in absolute expenditure connected with government debt service and unemployment benefits.

Table 22: Shares of mandatory state budget expenditure (%)

	2007	2008	2009	2010	2011
Shares of mandatory expenditure in total SB expenditure	50.8	53.7	53.3	55.1	57.7
Shares of mandatory expenditure in total SB revenue	54.1	54.7	63.8	63.9	65.2

Note: Data for 2007–2009 are actual figures; data for 2010 and 2011 are based on the government's August 2010 draft state budget.

Source: Ministry of Finance of the Czech Republic (2010).

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 23). "Statutory" mandatory expenditures consist of social payments (social benefits – pension and sickness insurance benefits in particular – as well as government payments for health insurance) and debt service spending. The Czech Republic ranked among the countries with low figures, in the case of debt service spending as a result of its still relatively low level of government debt (in the sample of countries under comparison). The situation was similar for compensation of employees, which represent salaries in budgetary and subsidised organisations and are usually referred to as quasi-mandatory expenditures. Part of expenditure on intermediate consumption and investment in the government sector can be included in mandatory expenditures (but cannot be assigned precisely in the given aggregation).

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

Table 23: Public revenues and expenditures in 2009 (% of GDP)

	CZ	AT	DE	PT	HU	PL	SI	SK	EU-16
Total revenue	40.3	48.3	44.3	41.6	45.8	37.4	44.4	34.0	44.4
- taxes	18.9	27.3	23.4	22.2	26.1	20.2	23.3	16.3	24.1
- social contributions	15.4	16.5	17.1	13.7	13.0	11.3	15.4	12.8	15.7
Total expenditure	46.2	51.8	47.6	51.0	49.8	44.5	49.9	40.8	50.7
- compensation of employees	8.1	9.8	7.4	13.7	11.2	10.2	12.6	7.8	10.8
- intermediate consumption	6.6	4.6	4.7	4.7	7.6	5.6	6.5	5.3	5.6
- social payments	19.8	25.4	26.6	22.2	19.0	16.9	19.0	18.8	23.5
- gross fixed capital formation	5.4	1.1	1.7	2.4	2.7	5.3	4.9	2.3	2.8
- interest expenditure	1.3	2.7	2.6	2.8	4.7	2.6	1.4	1.5	2.8

Sources: European Commission (2010a) and European Commission (2010b).

The current stock of, and prospects for, **government debt** through its effect on debt service spending and through its effect on governments' ability to finance budget deficits and to refinance maturing government debt, which has serious macroeconomic impacts, may also become factors limiting the stabilising ability of fiscal policy.[85] Table 24 provides a comparison of the ratio of gross consolidated debt to GDP.

Table 24: Government debt (ESA95), European Commission estimate (% of GDP)

	2007	2008	2009	2010	2011
CZ	29.0	30.0	35.4	39.8	43.5
AT	59.5	62.6	66.5	70.2	72.9
DE	65.0	66.0	73.2	78.8	81.6
PT	63.6	66.3	76.8	85.8	91.1
HU	65.9	72.9	78.3	78.9	77.8
PL	45.0	47.2	51.0	53.9	59.3
SI	23.4	22.6	35.9	41.6	45.4
SK	29.3	27.7	35.7	40.8	44.0
CZ [a)]	*29.0*	*30.0*	*35.3*	*39.3*	*44.1*

Note: [a)] Data according to the CZSO's notifications (October 2010) for 2007–2009, and the CNB's estimate from the forecast in Inflation Report IV/2010 for 2010 and 2011.

Sources: European Commission (2010a), CNB.

Like the other indicators, future debt (characterised by the gross consolidated debt indicator) is being affected by dramatic changes in the current economic situation. In all the countries under comparison, the slightly declining government debt path observed in previous years will be replaced by a more or less sharp increase in line with the growth in deficits and other extraordinary 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). After the current extraordinary situation subsides, it will thus be necessary to focus on long unresolved problems, in particular reform of the pension and health insurance systems, which would reduce the otherwise inevitable increase in debt and thus also the mandatory expenditures connected with debt service, which is no longer lowest in the Czech Republic out of the selected sample of countries (see Table 25).

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

Table 25: Debt service, European Commission estimate (% of GDP)

	2007	2008	2009	2010	2011
CZ	1.1	1.1	1.3	1.7	2.1
AT	2.7	2.5	2.7	2.8	2.9
DE	2.8	2.7	2.6	2.6	2.7
PT	2.8	2.9	2.8	3.1	3.5
HU	4.1	4.2	4.7	4.5	4.1
PL	2.3	2.2	2.6	2.9	3.0
SI	1.3	1.1	1.4	1.8	2.0
SK	1.4	1.2	1.5	1.5	1.5

Source: European Commission (2010b).

The recession has shown clearly that a high share of mandatory expenditures leaves only narrow room for the stabilising role of fiscal policy in bad times. This is unfavourable from the viewpoint of future euro adoption and should be remedied by future fundamental public finance reforms.

2.1.3 Sustainability of public finance

Sustainability of public finance, i.e. a moderate government deficit and debt in the medium and 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 26.

Table 26: Age-related government expenditures (% of GDP)

	Pensions		Health care		Long-term care		Unemployment		Total	
	2010	2060	2010	2060	2010	2060	2010	2060	2010	2060
CZ	7.1	11.1	6.4	8.4	0.2	0.6	3.3	3.3	17.0	23.3
AT	12.7	13.7	6.6	8.0	1.3	2.5	5.2	5.0	25.7	29.0
DE	10.2	12.7	7.6	9.2	1.0	2.4	4.6	4.2	23.3	28.4
PT	11.9	13.4	7.3	9.1	0.1	0.2	5.6	5.2	24.9	27.8
HU	10.5	11.2	5.8	7.1	0.3	0.7	4.5	4.2	21.0	23.0
PL	10.8	8.7	4.1	4.9	0.4	1.1	3.8	3.2	19.1	18.0
SI	10.1	18.6	6.8	8.5	1.2	2.9	5.1	5.8	23.1	35.8
SK	6.6	10.2	5.2	7.3	0.2	0.6	2.9	2.3	14.9	20.4

Source: European Commission (2010a).

Although the Czech Republic (together with Slovakia and Poland) has the lowest levels of age-related expenditure compared to the other selected countries (and also in the broader context of the EU) in the base year, the expected increase in such expenditure at the forecast horizon is sizeable. Moreover, it should be borne in mind that the forecast does not fully take into consideration the current developments in the economy. Economic shock scenarios that are close to the current economic situation and predict its long-term impact indicate a potential increase in age-related expenditure as a percentage of GDP of up to one-third as a result of a decline in economic activity that is deeper and more protracted than in the baseline scenario. Such a situation would clearly be unsustainable and would very probably lead to a substantial rise in gross government debt in the absence of fundamental pension and health system reforms. A growing risk of conflict with the commitments stemming from the Stability and Growth Pact also needs to be taken into account. Ensuring public finance

sustainability is therefore a key condition (not only) for the future smooth functioning of the Czech economy within the euro area.

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.

2.2.1 Degree of adjustment of real wage growth to the unemployment rate (the Phillips curve)

The response of wages to changes in demand for labour is one of the methods of economic adjustment and a means of preserving a low unemployment rate. The following analysis assesses the ability of the Czech economy to dampen the impacts of shocks by means of real wage adjustment. The degree of real adjustment of wages to changes in unemployment, i.e. real wage elasticity, is measured using a simple Phillips curve. Real wage elasticity may be either positive or negative. Negative values suggest that wages are flexible (growth in wage costs is suppressed by growth in unemployment). By contrast, positive or insignificant values of wage elasticity point to the absence of wage flexibility. The Phillips curve estimates were made using the ordinary least squares method (OLS).[86] Table 27 shows a summary of the results.

Table 27: Elasticity of wages to the unemployment rate

	1996–2001	2001–2010
CZ	-0.018 *	0.003
AT	-0.090 **	-0.003
DE	-	-0.012
PT	-0.012	-0.017
HU	-0.041 **	-0.037 *
PL	-0.027 *	-0.002
SI	0.001	-0.019
SK	-0.032 **	0.013
EU-16	-	-0.017

Note: Owing to a data revision, the estimate was updated for the period 2001–2010. The data for 1996–2001 are taken from the 2008 Alignment Analyses.

Source: CNB calculations.

The estimated wage elasticity for the Czech Republic, like those for Austria, Poland and Slovakia, decreased between the periods under review, becoming statistically insignificant. The estimates for the recent period are statistically significantly different from zero only for Hungary. Real wages in the Czech Republic and most countries under review are thus not likely to have had a stabilising effect at the macroeconomic level in 2001–2010, which is not a favourable finding from the viewpoint of euro adoption. However, nominal wages

[86] Owing to Eurostat's changeover to a new NACE2 classification, wage cost data for the current analysis are only available since 2001; new estimates were therefore made on quarterly data for 2001 Q1–2010 Q1. The data for 1996 Q1–2001 Q1 are taken from the 2008 Alignment Analyses, where the same methodology was used for the calculation.

responded to the buoyant growth and subsequent sharp downturn in the appropriate direction, dampening the impact of the recession on the Czech labour market.[87] The absence of real wage flexibility may be linked with lagged changes in wages and the co-movement of inflation, associated among other things with the evolution of world commodity prices.

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 different impacts of the single monetary policy. According to Angeloni and Ehrmann (2004), the differences in inflation observed among individual euro area countries can be largely explained by different inflation persistence.

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

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

Table 28 summarises the inflation persistence estimates for 1997 Q1–2010 Q2. Under the three methods, inflation persistence in the Czech Republic exhibits slightly higher levels than in the assessment made in the last year's Alignment Analyses. However, it remains low in comparison with the other countries under review, albeit higher than, for example, in Germany and probably also in Austria.[88] Inflation persistence in the Czech Republic therefore presents no major risk in terms of future adoption of the euro.

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

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

Table 28: Inflation persistence estimates

	Method 1	Method 2	Method 3
CZ	0.81	0.91	0.38
AT	0.85	0.83	0.25
DE	0.77	0.78	0.34
PT	0.83	0.99	0.33
HU	0.85	0.98	0.80
PL	0.85	1.01	0.50
SI	0.85	1.02	0.52
SK	0.83	1.01	0.41

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

Sources: Eurostat, CNB calculations.

2.3 Labour market flexibility

Labour market adjustment is a significant equilibrating process. Like wage and price adjustment, it will increase in importance after euro area entry. Wage adjustment or changes in employment and its structure may dampen the negative impacts of asymmetric shocks on the labour market. Labour market flexibility is defined by labour force flexibility and institutional factors.

2.3.1 Unemployment and internal labour market flexibility

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

Table 29 illustrates the evolution of the **long-term unemployment** rate in the countries under review. In the late 1990s, this indicator increased substantially in the Czech Republic, hovering at around 4% until 2006. The long-term unemployment rate declined over the last three years of the period under review, to 2.0% in 2009. This indicator is still higher than in Austria (the lowest level of the countries under comparison) and Slovenia. The long-term unemployment rate is higher in the other countries under comparison than in the Czech Republic. Slovakia has the highest level. The long-term unemployment rate has also been declining in recent years in all the countries under review except Hungary and Portugal. The share of the long-term unemployed in total unemployment (see Table 30) in the Czech Republic was above 50% in previous years. As in the other countries, it fell in 2009 due to a sharp increase in short-term unemployment in response to the financial and economic crisis. Comparable levels are recorded by Poland and Slovenia, while Germany, Hungary and Portugal have higher shares. Slovakia has the highest share of long-term unemployment. Owing to the financial and economic crisis, unemployment is increasing in all the countries under review. This is being reflected in a decrease in the share of long-term unemployment. In these countries, the long-term unemployment rate will increase with a lag, i.e. roughly in the period 2010–2011. The long-term unemployment rate has been rising since 2009 H2 in the Czech Republic.

Table 29: Long-term unemployment rate (%)

	1998	2003	2004	2005	2006	2007	2008	2009
CZ	2.0	3.8	4.2	4.2	3.9	2.8	2.2	2.0
AT	1.3	1.1	1.4	1.3	1.3	1.2	0.9	1.0
DE	4.7	4.6	5.5	5.7	5.5	4.7	3.8	3.4
PT	2.2	2.2	3.0	3.7	3.9	3.8	3.7	4.3
HU	4.2	2.4	2.7	3.2	3.4	3.4	3.6	4.2
PL	4.7	11.0	10.3	10.3	7.8	4.9	2.4	2.5
SI	3.3	3.5	3.2	3.1	2.9	2.2	1.9	1.8
SK	6.5	11.4	11.8	11.7	10.2	8.3	6.6	6.5

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

Table 30: Share of the long-term unemployed in total unemployment (%)

	1998	2003	2004	2005	2006	2007	2008	2009
CZ	31	49	51	53	54	52	49	30
AT	30	26	28	25	27	27	24	21
DE	51	50	56	53	56	57	53	46
PT	43	35	44	48	50	47	47	44
HU	50	41	44	45	45	47	47	42
PL	47	56	54	58	56	51	34	30
SI	45	53	52	47	49	46	42	30
SK	52	65	65	72	76	74	70	54

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

Cyclical and **structural unemployment** can be differentiated by means of the Beveridge curve and with the aid of the aggregate fixed effects of the matching function. The Beveridge curve expresses the dependence between vacancies and unemployment. Decreasing (increasing) unemployment amid a rising (falling) number of vacancies is associated with changes in the cyclical component of unemployment, whereas simultaneous movements of unemployment and vacancies in the same direction signal changes in structural unemployment. The Beveridge curve for the Czech Republic (see Chart 35) shows that cyclical unemployment was decreasing as from around mid-2004, with the rate of decline of cyclical unemployment increasing since 2006. This reflected growing demand for labour in the growth phase of the business cycle. Cyclical unemployment has been increasing since around mid-2008 owing to the cooling of the economy. It is also clear that the labour market in the Czech Republic suffered from the phenomenon of hysteresis, where a period of economic recession is accompanied by a rise in structural unemployment, manifesting itself in an increase in long-term unemployment. This occurred, for example, in 1999–2000 and 2003–2004. The increase in long-term unemployment in these periods is apparent in the data given in Tables 29 and 30 above.

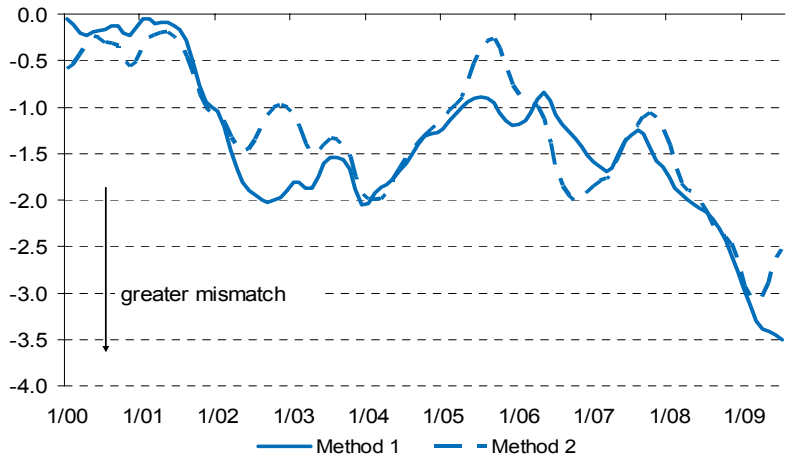
Chart 35: Beveridge curve

Note: Seasonally adjusted quarterly data.

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

A cyclical movement along the Beveridge curve has been observed since the end of 2008. The aggregate fixed effects of the matching function (see Chart 36), which express the mismatch in the filling of vacancies by the unemployed, shows a gradual rising trend in structural mismatch rather than any moderation.[89]

Chart 36: Aggregate fixed effects of the matching function (January 2000 – July 2010)



Note: Smoothed aggregate fixed effects based on two matching function estimation methods. The x-axis gives the beginning of the 13-month period for which the estimate is calculated. The two estimation 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.

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

[89] There has been no improvement yet in the structural problems on the Czech labour market according to the estimates of the matching function (see Chart 36) and so no decline in structural unemployment can be expected in the period ahead. A similar conclusion is given in OECD (2010b), where the methodology of Guichard and Rusticelli (2010) is used to estimate how a shock to aggregate unemployment in OECD countries will affect the level of structural unemployment through an increase in long-term unemployment. The results reveal that the Czech Republic is one of the countries where the expected impact of the crisis on long-term and structural unemployment will be higher in 2007–2012. Similarly large increases will be recorded in Portugal and Hungary. By contrast, growth in structural unemployment until 2012 will be very small in Austria and Germany, while Slovakia and Poland will see a decline in structural unemployment as a result of past labour market reforms.

Regional differences in unemployment can be quantified using the coefficient of variation of the unemployment rate for areas (NUTS 2) and regions (NUTS 3). Table 31 shows that the regional differences in the unemployment rate across areas in 2007, for which an international comparison is available, were slightly lower than in Austria and Germany but higher than in Portugal and Poland. The differences across regions were lower in the Czech Republic in 2007 than in the other countries under comparison except Portugal and probably Poland. In 2008, the peaking business cycle was reflected in a slight increase in regional differences in the Czech Republic; in 2009, by contrast, the transition into recession and a higher rise in unemployment in regions with prevailing lower unemployment resulted in a noticeable decline in differences in the unemployment rate.[90]

Table 31: Coefficient of variation of the unemployment rate (%)

	NUTS 2 regions								NUTS 3 regions							
	1999	2003	2004	2005	2006	2007	2008	2009	1999	2003	2004	2005	2006	2007	2008	2009
CZ	33	42	42	46	45	42	44	34	42	45	44	47	46	43	45	35
AT	29	42	41	40	44	45	-	-	31	43	42	41	45	46	-	-
DE	42	46	45	40	39	44	-	-	-	50	49	45	44	50	-	-
PT	31	30	25	22	21	20	-	-	37	35	33	30	29	27	-	-
HU	35	33	28	27	32	39	-	-	37	37	32	30	36	45	-	-
PL	23	16	16	15	12	14	-	-	38	28	26	25	24	-	-	-
SK	27	27	31	37	38	38	-	-	31	36	37	42	43	46	-	-

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

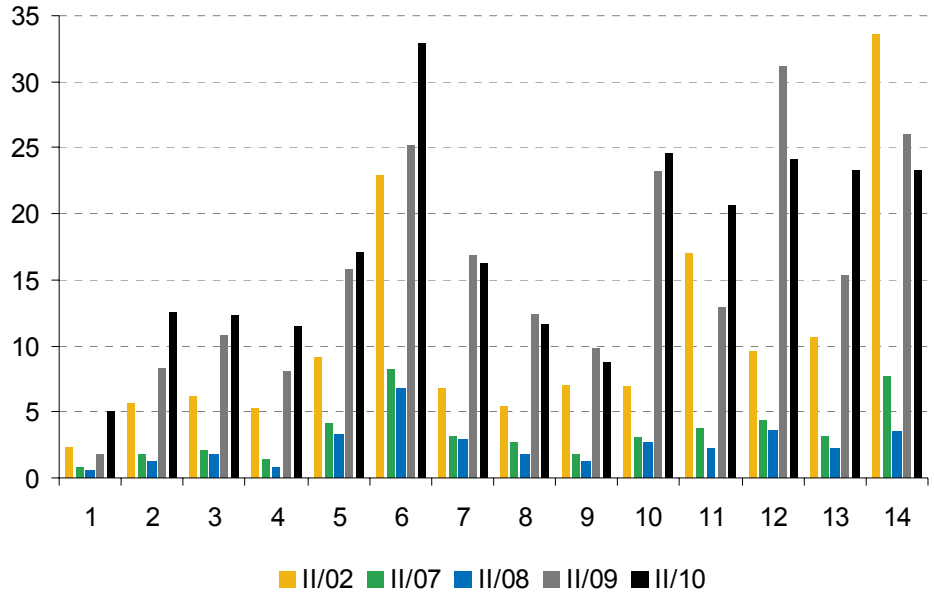
Sources: Eurostat, CNB calculations for CZ 2008 and CZ 2009.

One of the reasons for the relatively large regional differences in unemployment in the Czech Republic is the gap between households' supply of labour and businesses' demand for labour. This gap can be expressed by the differences in the **number of unemployed persons per vacancy in regions and by profession**. Chart 37 shows that the differences in the number of unemployed persons per vacancy across regions are large. The highest figures are recorded in the Ústí region. Although the number of unemployed persons per vacancy had been declining until 2008, owing to the economic crisis the observed indicator increased sharply in 2009 in all regions, and most of all in the Olomouc, Moravia-Silesia, Ústí and Vysočina regions. In 2010, the number of unemployed persons per vacancy increased further in all regions except the Liberec, Hradec Králové, Pardubice, Olomouc and Moravia-Silesia regions, where this indicator declined compared to 2009. A large gap between the demand for and supply of labour is also apparent in some professions (see Chart 38). Jobs are especially hard to find for persons employed in elementary occupations, clerks, service, shop and market sales workers and skilled agriculture and forestry workers. These professions also recorded the largest growth in the number of unemployed persons per vacancy during the financial and economic crisis.[91]

[90] The coefficient of variation of the unemployment rate is counter-cyclical in the Czech Republic (see Galuščák and Münich, 2003).

[91] In 2010 Q2, extraordinarily high figures for the number of unemployed persons per vacancy (exceeding 100) were recorded in elementary occupations and for skilled agricultural and forestry workers. The Moravia-Silesia, Olomouc, Karlovy Vary and Ústí regions are being affected by this trend. The average value for the Czech Republic is roughly 15 unemployed persons per vacancy.

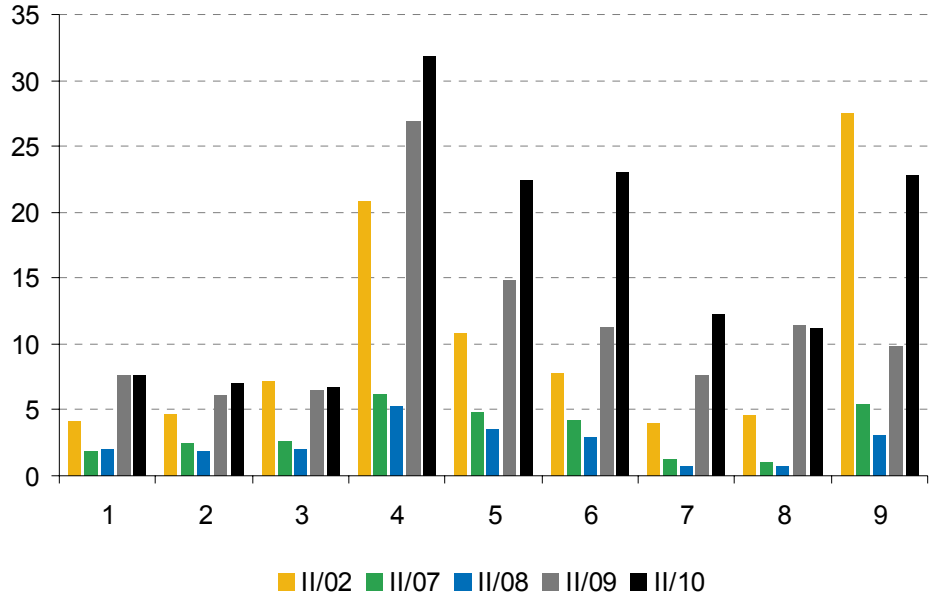
Chart 37: Number of unemployed persons per vacancy in regions



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

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

Chart 38: Number of unemployed persons per vacancy by profession



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

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

The large regional differences in unemployment in the Czech Republic may be due to low regional mobility. Although **internal mobility** (Table 32) in the Czech Republic is greater than in Poland and Slovakia, it is significantly lower than in Austria and Germany. This

indicator edged up temporarily in the Czech Republic in 2007 and 2008 compared to the previous period, but fell back to the 2006 level in 2009.[92]

Table 32: Internal migration (per 1,000 inhabitants)

	1999	2003	2004	2005	2006	2007	2008	2009
CZ	20	21	21	21	22	25	24	22
AT	33	44	35	35	36	37	38	-
DE	48	46	45	44	43	44	-	-
HU	21	24	22	22	25	25	24	-
PL	11	11	11	11	12	13	11	-
SI	10	10	10	11	13	13	43	-
SK	15	16	16	16	17	17	16	-

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

Sources: Statistical yearbooks, Eurostat, CNB calculations.

To sum up, the structural problems in unemployment and internal labour market flexibility did not moderate in 2009. A persisting gap between the demand for and supply of labour is apparent in the number of unemployed persons per vacancy in regions and professions. This indicator increased further in 2009. Estimates of the aggregate fixed effects of the matching function suggest a possible worsening of the structural problems in 2009. Internal labour market mobility remains low by international comparison. A partial improvement in long-term unemployment is apparent in 2009 (thanks only to the business cycle), while an increase in long-term unemployment can be expected in the longer term.

2.3.2 Structural unemployment

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

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

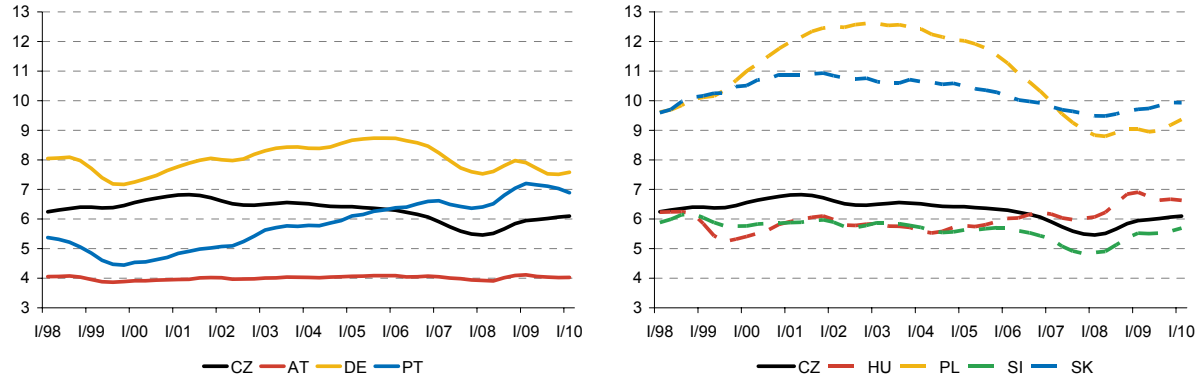
Chart 39, which compares the NAIRUs in the countries under review, shows that all of them recorded a slight decline in their NAIRUs in 2007. In the subsequent period this decline was replaced by growth due to rising unemployment rates coupled with low inflation. According to the estimate, the NAIRU in the Czech Republic in the time period under review was

[92] 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.

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

initially just above 6%, dipped below this level in 2007 and 2008, and subsequently returned to around 6%, where it might remain in the coming quarters. The current NAIRU level in the Czech Republic is still among the lower ones in the sample of countries under review and is roughly comparable with that in Slovenia. Only Austria, which has a low and involatile unemployment rate, has a significantly lower NAIRU. The NAIRUs in Hungary and Portugal fell towards the end of the period under review but stayed higher than in the Czech Republic. The NAIRU is relatively high in Germany and even higher in Slovakia and Poland. Moreover, it edged up further in these countries at the end of the period under review.

Chart 39: The NAIRU



Sources: Eurostat, CNB calculations.

The estimated NAIRU suggests that the Czech labour market might have seen a slight structural improvement in 2006–2008, but this trend has reversed recently. Moreover, the previous decline in the NAIRU should be interpreted with caution, as the estimates have fairly wide confidence intervals[94] and conflict with the Beveridge curve and the matching function (see section 2.3.1). Similar changes in the NAIRU have been visible recently in most of the countries under comparison. In terms of its NAIRU level, the Czech Republic has one of the more flexible labour markets in the selected sample, although this may be a soft benchmark.

2.3.3 International labour mobility

International labour mobility within a currency area can be an important channel for the economy's ability to absorb asymmetric shocks, in particular those of a long-term nature, through changes in labour supply.[95]

The degree of international mobility can be assessed by means of the number of immigrants and emigrants (see Table 33). The data on recorded mobility show that the **number of immigrants** to the Czech Republic rose continuously until 2007, but has been declining sharply since 2008. In 2009 it was lower only in Portugal, Poland and Slovakia (and probably also in Hungary, for which, however, current data are unavailable). The **number of emigrants** is showing a similar sharp decline. The decline in the number of immigrants to the Czech Republic and emigrants in 2008 and 2009 was probably linked with the global

[94] The magnitude of the decline in the NAIRU in 2006 and 2007 is roughly the same as the width of the 95% confidence interval of the point estimate. Gianella et al. (2008), for example, find relatively wide confidence intervals of NAIRU point estimates for 23 OECD countries. Short-term and small movements in this indicator should therefore be taken with a pinch of salt.

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

economic and financial crisis (a general decline in vacancies). The situation was similar in most of the other countries under review.

Table 33: Immigration and emigration (number of persons per 10,000 inhabitants)

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

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

Sources: Eurostat, CNB calculations.

International mobility is also evidenced by the data on the **proportion of foreigners in the population** (see Table 34). The share of foreigners in the population in the Czech Republic is similar to that in Slovenia and higher than that in Hungary, Poland and Slovakia. By contrast, Austria and Germany have considerably higher shares of foreigners in their populations. Compared to previous years, there has been an increase in the share of foreigners in the population in the Czech Republic since 2006, owing to significant increases in the number of employed foreigners.

Table 34: Share of foreign nationals in the population (%)

	1998	2003	2004	2005	2006	2007	2008	2009
CZ	2.0	1.8	1.9	1.9	2.5	2.9	3.3	3.9
AT	9.3	9.3	9.4	9.6	9.8	10.0	10.3	10.3
DE	9.0	8.9	8.9	8.8	8.8	8.8	8.8	8.8
PT	1.7	2.3	-	-	2.6	4.1	4.2	4.2
HU	1.4	1.1	1.3	1.4	1.5	1.7	1.8	1.9
PL	-	-	-	-	0.1	0.1	0.2	0.1
SI	2.1	2.2	2.3	2.2	2.4	2.7	3.4	3.5
SK	-	0.6	0.6	0.4	0.5	0.6	0.8	1.0

Sources: Eurostat, CNB calculations.

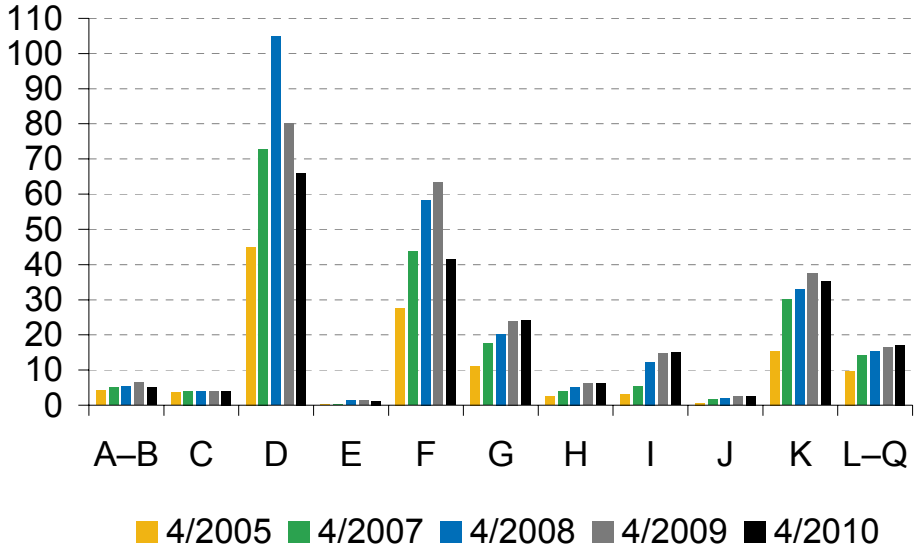
At the end of April 2010, 217,900 foreign workers were registered in the Czech Republic (as against 256,300 a year earlier).[96] Most of these were Slovaks (44%), followed by Ukrainians (23%) and Poles (7%). The number of foreign workers had been increasing very quickly since about the beginning of 2005. A total of 132,300 newcomers had been recorded by the end of 2007. The number of foreign workers decreased by 6,400 in 2008 and 53,800 in 2009 as a result of lower labour demand. The main factor of foreign employment in the Czech Republic

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

is demand for labour. Accession to the EU in 2004 and the related relaxation of conditions for foreign employees had only a limited effect.[97]

Foreign workers are employed in the Czech Republic mainly in manufacturing, construction, real estate and renting, and wholesale and retail trade (see Chart 40). These industries were reporting the highest growth in the number of foreign workers in previous years. In 2008, 2009 and the first few months of 2010, the number of foreign workers in manufacturing declined significantly owing to lower demand for labour. The same applied in construction in 2009 and 2010.

Chart 40: Foreign employees in the Czech Republic by industry (thousands of persons)



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

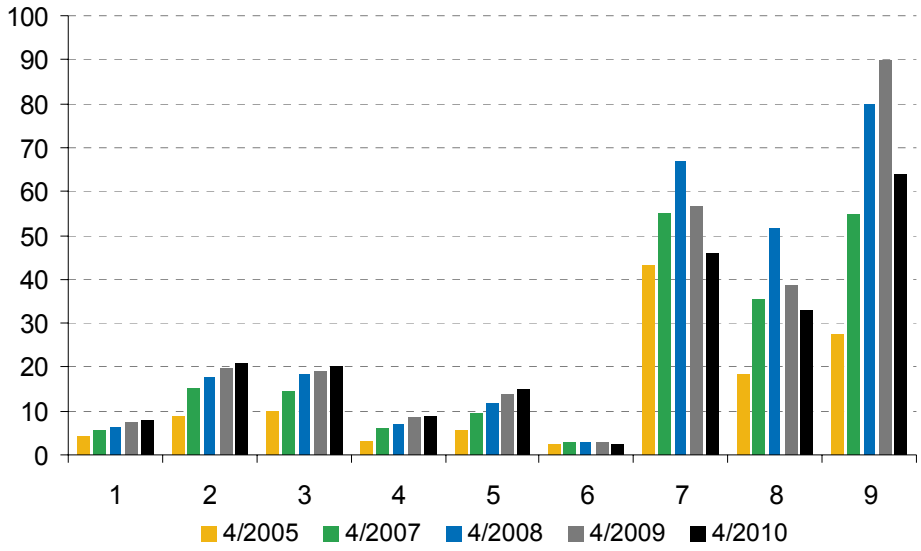
Source: Ministry of Labour and Social Affairs.

Foreign workers find employment in jobs requiring lower skills (see Chart 41), the largest increases in 2008 being recorded for workers in elementary occupations. In 2009 and during 2010, the number of foreign workers employed as craft and related trades workers, as plant and machine operators and in elementary occupations recorded a decline.[98]

[97] Since May 2004, EU nationals have been able to work in the Czech Republic without restrictions (Slovak nationals did not require a work permit even prior to EU accession). The number of foreign workers began to increase significantly only in 2005. The numbers of foreign workers in the Czech Republic since 1996, when data on foreign employment began to be available, correlate very closely with economic activity as measured by GDP growth. The extraordinary increase in foreign workers in 2005–2007 was probably related primarily to the high GDP growth and a related increase in demand for labour. This has reversed recently as a result of the decline in economic activity, which is having social impacts.

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

Chart 41: Foreign employees in the Czech Republic by profession (thousands of persons)



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

Source: Ministry of Labour and Social Affairs.

To sum up, according to the data on recorded mobility, international mobility in the Czech Republic is lower than in Austria and Slovenia. It is also lower than in Germany and Portugal in terms of the number of emigrants. The high growth in foreign employment in the Czech Republic from 2005 until the second half of 2008 was due to increasing demand for labour and can be viewed as evidence of an ability to adjust. Similarly, the decline in the number of foreign workers which began as a result of the sharp fall in economic activity during the crisis can be regarded as an adjustment channel. However, the previous inflow of workers from abroad was probably linked with the other rigidities on the Czech labour market, causing demand for labour of workers with lower skills not to be met from domestic sources.[99] Moreover, the mobility of the foreign labour force may itself pose some risk to the supply of labour in a country, as movements of foreign workers are affected by other factors in addition to demand in the host country (potential earnings, language barriers, geographical distance, conditions in other countries, etc.). Unexpected changes in foreign employment flows may thus occur despite unchanged domestic conditions.

2.3.4 Institutional environment

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

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

2.3.4.1 Trade unions and collective bargaining

In the economy, wages represent information about the cost of labour, which influences the allocation of production resources. Wage-setting at the company level with regard to corporate labour productivity is an important prerequisite for wage flexibility. If industry-level (generally higher-level) collective bargaining plays a significant role, it may weaken the link to labour productivity and lead to a higher wage level and higher unemployment (Calmfors and Driffill, 1988).[100] If industry-level bargaining predominates, it may result in lower wage flexibility. The negative impact of industry-level bargaining can be intensified by regulations extending the binding effect of collective pay agreements beyond the contractual parties (Brandt, Burniaux and Duval, 2005).

Table 35 gives an overview of **the coverage of employees by collective agreements** in 2006, for which comparable data are available. Collective bargaining coverage in the Czech Republic was higher than in Hungary and Poland, and was around 11 percentage points lower than in Germany.[101] Full, or almost full, coverage of employees by collective agreements was recorded in Austria and Slovenia. An updated survey by Trexima on collective agreement coverage in the Czech Republic reveals that the coverage dropped to 46% in 2009.[102]

Table 35: Coverage of employees by collective agreements in 2006 (%)

	CZ	AT	DE	PT	HU	PL	SI
Total	51	98	62	97	45	27	100
- manufacturing	56	99	63	96	46	28	100
- construction	49	98	-	97	39	24	100
- trade	39	100	-	97	44	16	100
- market services	49	94	61	98	43	33	100

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

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

The practice of extending the binding effect of higher-level collective agreements is not applied generally in the Czech Republic. An analysis of Labour Force Survey data reveals that extended higher-level collective agreements did not cover significantly more than 10% of employees in 2008. In 2010, however, the extension of the binding effect of higher-level collective agreements, which regulate staff remuneration, applies to the entire construction

[100] 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.

[101] The data for 2006 show that compared to the average in the Czech Republic (51%), the coverage is slightly higher in manufacturing (56%), while standing at just 39% in trade. Other estimates of the degree of coverage in the Czech Republic provide similar figures. According to an estimate by Trexima, the collective agreement coverage in businesses of the whole business sector with ten employees or more amounted to 53% in 2007 (data from the Average Earnings Information System).

[102] In 2009, 50% of employees were not covered by collective agreements and 4% of corporations failed to respond. The breakdown by collective agreement type reveals that 16% of employees are covered by a corporate collective agreement only, 24% are covered by both a corporate and higher collective agreement and 6% are covered by a higher-level collective agreement only. These estimates do not include higher-level collective agreements extended to other employers (see later in the text).

and agriculture sectors and to selected branches of manufacturing (about 15% of employees; situation as of September 2010).[103]

Wage flexibility in the Czech Republic is thus not limited by collective bargaining more than in the existing euro area Member States.

2.3.4.2 Minimum wage

The administrative setting of a minimum wage reduces wage differentiation and wage flexibility at the low end of the wage scale. 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 **minimum wage** as a percentage of the average wage was relatively low in the 1990s. This indicator rose continuously between 1999 and 2006; in 2008, it declined to 35% (see Table 36).[104] The minimum wage as a percentage of the average wage in the Czech Republic is roughly the same as in Poland but lower than in Portugal, Hungary and Slovenia.[105]

Table 36: Minimum wage (% of the average wage)

	2002	2003	2004	2005	2006	2007	2008	2009
CZ	36.9	38.1	38.4	39.1	39.7	38.1	35.0	-
PT	43.0	40.7	40.0	40.5	40.7	41.6	39.9	40.9
HU	42.1	42.2	41.2	41.3	41.7	39.8	38.8	-
PL	33.0	33.9	35.1	33.7	36.1	32.4	35.7	-
SI	45.3	45.8	45.9	46.2	45.2	43.4	43.5	45.8
SK	32.4	34.0	34.1	34.4	34.8	-	-	-

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

Source: Eurostat.

The minimum wage's negative impact on wage flexibility can be more pronounced in some sectors and professions. The minimum wage as a percentage of the wage in the first decile of the wage distribution is high in low-skilled professions (see Table 37). This relation indicates that for 10% of persons employed as service and shop and market sales workers and in elementary occupations, the minimum wage made up more than 80% of their earnings in 2009. However, a decline in the minimum wage ratio compared to 2006 can be observed here as well.[106]

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

[104] This ratio probably declined further in 2009 and 2010, since the minimum wage remains the same as in 2007 (CZK 8,000), while the average wage is rising modestly.

[105] No minimum wage has been defined at the national level in Germany. In January 2009, Austria introduced an across-the-board minimum wage of EUR 1,000, which represents about 44% of the average wage.

[106] The minimum wage ratio increased slightly in 2009 compared to 2008 owing to a decline in the wage in the first decile according to Average Earnings Information System statistics, while the minimum wage level was unchanged in 2009.

Table 37: Minimum wage and gross monthly wage in selected professions (%)

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

Note: The table only lists the three professions with the highest figures in 2009.

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

2.3.4.3 Employment protection

Strict **conditions for the recruitment and dismissal of employees** reduce flows on the labour market and increase long-term unemployment (OECD, 2004; OECD 2010a).[107] The high costs of dismissing individual employees (in particular during the period shortly after an employment contract is concluded, once the probationary period has expired) result in lower job creation, especially for graduates and young people. The combination of high costs of dismissing permanent employees and weak regulations for temporary work strengthens the position of permanent employees relative to temporary workers, whose chance of gaining permanent employment is thus lower.

According to OECD data, the conditions for the dismissal of individual employees were stricter in the Czech Republic in 2008 than in the countries under comparison except for Portugal and Slovenia (see Table 38).[108] In the Czech Republic, the cost of dismissing employees is relatively high, especially with regard to short-term contracts (see Chart 42).[109] This institutional set-up may adversely affect job creation and long-term unemployment in the Czech Republic.

[107] Bassanini and Duval (2006) confirm the conclusions of other papers that employment protection, as measured by the EPL index (Employment Protection Legislation; see Table 38), has no clear impact on the overall employment rate. Higher EPL values, however, adversely affect the entry of young people onto the labour market. A higher EPL index, according to these authors, is also associated with substitution of part-time contracts with full-time contracts for women.

[108] Protection of permanent employment changed slightly in connection with the new Labour Code in 2007. This was reflected in a slight decline in the corresponding OECD index. The change was that in the case of redundancy dismissals employers are no longer required to consider the option of transferring employees to another job or retraining them.

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

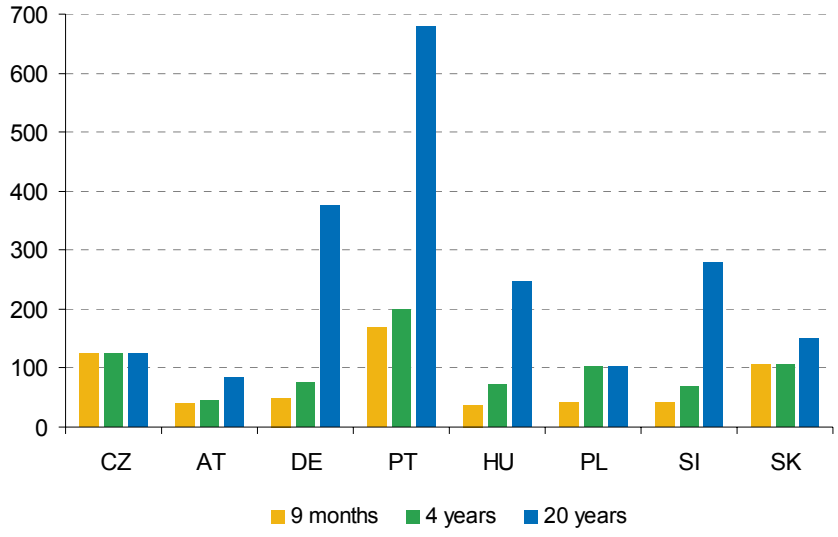
Table 38: Employment protection legislation (EPL) index[a)]

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

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

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

Chart 42: Costs of individual termination of an open-ended contract by employment contract duration in 2008 (number of days for which wage is paid)



Note: Sum of data for days of notice, severance pay and delay to start of notice period.

Sources: OECD, CNB calculations.

A very low index for the protection of temporary employment combined with high protection of permanent employment in the Czech Republic (Table 38) suggests the risk of labour market duality, where temporary workers have only a small chance of gaining permanent employment. With respect to collective dismissals of employees (above the level of individual dismissals), the Czech Republic applies the lowest restrictions by comparison with the countries under review except Portugal.

In terms of the aggregate index of employment protection, which is a weighted average of the three foregoing components, the Czech Republic ranked among the countries with average or

slightly freer labour market regulation in 2008 as compared to the sample.[110] However, one should take into account that there is a disparate intensity of protection of permanent and temporary jobs behind the average figure, which may result in the above issue of labour market duality. Moreover, employment through employment agencies is relatively widely used in the Czech Republic, since employees of employment agencies are not subject to the prohibition of repetition of fixed-term contracts, which gives employers a greater degree of flexibility compared to permanent contracts.

No measures were taken in 2009 that would affect the employment protection index (see also OECD, 2010c). Thus, the adverse impact of protection of permanent employment (especially under short-term employment contracts) on job creation and long-term unemployment is still higher than in the countries under comparison except for Portugal and Slovenia.[111]

2.3.4.4 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, school-leavers and older people. Moreover, high labour taxation increases the size of the grey economy[112] and can significantly increase unemployment if the minimum wage is high.[113] The taxation of people with high incomes is also important in conditions of international competition, as persons with high skills and high incomes have a greater propensity to migrate.

Overall labour taxation in the Czech Republic in 2009 was higher than in Portugal, Poland and Slovakia both at the average wage level and for low-income earners (see Table 39). By contrast, labour taxation is lower in the Czech Republic than in its advanced neighbouring countries – Germany and Austria – and also Hungary. Although labour taxation declined slightly in the Czech Republic in 2009 owing to a tax reform introduced in 2008[114] (a similar trend was observed in the other countries under review except Austria), overall labour taxation remains relatively high in the Czech Republic.

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[110] However, European labour markets are generally rather inflexible, so the benchmark offers a rather low standard in this case.

[111] The costs of terminating open-ended contracts fell in Portugal in 2009. This will result in a decrease in the EPL index for permanent employment compared to the previous year from 4.2 to 3.6.

[112] Brandt et al., 2005.

[113] Bassanini and Duval, 2006.

[114] A single 15% personal income tax rate (calculated in the case of employees from the so-called "super-gross wage" containing social and health insurance contributions paid by employers) and maximum assessment bases for social and health insurance premium payments were introduced in 2008. Insurance paid by employees and employers was reduced from 12.5% to 11% and from 35% to 34% respectively in January 2009.

Table 39: Overall labour taxation

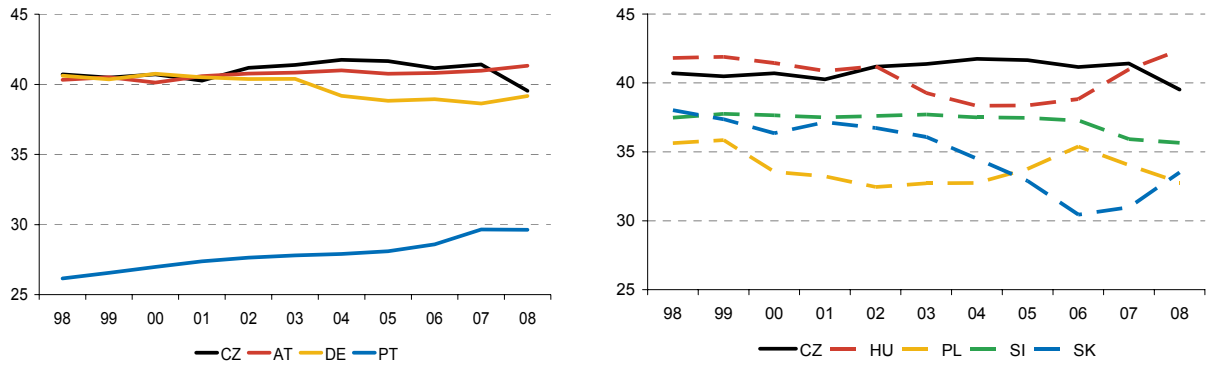
	100% of average wage					67% of average wage				
	2000	2007	2008	2009	Change[a)]	2000	2007	2008	2009	Change[a)]
CZ	42.7	42.9	43.4	41.9	-0.8	41.4	40.6	40.0	38.6	-2.8
AT	47.3	48.6	48.8	47.9	0.6	43.2	44.1	44.4	43.3	0.1
DE	54.0	52.6	52.0	50.9	-3.1	48.6	47.7	47.3	46.0	-2.6
PT	37.3	37.'7	37.6	37.2	-0.1	33.2	33.0	32.9	32.3	-0.9
HU	54.6	54.5	54.1	53.4	-1.2	51.4	46.0	46.7	46.3	-5.1
PL	43.1	42.9	39.7	34	-9.1	42.0	41.8	38.7	33.0	-9.0
SK	41.7	38.6	38.9	37.6	-4.1	40.5	35.6	36.1	34.3	-6.2

Note: Income tax and social security contributions paid by employees and employers as a percentage of total labour costs. Data for employees (individuals without children) earning 100% (left-hand part of the table) and 67% (right-hand part of the table) of the average wage.
[a)] Differences in p.p. for 2000–2009.

Sources: OECD (2009), CNB calculations.

The real tax burden in terms of aggregate tax revenues as a percentage of the potential tax base in relation to the production factor of labour is described by **implicit tax rates** (see Chart 43). Although this indicator declined in the Czech Republic in 2008, it was still higher than in most of the countries under comparison. Slightly higher implicit tax rates were recorded only by Austria and Hungary, while significantly lower implicit tax rates were recorded in Portugal, Poland, Slovakia and Slovenia. Between 1998 and 2007, this indicator declined in Slovakia, Poland, Slovenia, Germany and the Czech Republic, while increasing in Austria and, in particular, Portugal. The data on the components of the implicit labour taxation rate (see Chart 44) show that in all the selected countries health and social insurance affects the implicit tax rate to a greater extent than income tax. The level of insurance in the Czech Republic is the same as that in Germany. Among the countries under comparison, only Hungary has a higher level.

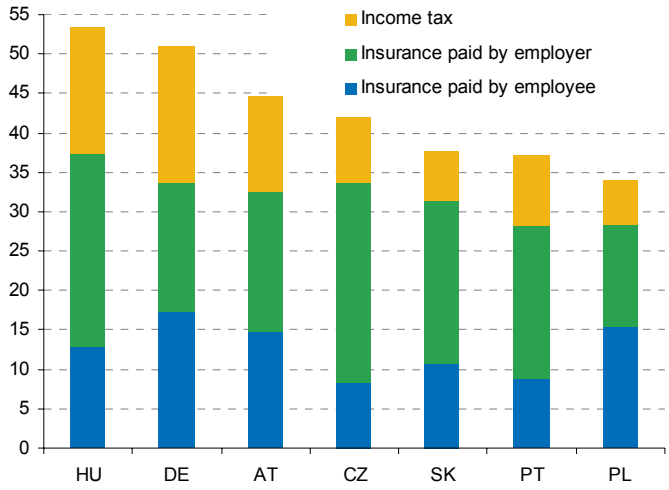
Chart 43: The implicit labour taxation rate (%)



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

Source: Eurostat (2010).

Chart 44: Components of the implicit labour taxation rate in 2009 (%)



Source: OECD (2009).

2.3.4.5 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. labour supply). The financial gain from work is measured by the net replacement rate. The indicator is defined as the ratio of net household income when the person under consideration is jobless to that when the same person has a job. Table 40 compares the **net replacement rates** for short-term and long-term unemployment and for two types of households.

Table 40: Net replacement rates[a)]

	Initial stages of unemployment[b)]								Long-term unemployment[c)]							
	Individuals without children				Family (2 children)[d)]				Individuals without children				Family (2 children)[d)]			
	2001	2006	2007	2008	2001	2006	2007	2008	2001	2006	2007	2008	2001	2006	2007	2008
CZ	59	55	59	60	65	64	72	72	53	42	42	42	92	76	80	77
AT	55	55	55	55	73	71	71	71	55	51	51	51	88	79	80	80
DE	61	61	59	59	81	79	78	78	58	51	49	48	81	84	80	80
PT	78	78	78	78	76	85	76	77	24	25	25	24	72	73	73	73
HU	58	71	73	73	61	78	80	79	28	30	31	30	54	75	71	70
PL	74	74	68	66	69	69	61	59	46	41	37	35	64	61	59	57
SK	67	62	62	62	76	56	57	60	75	28	28	27	122	53	53	55

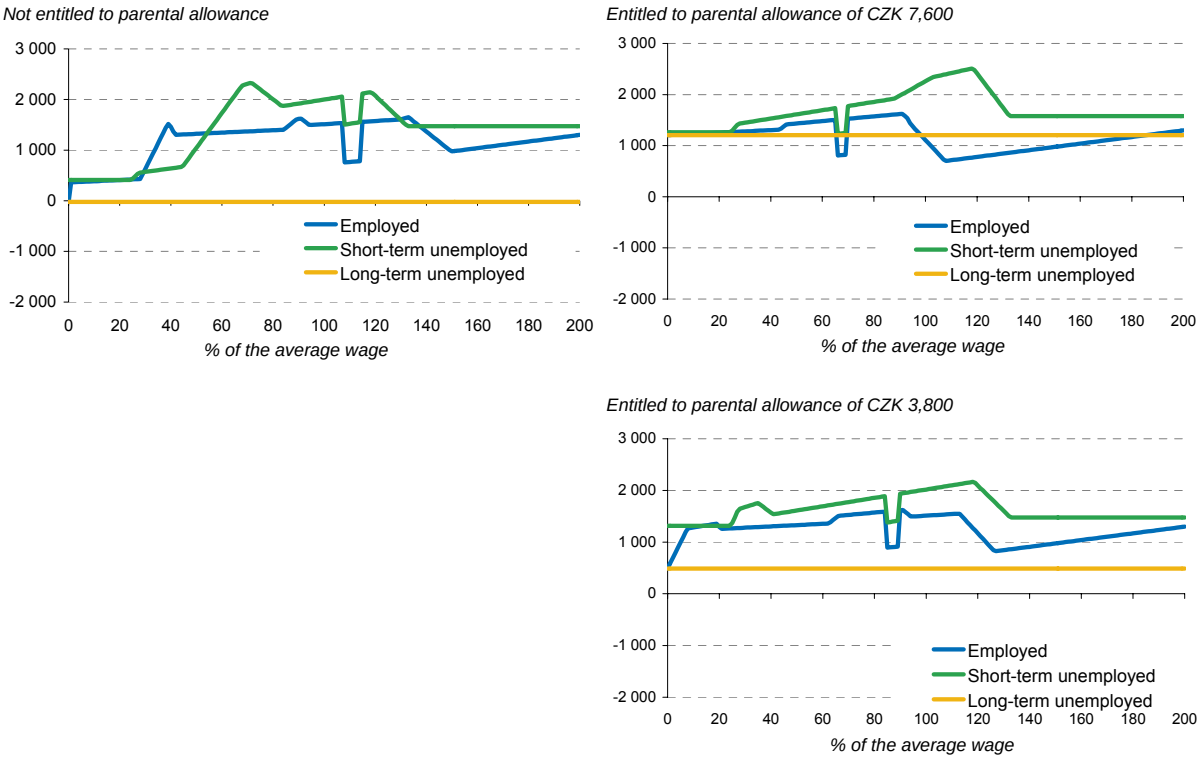
Note: [a)] The ratio of net household income when the breadwinner is unemployed and employed (data in %). Income from employment of the breadwinner at 67% of the average wage.
[b)] Unemployed persons entitled to unemployment benefits, excluding social assistance benefits.
[c)] Unemployed persons after five years.
[d)] The other adult is economically inactive, children of 4 and 6 years of age.

Source: OECD tax benefit models.

Of the countries under comparison, the financial incentives to accept a job in the initial phase of unemployment among childless individuals are highest in Austria, Germany and the Czech Republic. On the other hand, these three countries have the lowest financial incentives to accept a job in the case of long-term unemployment. Considerably greater incentives to accept a job in this case are recorded in Slovakia, for example. The position of the Czech Republic remained mostly unchanged in 2008 compared to 2007. A slight improvement is apparent only for the long-term unemployed in the model category of a family with two children. A major improvement is visible in this category by comparison with 2001.

In 2009, health and social insurance paid by employees was reduced to 11%, while insurance paid by employers was decreased to 34%. The limit for spouses' own income was increased to CZK 68,000, which is the deciding factor for the application of tax discounts for non-working spouses. Unemployment benefit was also increased. The unemployed are entitled to 65% of their previous net wage for the first two months, 50% for the subsequent two months and 45% thereafter. The period of entitlement to unemployment benefit was shortened by one month to five months for persons under 50 years, eight months for persons aged 50–55 and eleven months for persons over 55 years. As regards social benefits, there was an increase in normative housing expenses, which determine the amount of housing benefit. Social assistance benefits were reduced for persons who have been unemployed for more than six months and who are not doing work in the community. However, microsimulations for model types of households using the methodology of Galuščák and Pavel (2007) reveal that the changes are not leading to a reduction in net replacement rates compared to 2008 (see Table 40) and so are not increasing the incentive to work.[115]

Chart 45: Change in the net income of households with a non-working partner in 2009 compared to 2008 (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).

[115] In 2009, the net income of households (shown in Chart 45) was increased – in addition to the labour income of employed persons – by housing benefits and, in the case of the unemployed, by higher unemployment benefits. Owing to this higher income, households containing long-term unemployed persons lost entitlement to a proportion of social assistance benefits, while households not entitled to parental allowance lost all entitlement to social assistance benefits. The change in the net income of households compared to 2008 is therefore zero in this category (see Chart 45, top left)

To sum up, in the area of collective bargaining the degree of coverage by collective agreements is decreasing. Nevertheless, the applicability of higher-level collective agreements is being extended to other employers although such extended higher-level collective agreements cover only a small percentage of employees. Wage flexibility is increasing slightly in the area of low wages. This is visible in a decline in the ratio of the minimum wage to the average wage. The impact of protection of permanent employment – especially under short-term employment contracts – on job creation and long-term unemployment remains high. Labour taxation in the Czech Republic is decreasing but remains high by international comparison. The configuration of taxes and benefits is such that incentives to work remain low for households of long-term unemployed persons in families with children. Parametric changes in taxes and benefits in 2009 did not increase the incentive to work.

2.4 Product market flexibility

2.4.1 Administrative barriers to entrepreneurship

High **costs and barriers as regards business start-ups** and **complicated administrative regulations** governing entrepreneurship reduce competitive pressures, productivity and thus flexibility on product markets. In the long run, this also has a negative impact on job creation and employment.[116] According to Bassanini and Duval (2006), regulation on product markets increases overall unemployment.

An OECD index is used for international comparison of the above-mentioned administrative barriers to entrepreneurship.[117] In 2008, the administrative barriers to entrepreneurship were higher in the Czech Republic than in the countries under comparison except Poland and Hungary (see Table 41, last column). As in the other countries, the overall index decreased for the Czech Republic compared to 2003.[118] By international comparison, the regulatory and administrative opacity in the Czech Republic was still relatively high in 2008, being higher only in Germany and Poland. By contrast, the Czech Republic recorded the lowest barriers to competition of all the countries under comparison.

An amended Trades Licensing Act took effect in the Czech Republic in July 2008, reducing the costs of starting up and carrying on trades. Trade certificates and licences were replaced by an extract from the Register of Trades and the extract issuance period was shortened. In addition, the charges for issuing certificates were reduced and the local competence of trade licensing offices was cancelled. The system of trades was made more transparent and simplified. The administrative environment in the Czech Republic has thus partially improved, and this, in turn, has reduced its potential adverse impact on labour market flexibility in the job creation area. This is reflected in a decline in the index of administrative barriers to entrepreneurship for the Czech Republic (see Table 41).

Three positive reform measures made doing business easier in the Czech Republic in 2009. The process of issuing building permits was made more efficient. This was reflected in a reduction of the number of days necessary for issuing a building permit from 180 to 150, bringing the Czech Republic below the average for the OECD countries. The real estate registration process was made simpler and the time limit was reduced from 123 days to 78. Despite this improvement, the time limit for registering real estate in the Czech Republic

[116] Nicoletti and Scarpetta (2004).
[117] Conway et al. (2005); Wölfl et al. (2009).
[118] Data for Slovakia are only available for 2003.

remains above the OECD average. Payment of taxes has been made easier by the introduction of electronic tax returns, the launch of a single collection authority project and the standardisation of tax return forms.

Table 41: Index of administrative barriers to entrepreneurship[a)]

	Administrative burdens on startups[b)]			Regulatory and administrative opacity[c)]			Barriers to competition[d)]			Barriers to entrepreneurship, total		
	1998	2003	2008	1998	2003	2008	1998	2003	2008	1998	2003	2008
CZ	2.3	2.5	2.1	2.6	2.2	1.3	1.8	1.5	1.3	2.3	2.1	1.6
AT	2.7	3.0	2.1	0.7	0.4	0.0	3.2	1.8	1.4	2.2	1.7	1.2
DE	2.5	1.6	0.5	2.5	2.2	2.0	1.9	1.8	1.4	2.3	1.8	1.3
PT	2.4	1.7	1.7	1.8	1.3	0.0	2.4	1.7	1.8	2.2	1.6	1.2
HU	3.1	2.7	2.9	0.3	0.3	0.6	2.2	2.4	1.8	1.9	1.8	1.7
PL	3.9	3.9	3.2	3.9	3.4	2.0	3.3	2.2	1.7	3.7	3.2	2.3
SK	-	2.1	-	-	0.7	-	-	1.7	-	-	1.5	-

Note: 2008 data relate to the beginning of 2008.
[a)] Indices ranging between 1 and 6, a higher value indicating higher barriers. The aggregate index is a weighted sum of indicators in seven basic areas, which are grouped into the three areas shown in the table.
[b)] Administrative burdens for corporations, administrative burdens for sole proprietors (natural persons), sector specific administrative burdens.
[c)] Licences and permits system, government communication strategy and simplification of rules and procedures.
[d)] Legal barriers to entry into the industry, antitrust exemptions for public enterprises.

Source: OECD Product Market Regulation Database.

However, World Bank data on business conditions signal that the Czech Republic's world ranking as regards the conditions for starting a business worsened in 2009 (see Table 42). Relative to the other countries included in the Doing Business database, the Czech Republic is in 113th place in 2009. Of the countries under review, Slovenia, Hungary, Portugal, Slovakia and Germany have better conditions for starting a business than the Czech Republic, while Poland and Austria have worse conditions. As regards closing a business, the Czech Republic has the worst ranking among the countries under comparison, down one place from 2008.

Table 42: Conditions for starting and closing a business

	Starting a business		Closing a business	
	2008	2009	2008	2009
CZ	91	113	115	116
AT	106	122	20	20
DE	101	84	35	35
PT	39	60	22	22
HU	29	39	58	58
PL	145	117	85	85
SI	42	26	40	40
SK	39	66	39	39

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 (2009).

Overall, the conditions for doing business have recently shown some improvements which are gradually bringing down corporations' still relatively high administrative costs by

international comparison. These are shifts in the right direction for adoption of the euro, but there remains a need to further increase flexibility in this area.

2.4.2 Tax burden on businesses

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

The Czech Republic applies a **corporate income tax rate** of 19% in 2010. Together with Slovakia and Poland, this is the lowest figure among the countries under comparison (see Table 43). Except for Hungary and partially also Slovenia, which had the lowest tax burdens on average for the whole period under review, corporate income tax rates have declined sharply in the countries under comparison since 1998.

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

	1998	2003	2004	2005	2006	2007	2008	2009	2010	Change (p.p.)
CZ	35.0	31.0	28.0	26.0	24.0	24.0	21.0	20.0	19.0	-16.0
AT	34.0	34.0	34.0	25.0	25.0	25.0	25.0	25.0	25.0	-9.0
DE	56.0	39.6	38.3	38.7	38.7	38.7	29.8	29.8	29.8	-26.2
PT	37.4	33.0	27.5	27.5	27.5	26.5	26.5	26.5	26.5	-10.9
HU	19.6	19.6	17.6	17.5	17.5	21.3	21.3	21.3	20.6	1.0
PL	36.0	27.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	-17.0
SI	25.0	25.0	25.0	25.0	25.0	23.0	22.0	21.0	20.0	-5.0
SK	40.0	25.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	-21.0

Note: Changes in p.p. for 1998–2010.

Source: Eurostat.

The tax rates are simple indicators of the taxation rate. However, the tax burden is also determined by the tax base, which is affected by depreciation, amortisation and tax exemptions. The **implicit tax rates**, defined as aggregate corporate income tax revenues as percentage of the potential tax base, are thus a complementary indicator of the tax rate (see Table 44). The implicit tax rate in the Czech Republic is, by contrast, one of the highest and slowest declining ones (together with Austria and Slovenia) among the countries under comparison.

Table 44: Implicit corporate income taxation rate (%)

	1998	2003	2004	2005	2006	2007	2008	Change (p.p.)
CZ	27.8	32.0	29.8	25.5	25.5	25.7	25.7	-2.1
AT	29.4	27.1	26.2	23.7	23.5	25.1	26.1	-3.3
PT	20.0	19.0	18.8	19.4	22.6	-	-	-
HU	22.7	19.3	17.4	18.2	15.6	18.1	19.9	-8.8
PL	42.7	21.9	18.7	21.0	19.1	20.3	20.0	-22.7
SI	19.0	21.0	23.0	33.8	30.5	30.5	27.4	7.7
SK	52.7	34.8	22.6	23.3	20.3	19.4	20.7	-32.0

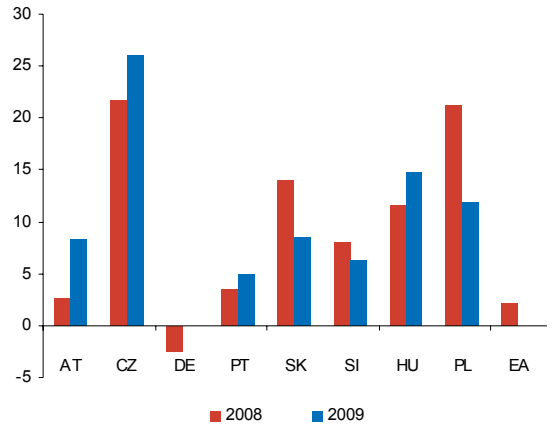
Note: The implicit taxation rate expresses aggregate corporate tax revenues as a percentage of the potential tax base. Changes in p.p. for 1998–2008.

Source: Eurostat.

2.5 The banking sector and its shock-absorbing capacity

The financial sector plays an important role in the economy's ability to absorb economic shocks and adjust flexibly in response to them. This applies above all to its key segment – the banking sector. Despite the recent substantial decline in economic activity and related growth in credit losses, the banking sector was able to generate sufficient operating revenues and maintained high profitability in 2009 (see Charts 46 and 47). High levels of return on equity and return on assets illustrate the above-average profitability of the Czech banking system relative to other Central and Eastern European countries as well as to the euro area. The relatively strong profitability of Czech banks is being supported by growth in the interest margin, which has been maintained even over the last two years. While the return on equity of Czech banks increased from 22% in 2008 to 26% in 2009, the profitability of Polish and Slovak banks fell significantly year on year.

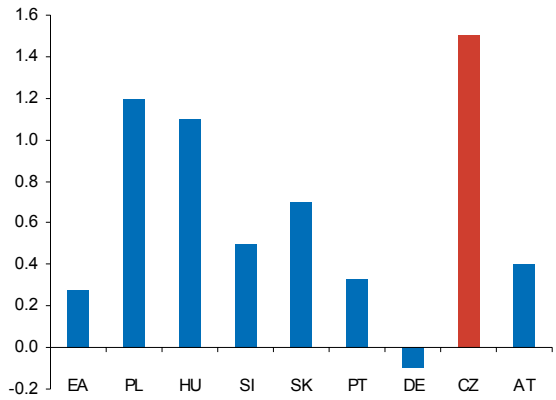
Chart 46: Return on equity, RoE (%)



Note: The chart does not contain data for Germany and EA in 2009. EA in 2008 represents the average of the current euro area member countries except Ireland, for which data were not available.

Sources: IMF FSI, GFSR.

Chart 47: Return on assets, RoA (%, 2009)



Note: 2008 data are shown for Germany and EA. EA represents the average of the current euro area member countries except Ireland, for which data were not available.

Sources: IMF FSI, GFSR.

The downturn in the real economy led to a rise in the ratio of non-performing loans in all the countries under review, including the Czech Republic (see Table 45). However, Czech banks had created a sufficient capital buffer to deal with potential shocks by retaining a part of their previous earnings. In mid-2010, the aggregate capital adequacy ratio of the banking sector in the Czech Republic was almost 15% (well above the regulatory threshold of 8%) and no bank reported a ratio below 10%. The Czech banking sector has one of the highest capital adequacy ratios among the monitored countries (see Chart 48). This creates conditions for lending to the real sector even in bad times, as banks would not be forced to stop or even reduce lending in order to increase their capital adequacy. The Czech banking sector, therefore, is not a source or amplifier of shocks to the real economy.

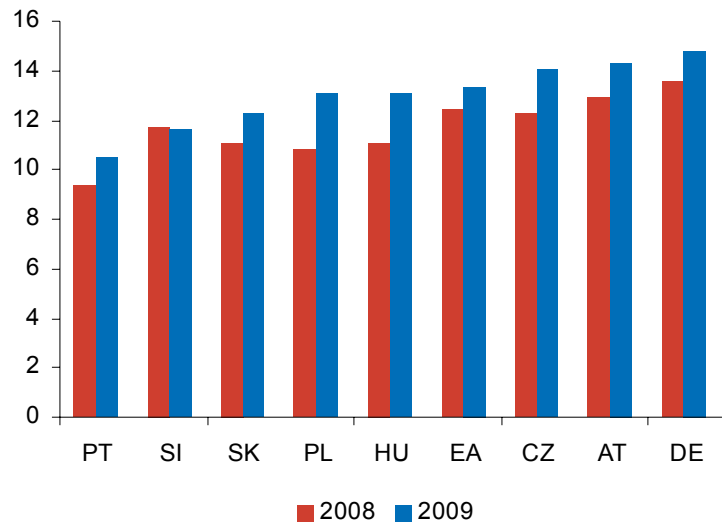
Table 45: Non-performing loans, NPLs (% of total bank loans)

	2007	2008	2009
CZ	2.8	3.3	5.3
AT	2.2	1.9	2.3
DE	2.6	2.8	-
PT	1.5	1.9	2.5
HU	2.3	3.0	5.9
PL	5.2	4.4	7.0
SI	1.8	1.8	2.3
SK	2.5	3.2	4.3
EA	2.0	2.7	4.2

Note: EA represents the average for the current euro area member countries except Luxembourg and the Netherlands in 2008 and Finland and the Netherlands in 2009, for which data were not available.

Sources: IMF FSI, GFSR

Chart 48: Capital adequacy ratio (%)

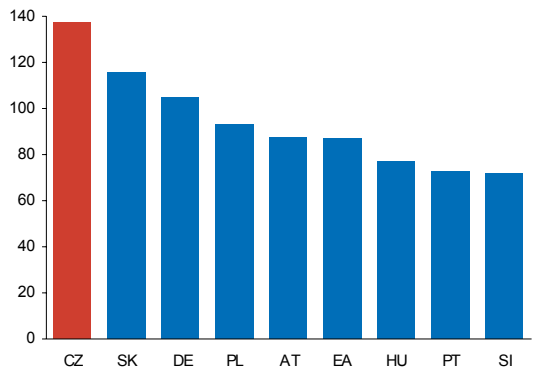


Note: EA represents the average for the current euro area member countries except France in 2008 and Finland, France and Italy in 2009.

Sources: IMF FSI, GFSR

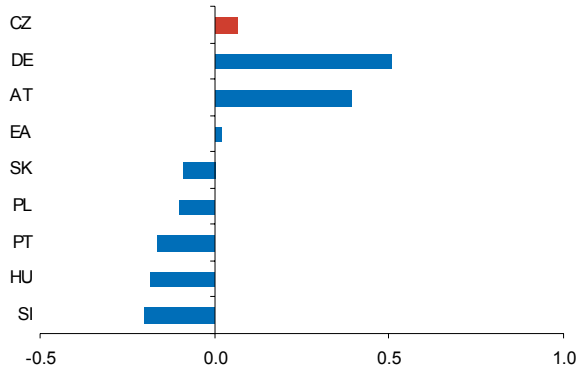
The Czech banking sector is characterised by a very conservative banking model that involves accepting deposits and providing loans chiefly to the private sector. This model is supported by high coverage of lending by primary deposits. The ratio of deposits to loans in the Czech banking sector is almost 140%, while the average for the euro area is 90% (see Chart 49). Sufficient sources of financing from deposits ensure that Czech banks are relatively independent of the Czech interbank market and foreign financial markets. The net external creditor position of the Czech banking sector is evidenced by a positive ratio of net external assets to GDP (see Chart 50).

Chart 49: Ratio of deposits to loans in selected EU countries (%, 2009)



Source: ECB.

Chart 50: External position of the banking sector (net external assets in % of GDP, 2009)



Note: 2008 data are shown for Austria due to unavailability of more recent data.

Source: IMF IFS.

Thanks to Czech banks' sufficient liquidity, limited dependence on foreign financing, almost zero volume of foreign currency loans and minimal investment in toxic assets, the Czech banking sector did not require any capital injections from public sources or any significant liquidity support from the central bank during the crisis. In the EU as a whole, support from public sources averaged 20% of GDP, of which 2% of GDP consisted of capital injections.

The CNB conducts stress tests to assess the impacts of highly adverse and implausible future macroeconomic scenarios on the resilience of the domestic banking sector. The stress tests of the Czech banking sector – performed using the data available as of 30 June 2010 and focused on the following two years – show that the sector's capital adequacy would stay above the 8% regulatory threshold even in an extreme and very improbable stress scenario. The results thus confirm that the Czech banking sector is suitably resilient to potential negative shocks.

The ***baseline scenario*** of the stress tests corresponds to the CNB's macroeconomic forecast published in Inflation Report III/2010. This scenario assumes slow growth of the economy, a gradual rise in inflation towards the inflation target, moderate appreciation of the exchange rate and stability of short-term interest rates, with gradual growth in rates as from 2011 H2.

The ***Debt Crisis*** stress scenario captures a combination of weak economic activity in the Czech Republic and abroad (a W-shaped GDP path) and adverse financial market developments. In this scenario, concerns regarding the stability of public finance will result in a rise in yields on Czech government bonds and rapid depreciation of the koruna. This will lead to an increase in inflation pressures, to which monetary policy will react by raising short-term interest rates. At the same time, a crisis on the government bond markets of the southern EU states[119] is assumed, causing a decline of 50% in the value of the Czech banking sector's exposures to those countries. This scenario is considered very extreme and highly improbable. Table 46 presents the evolution of the key macroeconomic variables of the stress scenario compared to the baseline scenario.

[119] Italy, Portugal, Greece and Spain.

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

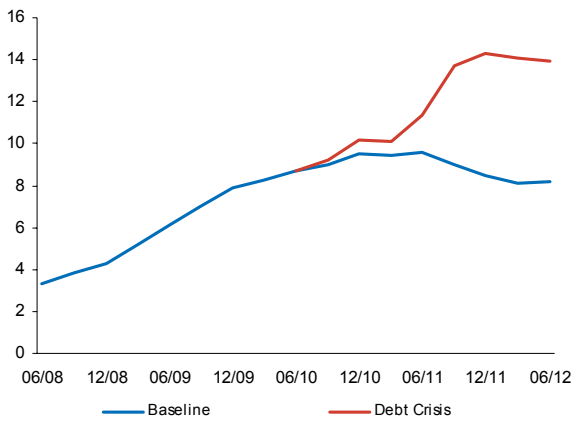
	Baseline		Debt Crisis	
	2010	2011	2010	2011
GDP (yoy in %)	1.6	1.8	0.2	-3.4
Exchange rate (CZK/EUR)	25.4	24.3	26.7	29.1
Inflation (%)	1.6	1.9	1.6	2.8
Unemployment (%)	9.5	9.8	9.8	11.7
3M PRIBOR (%)	1.3	1.4	2.9	4.7

Source: CNB

The ratio of NPLs to total loans in the non-financial corporations sector continues to rise even under the baseline scenario, nearing 10% in mid-2011. In the case of households (individuals), the NPL ratio is estimated to rise in the baseline scenario by around one percentage point at the end of 2010 from 4.5% in June 2010. The NPL ratios estimated in the stress scenarios are much higher owing mainly to the weaker assumed economic activity (see Charts 51 and 52).

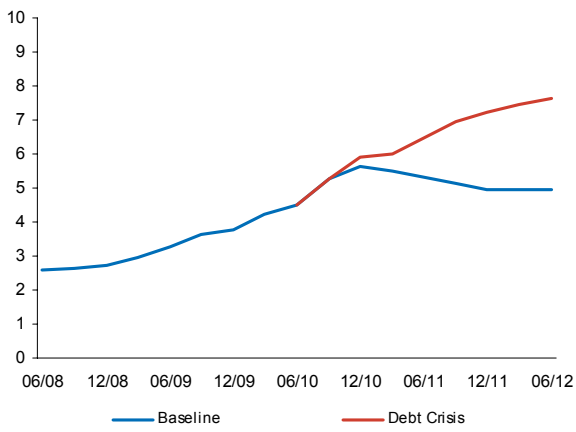
In the adverse *Debt Crisis* scenario, the increase in NPLs is reflected in relatively high loan impairment losses. This is exacerbated by losses caused by a decline in the prices of Czech government bond holdings and also by losses on exposures to the indebted southern EU states.

Chart 51: Non-performing loan ratio: non-financial corporations (%)



Source: CNB.

Chart 52: Non-performing loan ratio: households (%)

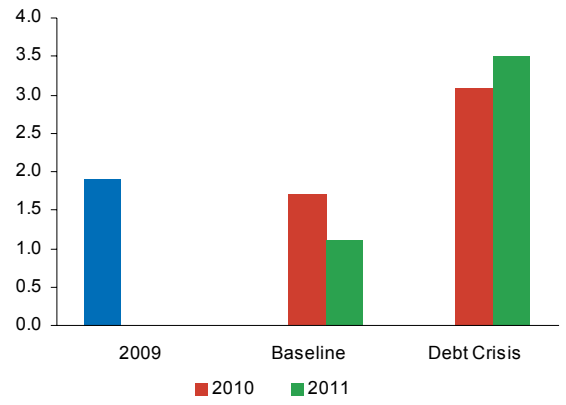


Source: CNB.

While the baseline scenario assumes that operating profit generation in the period ahead will remain roughly same as last year, the estimate of operating profits in the *Debt Crisis* stress scenario is roughly 30% lower. In the stress scenario, some banks might thus get into a loss-making situation, which will immediately cause regulatory capital to decline.

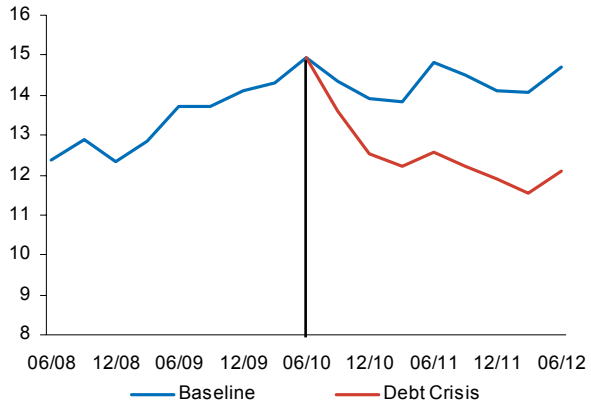
The increase in the credit risk parameters (PD, LGD) in the stress scenario leads to quite a significant rise in credit losses and therefore a rise in provisions to cover such losses. The risk costs of the banking sector, as measured by the amount of new provisions relative to total gross lending, would almost double under the stress scenario from 1.9% in 2009 (see Chart 53).

Chart 53: Risk costs of the banking sector (provisioning relative to gross lending in given year, %)



Source: CNB, CNB calculations

Chart 54: Evolution of the capital adequacy ratio (%)



Source: CNB

Note: The **baseline scenario** corresponds to the CNB's macroeconomic forecast published in Inflation Report III/2010. The ***Debt Crisis*** stress scenario captures a combination of weak economic activity in the Czech Republic and abroad and adverse financial market developments. At the same time, a crisis on the government bond markets of the southern EU states is assumed, causing a decline of 50% in the value of the Czech banking sector's exposures to those countries. This scenario is considered very extreme and highly unlikely.

Despite the relatively high credit and market losses, however, the banking sector as a whole remains stable in both macroeconomic scenarios and its aggregate capital adequacy stays constantly above the regulatory minimum of 8% (see Chart 54). This result is achieved despite the conservative settings of many of the assumptions of the individual scenarios. The reasons include the high capital adequacy ratio of the banking sector in the second half of 2010.

In the *Debt Crisis* stress scenario, some banks could get into a situation of insufficient capital adequacy. To make up their capital adequacy to the regulatory minimum of 8%, the banks having their registered offices in the Czech Republic (i.e. excluding foreign bank branches) would have to increase their regulatory capital by just under CZK 3.5 billion (i.e. around 0.1% of GDP); this is an insignificant figure relative to the size of the sector.

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

3 SUMMARY OF RESULTS OF ANALYSES

Analysis	Method / Category	Section	Value 2006[o)]	Value 2007[a)]	Value 2008[b)]	Value 2009[c)]	Value 2010[f)]	Commentary
CYCLICAL AND STRUCTURAL ALIGNMENT								
Direct alignment indicators								
Real economic convergence	GDP per capita, PPP, EA-16=100 (2006–2008 values: EA-13=100)	1.1.1	68.5	72.1	74.1	74.1[d)]	73.4[d)]	Czech convergence process interrupted (probably temporarily). Figures for 2007−2009 revised downwards. Indicator above levels of PT, HU, SK and PL, lower than SI.
	Price level of GDP, EA-16=100 (2006–2008 values: EA-13=100)	1.1.1	55.0	57.8	59.8	67.9[d)]	64.6	Convergence halted in 2009 (probably temporarily). Persisting large lag behind AT, DE, PT and SI.
	Real exchange rate against euro, 1998=100	1.1.1	123	129	133	151	143	Real depreciation had stabilising effect during crisis. Real appreciation of koruna against euro at average rate of 2.0–3.4% a year expected over next five years.
	3M real interest rates	1.1.1	0.4	0.2	0.1	-2.1	1.6	Low level of real rates in past 5 years means smaller adjustment need in future.
	3M real interest rate outlook for following 5 years given no change in exchange rate and risk premium	1.1.1	-	-	(-0.6;0.5)	(-1.7;0.5)	(-1.6;-0.2)	Czech Republic would face negative real interest rates, which could mean a risk of economic disequilibrium.
Correlation coefficients of real economic activity (CZ and EA-16, 2006−2008 EA-12)	GDP (Method 1)	1.1.2	0.29	0.62	0.73	0.88	0.92	High correlation is visible for all countries compared and is affected by financial and economic crisis.
	GDP (Method 2)	1.1.2	0.26	0.33	0.34	0.84	0.71	
2006 value: 2001 Q1–2006 Q1 2007 value: 2002 Q1–2007 Q1 2008 value: 2002 Q1–2008 Q1 2009 value: 2002 Q1–2009 Q1 2010 value: 2002 Q1–2010 Q1	GDP (Method 1, dynamic correlation, average for cycle length considered)	1.1.2	0.33	0.7	0.8	0.89	0.94	
	IPI (Method 1)	1.1.2	0.77	0.77	0.74	0.9	0.92	Statistically significant correlation according to both methods.
	IPI (Method 2)	1.1.2	0.41	0.25	0.31	0.35	0.32	
	Total exports (Method 1)	1.1.2	0.64	0.63	0.63	0.76	0.85	Statistically significant correlation according to both methods.
	Total exports (Method 2)	1.1.2	0,00	-0.04	0.36	0.47	0.52	
Method 1: year-on-year difference Method 2: quarter-on-quarter (or month-on-month) difference	Czech exports to EA vs. EA GDP (Method 1)	1.1.2	0.42	0.38	0.38	0.56[d)]	0.78	Statistically significant correlation according to both methods.
	Czech exports to EA vs. EA GDP (Method 2)	1.1.2	0.24	0.3	0.27	0.49[d)]	0.48	

Analysis	Method / Category	Section	Value 2006[o)]	Value 2007[a)]	Value 2008[b)]	Value 2009[c)]	Value 2010[f)]	Commentary
Analysis of cyclical alignment using Taylor rule	Average square of deviations from implied euro area rates (2003 Q1–2008 Q1)	1.1.3	-	-	reasonable alignment	reasonable alignment	reasonable alignment	Czech value historically generally lower than in other new member states (lower values mean greater alignment).
Synchronisation of demand shocks	Structural vector autoregression, correlation	1.1.4	asymmetry	asymmetry	asymmetry	asymmetry	asymmetry	Zero correlation of demand-side shocks, unchanged between periods under review. Other countries compared except DE show no statistically significant correlation either.
Synchronisation of supply shocks	Structural vector autoregression, correlation	1.1.4	asymmetry	asymmetry	asymmetry	symmetry	symmetry	Positive correlation of supply-side shocks in 2002–2010. Other countries except PL also show statistically significant correlations.
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	Czech Republic has highest structural dissimilarity among countries compared. However, indicator value still lies quite close to zero, which would represent identical structure.
Convergence of interest rate differential	Difference in three-month, five-year and ten-year interest rates	1.1.6	convergence	convergence	convergence	slight divergence	stabilisation	Sustained low interest rate differentials. Slight rise in 2009. Markedly lower than in HU and PL.
Convergence of exchange rates to euro	Bivariate GARCH	1.1.7	high correlation	high correlation	high correlation	fall in correlation	high correlation	In 2010 H1, correlation return to its high pre-crisis level.
Exchange rate volatility (exchange rate to euro, annualised, in %)	historical (daily returns for period of six months)	1.1.8	<5 (2006)	4 (2007)	5–8 (2008)	13–16 (2009)	6–7 (2010)	Growth in volatility due to uncertainty in world financial markets is gradually subsiding. Volatility still lower than in PL and HU.
	implied (options)	1.1.8	<5.5 (2006)	4 (2007)	5–7 (2008)	9–19 (2009)	6–10 (2010)	
Effect of international economic relations								
Share of foreign trade with euro area in total foreign trade	Exports,%	1.2.1	59.3	58.4	57.1	67.9[d)]	67.4	High level of trade links. Increase compared to 2008 value reflects inclusion of SK in euro area total.
	Imports, %	1.2.1	52.9	58.4	59.1	61.3[d)]	61.8	
Ratio of direct investment to/from euro area to GDP	Inflow of direct investment, % (stock)	1.2.1	38 (2004)	42 (2005)	43 (2006)	48 (2007)	49 (2008)	High level of ownership links, particularly on FDI inflow side.
	Outflow of direct investment, % (stock)	1.2.1	1 (2004)	1 (2005)	1 (2006)	2.3 (2007)	4.1 (2008)	
Share of intra-industry trade	Grubel-Lloyd index	1.2.2	0.8 (2004)	0.8 (2005)	0.8 (2006)	0.4d) (2009)	0.4 (2010)	High share of intra-industry trade (only AT and DE have higher shares) remains broadly unchanged. Fall in 2008−2009 values is due to change in method and was seen for all countries.

Analysis	Method / Category	Section	Value 2006[o)]	Value 2007[a)]	Value 2008[b)]	Value 2009[c)]	Value 2010[f)]	Commentary
Financial market								
Financial sector	Financial system assets (% of GDP)	1.3.1	135	133	142	146[d)]	153	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 and PL.
	Private sector debt (% of GDP)	1.3.1	-	-	-	-	54	
Conditions for transmission of monetary policy changes to firms and households	Structure of financial assets and liabilities of corporations and households	1.3.2	-	-	differences exist	differences exist	differences exist	Difference apparent primarily in relatively high proportion of trade receivables in corporate assets and liabilities and in household asset structure.
	Effect of monetary policy on client interest rates and loans	1.3.3	-	-	-	similarity	similarity	Effect of money and financial market rates on client rates is broadly similar in Czech Republic as in euro area. In Czech Republic, however, crisis increased interest rate differentials for client interest rates on new loans relative to euro area.
	Spontaneous euroisation	1.3.4	-	-	low	low	low	Use of euro by Czech corporations is consistent with openness of economy. Czech households make minimal use of euro in transactions and their debt in euro is also minimal.
Financial market integration Speed of convergence of yields with yields in euro area (beta-convergence coefficient, since 08/2007)	Money market	1.3.5	-	-0.6	-0.6	-0.39	-0.38	Financial and economic crisis led to decline in speed of adjustment on markets analysed. However, gradual return of convergence has been visible since mid-2009.
	Foreign exchange market	1.3.5	-	-0.9	-0.8	-0.89	-0.9	
	Bond market	1.3.5	-	-0.9	-0.8	-0.73	-0.69	
	Stock market	1.3.5	-0.9	-0.9	-0.9	-0.84	-0.77	

Analysis	Method / Category	Section	Value 2006[o)]	Value 2007[a)]	Value 2008[b)]	Value 2009[c)]	Value 2010[f)]	Commentary
ADJUSTMENT MECHANISMS								
Fiscal policy								
General government deficit	CNB estimate % of GDP, ESA 95	2.1.2	-3.5 (2006)	-3.5 (2007)	-1.0 (2007) -0.8 (2008)	-2.1 (2008) -6.0 (2009)	-5.9 (2009) -5.7 (2010)	Latest developments reflect impacts of recession and of measures adopted. In 2009 deficit significantly exceeded Stability and Growth Pact reference value, and excessive deficit procedure was opened against Czech Republic.
Public debt	CNB estimate % of GDP, ESA 95	2.1.2	30.6 (2006)	30.5 (2007)	28.9 (2007) 27.6 (2008)	30.0 (2008) 35.7 (2009)	35.4 (2009) 39.8 (2010)	Total public debt is rising. Ratio of public debt to GDP will stay below Maastricht convergence criterion, but risk to its sustainability remains.
Wage and price flexibility								
Rate of adjustment of real wage growth to unemployment rate	Phillips curve	2.2.1	-0.008	-0.019	-0.030	-0.009[d)]	0.003	Real wage flexibility remains low, as in other countries compared.
Inflation persistence (1997–2010)	Method 1 (non-parametric)	2.2.2	0.93	0.92	0.79[d)]	0.79	0.81	According to all three methods, inflation persistence in Czech Republic is slightly higher than in last year's analysis. However, it is still low by comparison with HU, PL, SI and SK, although higher than in DE and AT.
	Method 2 (sum of AR coeffs, constant mean)	2.2.2	-	0.74	0.83	0.82	0.91	
	Method 3 (sum of AR coeffs, time-varying mean)	2.2.2	-	0.45	0.32	0.32	0.38	
Labour market flexibility								
Long-term unemployment	Long-term unemployment rate, %	2.3.1	4.2	3.9	2.8	2.2	2.0	After a previous decline, long-term employment has been rising since 2009 H2 and this process can be expected to continue in 2010 and 2011.
	Long-term unemployment as share of total unemployment, %	2.3.1	53	54	52	49	30	
Regional differences in unemployment	Coefficient of variation in unemployment rate (at regional level, NUTS-3)	2.3.1	44 (2004)	47 (2005)	47 (2007)	45[d)] (2008)	35 (2010)	Regional differences decreased in 2009 owing to growth in unemployment in regions with lower unemployment.

Analysis	Method / Category	Section	Value 2006[o)]	Value 2007[a)]	Value 2008[b)]	Value 2009[c)]	Value 2010[f)]	Commentary
Labour market flexibility (cont.)								
Population mobility	Internal migration – per 1,000 inhabitants	2.3.1	20.9	21.9	24.9	24	22	Internal migration probably lower than in AT and DE and higher than in PL and SK.
Structural unemployment	NAIRU structural unemployment rate, %	2.3.2	-	-	-	5.9	6.1	Structural unemployment rate among lower ones of countries compared. AT significantly lower, however.
International migration	Immigrants – per 10,000 inhabitants	2.3.3	59	66	101	75	38	International mobility was rising until 2007, but has been falling sharply since 2008. However, proportion of foreign nationals in population is continuing to rise. Use of foreign workers is sign of flexibility of Czech labour market.
Institutional environment	Trade unions and collective bargaining – coverage of employees by collective agreements (%)	2.3.3	minor impact	minor impact	51 (2006)	51 (2006)	46 (2009)	Higher in CZ than in HU and PL and lower than in DE, AT, PT and SI. Practice of extending binding nature of higher collective agreements is not very common in Czech Republic. Wage flexibility in wage formation area is thus not constrained in business sector any more than in euro area countries.
	Minimum wage as % of average wage in industry and services	2.3.3	38.8 (2004)	39.1 (2005)	38.1 (2007)	38.1 (2007)	35.0 (2008)	Halt in growth and slight decline is positive development. This ratio is similar in PL, but higher in HU, SI and PT.
	Employment protection legislation index – permanent employment (OECD)	2.3.3	3.3 (2003)	3.3 (2006)	3.2 (2007, CNB estimate)	3.1	3.1 (2008)	Slight fall. Together with DE and SI lower than PT and higher level of employment protection than others.
	Employment protection legislation index – temporary employment (OECD)	2.3.3	0.5 (2003)	1.1 (2006)	1.1 (2007, CNB estimate)	0.9[d)]	0.9 (2008)	Behind SK lowest level among countries compared. Unchanged since 2006 (revision of OECD indicator).
	Overall labour taxation (persons on average wage, %)	2.3.3	43.8	42.6	42.9	43.4	41.9	Labour taxation decreased slightly in 2009, but is still higher than in PL, PT and SK.
	Overall labour taxation (persons on two-thirds of average wage, %)	2.3.3	42.1	40.1	40.5	40.0	38.6	
	Share of net income of households without and with employment, %[e)]	2.3.3	81 (2004)	74 (2006)	74 (2006)	80 (2007)	77 (2008)	Together with AT and DE lowest financial incentive to work for low-income long-term unemployed with children among countries compared.

Analysis	Method / Category	Section	Value 2006[0)]	Value 2007[a)]	Value 2008[b)]	Value 2009[c)]	Value 2010[f)]	Commentary
Product market flexibility								
Administrative barriers to entrepreneurship	Index of administrative barriers to entrepreneurship (OECD)	2.4.1	1.9 (2003)	1.9 (2003)	1.9 (2003)	1.6[d)]	1.6 (2008)	Partial improvement in 2005–2008. Together with HU highest behind PL.
	Conditions for starting a business (ranking, World Bank)	2.4.1.	-	-	86 (2008)	86 (2008)	113[d)]	Conditions for establishing business are better in DE, PT, HU, SI and SK, but worse in AT and PL.
	Conditions for closing a business (ranking, World Bank)	2.4.1.	-	-	113 (2008)	113 (2008)	116[d)]	Worst among countries compared.
Taxation rate	Implicit corporate taxation rate	2.4.2	-	-	23.4 (2006)	24.1[d)] (2007)	25.7[d)] (2008)	Unchanged from revised 2007 figure. Higher than in HU, PL and SK. Statutory corporate income tax rate is one of lower ones among countries compared.
Flexibility and shock-absorbing capacity of banking sector								
Non-performing loans	Percentage share of total loans	2.5	3.9	3.7	2.8	3.3	5.3	Increase due to recession. Only HU and PL have higher ratios among countries compared.
Capital adequacy of banks	%	2.5	11.9	11.4	11.5	12.3	14.1	Growth; capital adequacy at relatively high level, slightly higher than euro area average.
Capital adequacy of banks after stress tests	%	2.5	10.2	9.9	10.8	12.0	12.1	Sufficient level.
Deposit-to-loan ratio	%	2.5	-	-	-	-	138.0	Highest in Czech Republic of all countries compared. Sufficient deposit financing sources ensure relative independence of Czech banks on both Czech interbank market and foreign financial markets.

Notes:
[0)] "Value 2006" is the most recent value of the indicator compared in the 2006 document. Unless stated otherwise, the data are for 2005.
[a)] "Value 2007" is the most recent value of the indicator compared in the 2007 document. Unless stated otherwise, the data are for 2006.
[b)] "Value 2008" is the most recent value of the indicator compared in the 2008 document. Unless stated otherwise, the data are for 2007.
[c)] "Value 2009" is the most recent value of the indicator compared in the 2009 document. Unless stated otherwise, the data are for 2008.
[d)] Value is not fully comparable with the previous year's value. The reasons include in particular a revision of the data on the variable observed or a change in calculation or methodology.
[e)] Unemployed after five years, potential income from employment at 67% of the average wage. Second person economically inactive, children 4 and 6 years old.
[f)] "Value 2010" is the most recent value of the indicator compared in the 2010 document. Unless stated otherwise, the data are for 2009.

E METHODOLOGICAL PART

1 CYCLICAL AND STRUCTURAL ALIGNMENT

1.1 Direct alignment indicators

1.1.1 Real economic convergence

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

The estimate of future appreciation over the next five years is based on two methods. Method 1 is based on a panel estimate, which links the price level of final consumption of households with GDP at purchasing power parity per capita for 32 European countries between 1995 and 2009 (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:

$$P_{C,t} = 29.37 + 0.72\ HDP_{PPP,t} + 0.90\ \mathrm{AR}(1)_t,$$

where $P_{C,t}$ is the price level of final consumption of households in year t, $GDP_{PPP,t}$ is gross domestic product at purchasing power parity per capita in year t (in both cases EA-16 = 100) and $\mathrm{AR}(1)_t$ is the first-order autoregressive term.[120] 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 2010 based on European Commission and Eurostat forecasts for real GDP growth, nominal exchange rates and inflation in the individual countries in 2009. They also assume beta-convergence of GDP towards the level of the EA-16 at a rate of 3% a year. A range of estimates around the mean appreciation estimate is obtained by increasing or decreasing the autoregression coefficient by one standard error of its estimate (i.e. within a range of roughly 0.87–0.93).

Method 2 uses updated estimates of equilibrium real exchange rate appreciation for the Czech Republic, Hungary, Poland, Slovakia and Slovenia presented in an analysis by Brůha and Podpiera (2007). This analysis is based on a calibrated dynamic general equilibrium model for two unequally developed countries in which real appreciation is going on owing mainly to investment in product quality. Compared to the 2007 version, the calibration of the model was changed using, among other things, newer time series. In most cases, this change resulted in higher estimated rates of equilibrium real appreciation than in the 2009 analyses.

Real interest rates are derived from three-month money market interest rates. Three-month interest rates were selected for reasons of data availability in the Eurostat database for all monitored countries over the whole period under review; twelve-month interest rates would be more appropriate from the economic point of view, but the differences compared to the three-month rates are small on average (usually around 0.2 percentage point). The average annual level of interest rates is deflated by the average annual inflation rate for the country concerned, using the Harmonised Index of Consumer Prices. The estimate of real rates going

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

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 data on the wage level and wage growth and labour productivity growth are taken from OECD (2010a) and OECD (2010d). The average gross annual wage is converted to the equivalent for an employee working full-time all year.

1.1.2 Correlation of economic activity

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

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

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

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

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

When examining alignment of the cyclical behaviour between selected economies in order to assess the impact of economic policy, it is appropriate to monitor the correlation only within a certain band. Cycles between one and half and eight years long are considered most frequently. **Dynamic correlation**[121], which allows this requirement to be met, was therefore used as a third method. Dynamic correlation is based on spectral analysis of time series, takes values in the range [-1;1] and, analogously to the static correlation coefficient, is defined by the relationship:

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

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

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

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

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

Time series are expressed in logs, seasonally adjusted and detrended. As the literature[122] does not offer a consensus on the optimal detrending method, the analysis applies two different detrending methods – namely year-on-year differences between the original time series and quarter-on-quarter (month-on-month) differences between the seasonally adjusted time series:

Method 1

Year-on-year differences of seasonally unadjusted (logarithmed) time series:

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

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

Method 2

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

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

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

In most cases, it is possible – based on the resulting time series – to conclude that the above methods succeed in detrending. As regards GDP in the Czech Republic, Hungary or 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: 1997 Q1–2001 Q4 and 2002 Q1–2010 Q1. An analysis using rolling correlations was prepared as an alternative to the breakdown into two periods. As the time series of the Industrial Production Index begin at different points in time for different countries, the periods are defined as January 1999–December 2001 and January 2002–May 2010 in this case. Relatively long time series are available for export data, so it was possible to calculate all correlation coefficients for two periods as in the case of GDP. Specifically, these periods are 1997 Q1–2001 Q4 and 2002 Q1–2008 Q4 for quarterly data, and January 1997–December 2001 and January 2002–December 2009 for monthly data. The choice of intervals was motivated by maximum possible unification to make results mutually comparable.

1.1.3 Analysis of cyclical alignment using the Taylor rule

The implied monetary policy interest rate for the countries under comparison and the euro area is estimated using the classic Taylor rule (Taylor, 1993).[123] In contrast to the more

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

[123] Estimating the reaction rules of central banks is a complex task. The more sophisticated reaction functions are forward-looking, but their estimation is rather complicated. Although a simple backward-looking rule (like the

complicated variants, the advantage of the basic version of this rule is that it works only with current output gap values and the deviation of inflation from the target. Equilibrium real interest rates are added as an exogenous variable. This rule is generally regarded as relatively realistically capturing the behaviour of central banks over the medium term and at the same time being highly robust.

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

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

where π_t is the inflation rate, y_t the output gap (derived using the Hodrick-Prescott (HP) filter),[124] π_t^* the inflation target and r^{eq} equilibrium real interest rates.

The time series of seasonally adjusted GDP, three-month money market rates[125] and the HICP are taken from Eurostat's database. The time series of monetary-policy relevant inflation in the Czech Republic is obtained from the CNB's database. As in Taylor (1993), equilibrium real interest rates and the inflation target are 2%. The comparison therefore assumes that the equilibrium rates and the inflation target are the same in all countries. Although the inflation targets in some non-euro area countries are different (usually higher), the assumption of a common target is motivated by the prospect of their adopting the single ECB monetary policy in the future.[126]

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

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

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

It follows from this relationship that $\mathrm{S_{EA}} = 0$. To follow developments over time, $\mathrm{S_X}$ is calculated for six different periods: 1999 Q1–2010 Q1, 2001 Q1–2010 Q1, 2003 Q1–2010 Q1, 2005 Q1–2010 Q1, 2007 Q1–2010 Q1 and 2009 Q1–2010 Q1.

1.1.4 Synchronisation of economic shocks

A bi-variate structural vector autoregressive (SVAR) procedure is applied to identify demand and supply shocks (see Blanchard and Quah, 1989; Bayoumi and Eichengreen, 1993; and Babetskii, 2004 and 2005). Quarterly seasonally adjusted GDP series at constant prices and the GDP deflator in selected EU and euro area countries (Czech Republic, Hungary, Poland,

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Taylor rule) is cruder, it can be directly interpreted as a statistic of the current cyclical position of the economy. However, the disadvantage of this simple rule is the fact that current inflation can also include the effects of temporary shocks (e.g. due to changes in regulated prices) which are non-cyclical (exogenous) and/or one-off in nature and to which central banks either cannot respond in time or do not want to respond at all (and apply escape clauses, for example).

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

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

[126] 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.

Slovakia, Slovenia, Germany, Portugal and Austria) are the inputs for the VAR model. The source of the data is Eurostat and the data cover the period 1996 Q1–2010 Q1.

This method identifies supply and demand shocks in the following way. First, the shocks with and without a lasting impact on GDP are identified. Using an over-identifying restriction, it is subsequently verified whether contrary movements in GDP and the price level occur for the former shocks. Where this condition is met, the shock can be regarded as a supply shock. For shocks without a lasting impact on GDP it is verified whether co-movement of GDP and the price level occurs. Such a shock is then considered a demand shock. The calculation of the correlation of shocks between the group of new EU Member States and the current euro area members and the whole EA-16 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-16). The difference between the shares is weighted by the share of the sector in country A in the total, and the weighted shares are then summed.

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

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

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

For the purposes of the analysis the coefficient was modified to SL/100.[127] Adjusted in this way, the coefficient takes a value 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 interest rate convergence in the Czech Republic, Hungary, Poland, Slovenia and Slovakia.[128] Eurostat data (three-month money market rates) and Bloomberg data (five-year government bonds) were used to measure the interest rate differentials between three-month and five-year rates in the euro area and these countries. The euro area comprises 11

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

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

[128] 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.

countries until the end of 2000, 12 countries until the end of 2006, 13 countries until the end of 2007, 15 countries until the end of 2008 and 16 countries from January 2009.

The time series of three-month interest rates starts in January 1998 for all of the countries monitored, excluding Slovenia, whose time series starts in May 1998. The time series of five-year interest rates starts in January 1998 for the euro area,[129] the Czech Republic and Hungary, March 1999 for Poland, February 2002 for Slovakia and August 2005 for Slovenia. The time series terminate in June 2010 for both three-month rates and five-year rates.

The time series "EMU convergence criterion bond yields" from the New Cronos database (Eurostat) were used to compare 10Y government bond yields.[130] These time series are based on the gross yield on government bonds on the secondary market with approximately ten years to maturity. A weighted yield is created by Eurostat for the euro area, in which the weights applied are the nominal stocks of government bonds in each country. For the period before 1999, the weights are based on national GDP in purchasing power parity. The compared data cover the period between January 1990 and June 2010 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.[131] 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:

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

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

The analysis covers the period from 1 January 1998 to 21 June 2010 and uses daily data from Thomson Datastream and Eurostat.

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[129] The source is Bloomberg – Euro Generic Government Bond time series.
[130] These interest rates are monitored under the Maastricht convergence criterion on long-term interest rates.
[131] The same method is used in Castrén and Mazzotta (2005).

1.1.8 Analysis of exchange rate volatility

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

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

where σ is the standard deviation, r_t is the daily return and T is the number of working days in the period of six months (126 for a year with 252 working days). We use the following relationship to translate the standard deviation of logarithmic daily returns to an 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. This volatility is directly quoted in the trading system. The source of the data is Bloomberg, and the index codes are EURCZKV6M, EURSKKV6M, EURPLNV6M and EURHUFV6M.

1.2 Effect of international economic relations

1.2.1 Integration of the economy with the euro area

The data for the calculation of the shares of exports to and imports from the euro area in total exports and imports are taken from the Direction of Trade Statistics database of the International Monetary Fund (1998–2008 annual data) and from Eurostat (2009, 2010 Q1).

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.[132] 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 presented time series does not start until 2002 owing to the availability and quality of the data compared. The GDP data are from Eurostat.

1.2.2 Intra-industry trade

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

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

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

[132] The data for 2007 were updated for all the countries under review and therefore may differ from those included in the 2009 Alignment Analyses. The data for Slovakia are preliminary.

The GL index is calculated using data on total exports and imports to and from the euro area in the countries under review.[133] To calculate the index, foreign trade is broken down on the basis of the SITC and CN8 classifications (the commodities *i* are thus given by SITC groups at the one- to five-digit level and CN8 at the eight-digit level). The data source is the Eurostat COMEXT database. Mirror trade flows were used for 1998, i.e. data on imports (exports) of euro area countries from (to) the monitored countries were used for exports (imports) of the monitored countries to (from) euro area countries.

The value of the GL index depends, among other things, on the level of detail of the branch breakdown. The breakdown according to the one- or two-digit SITC is a rather broader sector breakdown which may put together in one category branches whose output is not closely related. This is particularly so in SITC 7 (Machinery and transport equipment), resulting as expected in a higher value of this indicator for all countries (see Chart 15 and Table 14 in section D). 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.[134]

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

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

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

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

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

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

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[133] 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.

[134] 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 9,000 categories of goods from the euro area in 2008 and exported more than 8,100 categories of goods.

1.3 Financial market

1.3.1 Financial system

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

Indebtedness of the private sector (ratio of gross book value of loans to non-bank clients, corporations and households to GDP at current prices) expresses the depth of financial intermediation by banks. Usually, the more advanced the market, the larger this ratio, but an excessively high value may reflect overleveraging of the private sector.

1.3.2 Structure of financial assets and liabilities of corporations and households

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

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

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

Indebtedness of households – loans from banks and non-bank institutions/GDP – this indicator shows the level of indebtedness of households. Given the role of households as consumers and as depositors of savings in the financial system, a change in their behaviour

caused by a high debt burden can have a significant impact on real economic activity and on the financial system as a whole. Adjustment (i.e. growth) towards the levels of indebtedness seen in advanced economies usually takes place in emerging economies.

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

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

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

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

1.3.4 Spontaneous euroisation

Euroisation is the process of substitution of a domestic currency with a foreign one (the euro) to ensure the necessary functions of money as a medium of exchange and a store of value. Generally, official and unofficial (spontaneous) euroisation can be distinguished. This analysis is concerned with spontaneous euroisation, which is important for assessing the efficiency and effectiveness of independent monetary policy. A comparison of the level of euroisation in the Czech Republic and selected Central European countries, namely Poland, Hungary and Slovakia, and an assessment of the initial effects of the escalating financial crisis on the degree of euroisation were performed using a survey conducted by Oesterreichische Nationalbank on the cash holdings and savings deposits of households in the autumn of 2008.

1.3.5 Financial market integration

1.3.5.1 Price-based measures

For quantification of 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[135] 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 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.

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

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

where Y is the asset yield, $\overline{Y}_t$ is the mean value of the yield over time t and i stands for the individual countries (i = 1, 2, …, N). For the purposes of this analysis, we introduce N = 2, i.e. we examine the evolution of sigma-convergence over time between the euro area and one of the countries under review.[136] σ takes only positive values in theory. The lower is σ, the higher is the level of convergence. In theory, full integration is achieved when the standard deviation is zero,[137] 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 $\lambda = 270{,}400$.

1.3.5.2 News-based measures

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

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

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

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

one and the proportion of the variance of coefficients γ (for benchmark and national assets) to be close to one. The time-varying parameters γ were estimated using recursive estimation.

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

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

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

Data

The calculations for both measures of financial integration were carried out using weekly data (daily data averages) from Thomson Datastream, covering the period January 1995 to July 2010 for the foreign exchange and stock markets, January 1999 to July 2010 for the money market and January 2001 to July 2010 for the bond market. Three-month interbank rates were used for the money market, national currencies quoted against the US dollar for the foreign exchange market, five-year government bonds for the bond market and national stock indices for the stock market (see Table E.1). The relevant time series were adjusted for exchange rate effects.

Table E.1: Data sources

	Money market	Foreign exchange market	Bond market	Stock market
	1999–2010	1995–2010	2001–2010	1995–2010
CZ	PRIBK3M	PRUSDSP	BMCZ05Y-(RY)	CZPXIDX
AT	-	-	BMOE05Y-(RY)	ATXINDX
DE	-	-	BMBD05Y-(RY)[B)]	DAXINDX
PT	-	-	BMPT05Y-(RY)	POPSI20
HU	HNIBK3M	HNUSDNB	BMHN05Y-(RY)	BUXINDX
PL	POIBK3M	POUSDSP	BMPO05Y-(RY)	POLWIGI
SI	-	SJUSDSP	-	SLOESBI
SK	SXIBK3M	SXUSDSP	SXGOVT1-(RY)[a)]	SXSAX16
EA-16	BBEUR3M[B)]	USECBSP[B)]	-	DJES50I[B), b)]
USA	-	-	-	S&PCOMP

Note: Thomson Datastream codes.

[B)] – benchmark.

[a)] – data from 2002 onwards.

[b)] – DJES50I consists of stocks from euro area member countries with the following weights: France 34.6%, Germany 28.0%, Spain 16.7%, Italy 11.0%, the Netherlands 5.6%, Finland 2.5% and Luxembourg 1.7%.

Source: Thomson Datastream.

2 ADJUSTMENT MECHANISMS

2.1 Fiscal policy

2.1.1 Stabilising function of public budgets

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

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

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

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

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

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

The description of mandatory expenditures is based on the definition used by the Ministry of Finance. These include mandatory expenditures arising from statutory requirements and other mandatory expenditures (namely expenditure arising under international treaties or due to judicial and extra-judicial decisions on disputes that are binding upon the Czech Republic). Included in particular are pension insurance benefits, government payments for health

insurance, government social assistance, sickness insurance benefits, debt service expenditure, state contributions related to the support of building savings schemes and private pension schemes, allocations to state funds, expenditure on contributions to political parties, payments to the EU budget, unsuccessful arbitrations, etc.

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

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

2.1.3 Sustainability of public finance

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

2.2 Wage flexibility and inflation persistence

2.2.1 Degree of adjustment of real wage growth to the unemployment rate (the Phillips curve)

A basic one-equation Phillips curve is used to estimate the elasticity of wages to the national unemployment rate (see, for example, Alogoskoufis and Smith, 1991, or Hycklak and Johnes, 1992, or Babecký, 2008).

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

where $\Delta w_t = \ln(w_t) - \ln(w_{t-1})$, $\Delta p_{t-1} = \ln(p_{t-1}) - \ln(p_{t-2})$, w_t is the wage component of nominal unit labour costs, p_t is the HICP index, and u_t is the natural logarithm of the standardised unemployment rate. The coefficient c_2 represents the elasticity of wages to the unemployment rate, i.e. it characterises wage flexibility. Although the left-hand side of the equation contains nominal wage costs, the coefficient c_2 in fact assesses the flexibility of real wage costs if the coefficient c_3 is close to one. The rest of the variation in wage costs (e.g. as a result of changes in productivity, growth in import prices, etc.) is included in the constant c_1. The source of the data (quarterly, seasonally adjusted time series) is Eurostat New Cronos. Since Eurostat has migrated to the new NACE2 classification, the wage cost data needed are only available from 2001. To assess its evolution over time, wage cost elasticity is now calculated for the period 2001 Q1–2010 Q1. Data for 1996–2001 are taken from the 2008 Alignment Analyses, where the same methodology was used for the calculation.

2.2.2 Inflation persistence

Inflation persistence is measured by three different methods. Quarterly data on HICP inflation (annual HICP changes) from 1997 Q1 to 2010 Q2 are used for the calculation. The source of the data is Eurostat.

Method 1

Method 1 uses the non-parametric technique proposed by Marques (2004) to estimate inflation persistence. This approach defines inflation persistence, γ, as $\gamma = 1 - n/T$, where n is the number of times actual inflation crosses the medium-term inflation value and T is the number of observations. Medium-term inflation is approximated using the Hodrick-Prescott (HP) filter. As the HP filter gives a biased trend estimate at the beginning and the end of the time series, the data for 1998 Q1 to 2009 Q4 were used for the actual calculation of inflation persistence.

Method 2

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

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

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

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

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

Method 3

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

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

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

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

where π_t^T is medium-term inflation (or the central bank's implicit inflation target), π_t^P is the inflation target perceived by the public, η_{1t} and ε_{1t} represent independent white noises, L^i is the lag operator and $\sum_{i=1}^{4} \varphi_i$ is the sum of autoregressive coefficients. Inflation π_t is the observed variable and medium-term inflation π_t^T is approximated with the inflation time series smoothed using the HP filter. The Kalman filter and a Bayesian estimate are used to

estimate the model parameters. The methodology draws on the article by Franta, Saxa and Šmídková (2007), where it is applied to data from a different source and period.

2.3 Labour market flexibility

2.3.1 Unemployment and internal labour market flexibility

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

The **Beveridge curve** is an instrument frequently used to differentiate between cyclical and structural unemployment (Jackman, Pissarides and Savouri, 1990; Petrongolo and Pissarides, 2001; Galuščák and Münich, 2007). It expresses the dependence between vacancies and unemployment. Decreasing (increasing) unemployment amid a rising (falling) number of vacancies is associated with changes in the cyclical component of unemployment, whereas simultaneous movements of unemployment and vacancies in the same direction signal changes in structural unemployment. Simultaneous increases (decreases) in the number of vacancies and unemployment are linked with increases (decreases) in structural unemployment. Data on unemployment and vacancies are from the Ministry of Labour and Social Affairs (MLSA).

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

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

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

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

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

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

2.3.2 Structural unemployment

The NAIRU analysis presented in the main part of the text focuses on the medium-term NAIRU concept,[138] which defines the NAIRU as the equilibrium rate towards which unemployment converges in the absence of temporary supply shocks once the dynamic adjustment of inflation to previous shocks is completed. A semi-structural approach using the *Kalman filter* is applied (Richardson et al., 2000; Szeto and Guy, 2004).

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

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

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

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

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

2.3.3 International labour mobility

International migration and 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.

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[138] 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 that 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.

2.3.4 Institutional environment

2.3.4.1 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. The data are taken from a harmonised ECB survey. The national part of the questionnaire was prepared by the CNB through its branches in 2007. The sample in the Czech Republic comprised 399 corporations. Weighted data were used for manufacturing, construction, trade and market services, excluding financial intermediation, in corporations with 20 employees or more.

2.3.4.2 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).

2.3.4.3 Employment protection

The **Employment Protection Legislation (EPL) Index** is taken from OECD and relates to 2003, 2006 and 2008. It consists of 18 items assessed in accordance with the Labour Code in force. These items are aggregated for the areas of permanent employment, temporary employment and collective dismissals.

Costs of individual termination of an open-ended contract in the number of days for which the wage has been paid since notice was given by the employer – includes the number of days of notice, severance pay and the delay to start of notice.

2.3.4.4 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 (2009).

The average effective tax burden is described by **implicit tax rates**, which are calculated as ratios, with the numerator containing the sum of aggregate revenue from direct taxes (in some countries also indirect taxes paid by the employer) and social contributions paid by both employees and employers, while the denominator comprises total compensation of employees (data under ESA95 methodology). The disadvantage of this indicator is that it is dependent on the business cycle. Inflation and real income growth increase the tax component of implicit tax rates where the income tax is progressive. Social contributions, which are usually degressive with rising income, can have the opposite effect. The overall effect of the cycle on implicit rates depends on which of the two factors is dominant. The data on implicit tax rates are taken from Eurostat (2010).

2.3.4.5 Work-incentive indicators

The data on the **net replacement rates (NRRs)** are taken from OECD tax benefit models for individual types of households, persons in the initial phase of unemployment who are entitled to unemployment benefits and persons not entitled to unemployment benefits (inactive or long-term unemployed). More detailed data for the Czech Republic are calculated using a micro-simulation tax and benefit model (Galuščák and Pavel, 2007). The calculations have been updated using the parameters valid in 2009.

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 ESA95 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 (%)

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 etc.).

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.[139]

[139] For details on the stress testing methodology, see Financial Stability Report 2009/2010 (CNB 2010b).

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