

ECONOMIC RESEARCH BULLETIN

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EDITORIAL

One of the major challenges faced by the central banks of candidate countries for euro adoption is preparation for and a subsequent successful stay in the ERM II regime for at least two years while complying with the exchange rate stability criterion. This issue of the Bulletin points to the results of three papers analysing the prospects for successful sailing to the euro via ERM II as well as the risks that may emerge. Roman Horváth brings some optimism by concluding that the current levels of exchange rate variability and pressures are at the level of the euro area countries before their euro adoption, because a number of the candidates seem to be well aligned with the euro area countries.

Aleš Bulíř and Kateřina Šmídková nevertheless warn that the candidates with trend real appreciation may experience problems with exchange rate misalignment in ERM II, especially if they stay longer than the minimum required period and if they accumulate high external debt during the cruise. They conclude that success in passing through ERM II is to a large extent dependent on the general success of the economies, strong economic performance being the key. Since it depends not only on domestic policies, but also on the external conditions, some element of luck is an inevitable part of the whole adventure.

Luboš Komárek and Martin Melecký highlight one of the possible approaches to the estimation of the equilibrium exchange rate essential for setting the central parity before entry into ERM II – the behavioural equilibrium exchange rate (BEER). Their estimates of exchange rate misalignments confirm that periods of low economic activity coincide with periods of an overvalued currency. Potential overvaluation therefore presents a really major risk for ERM II.

Jan Frait

IN THIS ISSUE

Exchange Rate Variability, Pressures and Optimum Currency Area Criteria: Implications for the New EU Members

It is found that countries fulfilling the optimum currency area criteria to a lesser degree are likely to experience greater exchange rate variability and/or exchange rate pressures. As a result, given the institutional process of euro adoption, this is likely to influence the timing of their ERM II entry, as they may be concerned about excessive exchange rate variability, especially during this period.

Roman Horváth (on page 2)

ERM2: Navigating the Wind Tunnel

Sustainable real exchange rates in four new EU member states point to potential difficulties in sustaining the ERM2 regime if entered too soon and with weak policies, in this approach owing to their high level of external indebtedness. By way of comparison, Greece, Portugal, and Spain faced both a much smaller misalignment and a less pronounced tendency to real appreciation of their national currencies prior to ERM2.

Aleš Bulíř and Kateřina Šmídková (on page 4)

The Behavioural Equilibrium Exchange Rate of the Czech Koruna

Estimations of the equilibrium exchange rate are essential for setting the central parity before entry into the ERM II mechanism. One of the possible approaches is the behavioural equilibrium exchange rate (BEER), which is determined by the interconnections of fundamental factors with the real interest parity. The estimation of a BEER model of the Czech koruna identified periods of their misalignment (by means of the productivity differential, the real interest rate differential, the terms of trade and net foreign direct investment) and could be used as a relevant tool in the context of setting the central parity.

Luboš Komárek and Martin Melecký (on page 6)

Exchange Rate Variability, Pressures and Optimum Currency Area Criteria: Implications for the New EU Members

Roman Horváth[■]

The choice of exchange rate regime is one of the central issues in macroeconomics. Often the optimum currency area (OCA) theory is employed to study this issue. Generally, as laid out by Mundell (1961), countries are ready for a common currency when they are well aligned with each other in terms of their economic characteristics and thus are not subject to large asymmetric shocks. On an empirical basis, there are a number of factors, such as economic fundamentals, influencing the authorities' decision about the exchange rate regime. It is quite complex to weight the importance of these factors in the present as well as the development of their importance in the future.

The new EU members – as well as Bulgaria and Romania, which are expected to enter the EU soon – are in the process of adopting a common currency, the euro, so it is worthwhile to analyze their prospects in terms of alignment with the Eurozone. One possible approach is to build on the methodology of Bayoumi and Eichengreen (1998), i.e. to identify the determinants of exchange rate variability and exchange rate pressures.¹ We examine the hypothesis of whether countries fulfilling the OCA criteria, such as business cycle synchronization and trade integration, encounter exchange rate variability and exchange rate pressures to a lesser degree.² In other words, countries experiencing similar shocks should have stable exchange rates or exhibit low exchange rate pressures. The focus on exchange rate pressures is important, as policy makers may regard excessive exchange rate volatility as undesirable for the economy and thus attempt to limit the variation of the exchange rate. Nevertheless, this strategy might not be successful at limiting the pressures in the foreign exchange market.

Generally, the determinants of exchange rate variability and pressures may be quite unstable in countries that have undergone massive structural changes in their economies in the recent past. Therefore, the so-called “out-of-sample approach”

is a viable option. This means that the links between the determinants of the exchange rate (e.g. the OCA criteria) and the exchange rate are estimated for a set of developed economies, and it is assumed that, as the new EU members finish their process of transition to a full-fledged market economy, similar relations will also pertain to them.

As a result, this approach allows us to identify the part of exchange rate volatility and exchange rate pressures explicitly connected to fundamentals (or the OCA criteria in our case). We label this part as the predicted exchange rate variability and pressures, as opposed to the actual values. Obviously, if the volatility and pressures remain high and persist in the future (whatever the difficulty with finding the right benchmark for comparison), it would then indicate that euro adoption may not be beneficial to these countries. On the other hand, favorable OCA conditions imply for small open economies that the necessary condition for joining the monetary union is likely to be met (sustainability of the union in the long run) and policy makers may choose such a timing and scenario of euro adoption that maximizes the medium-term net benefits to the economy. In reality given the institutional process of euro adoption, this is likely to influence the timing of ERM II entry, as countries may be concerned about excessive nominal as well as real exchange rate variability, especially during this period.

In this respect, it is vital to note that there must be some benchmark for comparison of exchange rate variability and pressures in the new EU members. The benchmark we choose involves comparing the exchange rate variability and pressures in the new EU members vis-à-vis the Eurozone with the variability and pressures that Eurozone members faced on a bilateral basis before their euro adoption. Therefore, Chart 1 compares the actual and predicted exchange rate variability between the euro area countries prior to their euro adoption and the

¹ Exchange rate pressures are constructed as the weighted average of exchange rate variability, changes in foreign exchange reserves and the interest rate differential.

² Analogously, a similar exercise can be carried out for real exchange rate variability. This is done in Horváth and Kučerová (2005). It is found that the OCA criteria influence real exchange rate variability to a large extent. Therefore, the arguments that we present later on for exchange rate variability and pressures can easily be generalized for real exchange rate variability as well.

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This short article is based on Horváth (2005).

new EU members. The results clearly suggest that while actual exchange rate variability is larger in the new EU members than it used to be in the euro area before its creation, the predicted exchange rate variability is roughly at the Eurozone levels, despite some heterogeneity across the countries. The predicted variability is topped by Estonia and the Visegrad countries (except Poland), followed by Slovenia. Somewhat surprisingly, Lithuania and Latvia are at the bottom.

The obvious discrepancy in terms of the degree of exchange rate volatility between the euro area countries and the CEECs arises from the fact that while several CEECs maintain flexible exchange rates, all the euro area countries participated in the ERM in the sample period and thus bounded their exchange rate fluctuations. This discrepancy disappears in the case of exchange rate pressures, as shown below. It is also noteworthy that Latvia and Lithuania exhibit relatively large exchange rate volatility despite these countries maintaining a currency board arrangement throughout the sample period. This is because these countries did not anchor their currencies vis-à-vis the euro during the whole sample period.

The results in Chart 2 suggest that the new EU members experience exchange rate pressures at the level typical for the euro area countries before their euro adoption. Estonia, the Czech Republic, Slovakia and Hungary have the smallest pressures predicted among the group. Nevertheless, it is interesting to note that the actual pressures for Slovakia and Hungary are much greater than those implied by our model. This difference, in general, may be a result of several factors, such as credibility of economic policies, rigidity of labor markets, or speculative attacks (for example, the speculative attack on the Hungarian forint in January 2003). Alternatively, the difference between the actual and predicted pressures might be interpreted as “excessive non-fundamental volatility”. According to Mundell

(1973), this non-fundamental volatility vanishes after joining the monetary union. In such case, the countries for which the difference between actual and predicted pressures is large would, in comparison to other countries, benefit the most from adopting the euro.

Generally, our results point to a usefulness of the OCA criteria in analyzing exchange rate develop-

CHART. 1

Actual and Predicted Exchange Rate Volatility: Comparison of CEECs and Eurozone

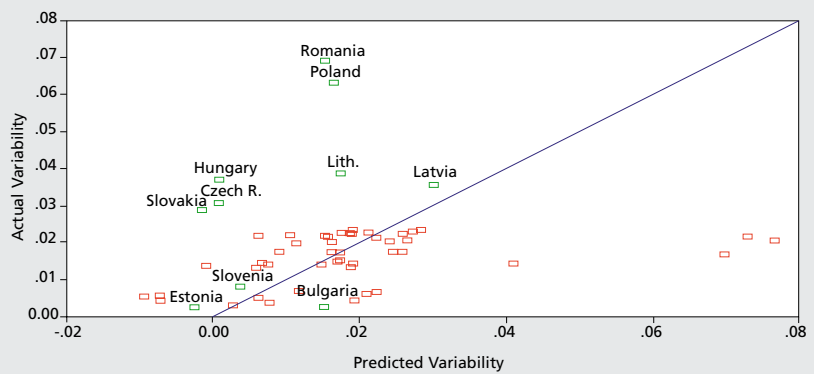
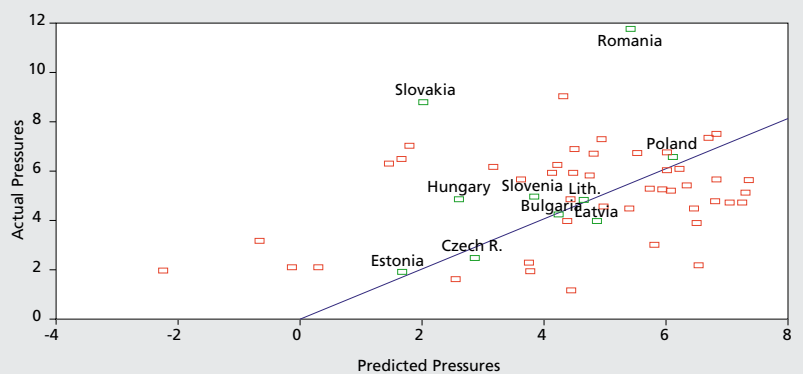


CHART. 2

Actual and Predicted Exchange Rate Pressures: Comparison of CEECs and Eurozone



ments as well as exchange rate pressures and add some evidence on whether the new EU members are suited to adopting a common currency. The results suggest some heterogeneity among the new EU members in terms of their exchange rate volatility and pressures. Notably, Estonia experiences low exchange rate variability and pressures. Overall, our model implies that the current levels of exchange rate variability and pressures are at the level of the euro area countries before their euro adoption. This is so because a number of the new EU members seem to be relatively well aligned with the euro area countries, especially in terms of their trade integration, openness and export commodity structure.

Literature

Bayoumi, T. and B. Eichengreen (1998): Exchange Rate Volatility and Intervention: Implications of the Theory of Optimum Currency Areas, *Journal of International Economics*, 45, No. 2, pp. 191–209.

Horváth, R. (2005): Exchange Rate Variability, Pressures and Optimum Currency Area Criteria: Implications for Central and Eastern European Countries, *Czech National Bank Working Paper Series*, No. 8/2005.

Horváth, R. and Z. Kučerová (2005): Real Exchange Rates and Optimum Currency Areas: Evidence from Developed Economies, *Finance a úvěr – Czech Journal of Economics and Finance*, pp. 253–266.

Mundell, R. (1961): A Theory of Optimum Currency Areas, *American Economic Review*, 51, pp. 657–665.

Mundell, R. (1973): Uncommon Arguments for Common Currencies, In: Johnson, H. G. and A. K. Swoboda (eds.): *The Economics of Common Currencies*, Allen and Unwin, pp. 114–132.

ERM2: Navigating the Wind Tunnel¹

Aleš Bulíř and Kateřina Šmídková

The enlargement of the European Union (EU) has brought the prospect of euro adoption to the new member states (NMSs). In the distance, they see a safe harbor of a single currency whose long-term benefits have long been accepted. Between them and the harbor is a necessary two-year membership in the Exchange Rate Mechanism (ERM2). The ERM2 reminds us of a wind tunnel through which it may or may not be easy to navigate, depending on the drag of the ship and the direction of the wind. Unfortunately, the ship may have developed a few holes in the keel and the captain is worried about getting wrecked en route to the harbor.

Is the rush for the harbor worth the risk, or is it better to wait for a favorable wind while cruising the open sea of flexible exchange rates and repairing the holes in the meantime? We have argued that an early “race to the euro” may entail substantial economic costs in terms of growing external imbalances. The NMSs should evaluate carefully whether the conditions for ERM2 entry are right and whether their policies are in good shape to sustain all the Maastricht demands. One indicator to help with this evaluation is the sustainable real exchange rate, which points out the risk of either failing the exchange rate stability and low inflation conditions or, worse still, of entering ERM2 at a wrong central rate.

To recap the Maastricht exchange rate criterion, prior to adopting the euro a country must have been a member of the ERM2 for a minimum of two years, during which its national currency is allowed to fluctuate around a predefined central rate within a certain corridor, from ± 2.25 to ± 15.00 percent vis-à-vis the euro. The examination of the required exchange rate stability then focuses on the exchange rate being close to the central rate, and on factors that could lead to fundamental appreciation. Thus, it is not obvious whether the NMSs can rely fully on the general definition of the ERM2 or whether they should aim at stabilizing the exchange rate within the narrow ± 2.25 band. Moreover, at the same time, a country must follow other Maastricht rules

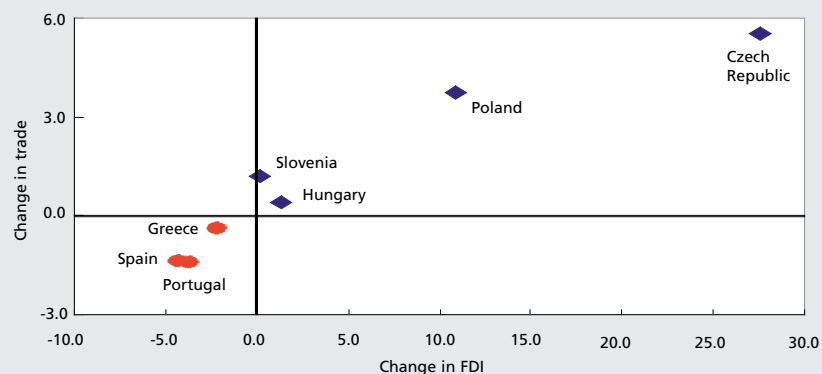
to qualify for eurozone membership, such as price stability.

These formal requirements have implications for what path the real exchange rate should take. We use the stability corridors to capture the two requirements of price and exchange rate stability, including the uncertainty related to the ERM2 interpretation. Of course, such a formally required path of the real exchange rate is not necessarily identical to an equilibrium path of the real exchange rate. We use so-called sustainable real exchange rates (SRERs) to compute this equilibrium path and SRER corridors to capture the uncertainty related to our baseline computation. A gap between the two corridors signals a currency misalignment, with a corresponding external disequilibrium. The main cost of protracted disequilibrium is accumulation of external debt and, consequently, a higher risk of a currency attack that could push the currency outside the ERM2.

The possibility of a potentially wide gap between the two corridors implies that countries should evaluate the sustainability of meeting all the formal

CHART. I

FDI and Trade Balance



Source: World Economic Outlook, authors' calculations.

Notes: All variables are in percent of GDP. The horizontal axis shows the difference between the stock of FDI-to-GDP ratio in 2003–2004 and 1998–1999. The vertical axis shows the difference between the average trade balance in goods in 2003–2004 and 1996–1999.

¹ This article is based on Bulíř and Šmídková (2004).

requirements prior to rushing into the euro area. Moreover, we discount the often-cited argument for speedy euro adoption that “waiting for the inevitable is pointless.” For example, we do not see any evidence of the euro-laggards being punished by foreign investors. On the contrary, the three euro-laggards in our sample—the Czech Republic, Hungary, Poland and Slovenia—have managed to attract far more foreign direct investment than the early euro adopters (or forerunners) of Greece, Portugal, and Spain, with corresponding improvements in the trade balance (Figure 1).

The comparison of the newcomers’ and forerunners’ sustainable real exchange rates helps us evaluate the case for an early sail through the wind tunnel. The euro optimists have argued that the NMSs should start the process immediately after joining the EU, since the two-year ERM2 membership and the subsequent peg vis-à-vis the euro can be accomplished easily, with little or no cost relative to the float, using the examples of Greece, Portugal, and Spain. In our view, the forerunners’ SRERs made it obvious that these countries had both a favorable wind and well-maintained ships when sailing through the ERM2, making their journey much less dangerous than that of the latecomers. We demonstrate the risks of the euro optimists’ advice on the following example.

Let us assume that the latecomers entered the ERM2 in 2005, and maintained the required exchange rate stability and low inflation criterion. Even though all the countries in question would not, and could not, introduce the euro in the two-year time frame of our hypothetical simulation, we can ask what would have been the cost—that is, the real exchange rate misalignment vis-à-vis the SRER—of doing so. We have estimated the SRER using a set of economic fundamentals: net external debt, the stock of net foreign direct investment, the terms of trade, international interest rates, and domestic and external demand variables. Real exchange rate appreciation/depreciation has been

reflected primarily in larger/smaller accumulation of external liabilities and the real exchange rate has been deemed sustainable to the extent that net exports could support the trajectory of debt. Just like any forward-looking model of equilibrium real exchange rates, this approach has provided model-specific results that differ from those based on alternative approaches.²

Our results point to difficulties in entering the ERM2 mechanism too soon after the EU enlargement for most NMSs, predicting a choppy sea ahead. Of the four latecomers, the Czech and Hungarian currencies appeared to be overvalued significantly in 2004 according to our model. The Slovenian currency, in contrast, was not, justifying a fast-track approach to the ERM2. Looking ahead, the SRER estimates suggest that, first, the Czech, Hungarian, and Polish currencies would be unlikely to stay within the ERM2 corridors during 2005–2010 and, second, the ERM2 corridors would be broadly inconsistent with the estimated SRERs (Table 1). The cushion in the form of low external debt would not be available to the latecomers—they borrowed heavily to cover the transformation costs.

How about the forerunner ships safely anchored in the euro harbor? Simulations of the SRERs for the forerunners indicate that they did not have problems with currency misalignment or with a strong tendency to real appreciation. The medium-term path of their real exchange rates was fairly stable and corresponded to the SRER-implied corridors. Nevertheless, our model suggests that the euro is presently too strong for their economies, as they have gradually accumulated a sizable external debt.

These findings suggest that an early entry into the wind tunnel may do more harm than good to some of the NMSs, as their ships badly need fixing before setting sail. According to the SRER, they need tighter fiscal policies than under the float, much faster GDP and export growth or sustained

² Barrell and others (2002) describe the underlying model used for the SRER simulations. Forward-looking variables use projections from the National Institute Global Econometric Model (NIGEM)

FDI inflows, or preferably all three. A continuation of current policies under a peg would result in growing external disequilibria and real exchange rate misalignment. The NMSs' leaky ships also carry more water than the forerunners'. External debt accumulated during the transformation period limits the scope for maneuver in the case of an adverse shock. In the end, of course, the outturn of the two-year ERM2 period will depend on the external conditions, bringing an element of luck into our projections. For example, should demand for imports from the NMSs increase, these countries are likely to benefit through faster export growth, making the ERM2 tunnel easier to navigate.

TAB. I

Selected Countries: Simulated Exchange Rate Misalignment

	Pre-ERM2 period	ERM2 period	Post-ERM2 period
Latecomers			
Czech Republic	Between 5 and 20%	Between 5 and 15%	Between 5 and 15%
Hungary	Between 0 and 50%	Between 50 and 75%	Between 40 and 60%
Poland	Between 15 and 30%	Between 5 and 25%	Between 0 and 20%
Slovenia	Between -5 and 10%	Between -15 and 5%	Between -20 and 0%
Forerunners			
Greece	No misalignment	No misalignment	Misalignment starts building 3 years after euro adoption
Portugal	No misalignment	Between 0 and 5%	Between 0 and 5%; larger misalignment 4 years after euro adoption
Spain	Between 0 and 5%	Between 0 and 5%	Misalignment starts building 4 years after euro adoption

Source: Authors' calculations.

Notes: Misalignment in percent during the two years prior to and during the ERM2, and four years after the ERM2. Forerunners' estimates are based on historical observations for all three periods; latecomers' estimates are for 2003–2004, 2005–2006, and 2007–2010. The estimate range includes the confidence interval.

References

- Buliř, A. and Šmídková, K. (2004) "Exchange Rates in the New Accession Countries: What Have We Learned from the Forerunners?" Czech National Bank, Prague, Working Paper No. 10.
- Barrell, Ray, Dawn Holland, Zoltán M. Jakab, Mihály A. Kovács, Kateřina Šmídková, Urmaz Sepp, Uroš Čufer (2002) "An Econometric Macro-model of Transition: Policy Choices in the Pre-Accession Period," in Proceedings of the AMFET'2

The Behavioural Equilibrium Exchange Rate of the Czech Koruna

Luboš Komárek ■
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Policy makers and market participants both have a strong interest in appropriate estimates of equilibrium exchange rates and their prospective movements. They also have a keen interest in understanding the determinants of the equilibrium exchange rate and the implied misalignments of the actual exchange rate. Overvalued or undervalued exchange rates induce suboptimal allocation of resources between importers and exporters. Additionally, an overvalued currency may lead to an unsustainable current account deficit, increasing external debt and the risk of possible speculative attacks, with detrimental consequences for the economy. There is also a general belief that an overvalued currency leads to lower economic growth, but that an undervalued currency has an equivocal effect on growth.

The prospects of an undervalued or overvalued currency are one of the crucial policy problems faced by the new EU Member States, which are supposed to adopt the euro in the near future. The prospective euro area members are required to first enter the exchange rate mechanism, ERM II, which is a part of the Maastricht criteria on exchange rate stability, and subsequently announce their euro-locking rates. ECB (2003) recommends in its position documents related to ERM II participation that "... *the central rate should reflect the best possible assessment of the equilibrium exchange rate at the time of entry into the mechanism. This assessment should be based on a broad range of economic indicators and developments while also taking account of the market rate*". In broad terms, the "equilibrium" exchange rate refers to the rate that is consistent with medium-term macroeconomic fundamentals. The medium term, usually defined as 2 to 6 years, is often chosen as a benchmark in order to assess the level towards which the actual exchange rate is meant to gravitate.

Analysis of the real equilibrium exchange rate can be divided into two main categories, for which

various terms and names are used – fundamental and behavioural analyses. A common starting point for inference on the equilibrium exchange rate is to use the purchasing power parity approach. However, there is a strong consensus in the literature that PPP is not an appropriate measure for developing and transition economies. Countries in a catching-up process may experience a trend appreciation of the real exchange rate which the simple version of PPP does not account for.

The behavioural equilibrium exchange rate (BEER) put forth by MacDonald (1997) and Clark and MacDonald (1998) draws on the real interest parity, through which the real exchange rate can be connected to the fundamentals. The permanent equilibrium exchange rate (PEER) is a variant of the BEER which aims to decompose the estimated BEER into a permanent and transitory component, with the permanent component being interpreted as the equilibrium exchange rate. The latter two approaches constitute a focal point in this paper and we use them to obtain estimates of the real equilibrium exchange rate of the Czech koruna.

The set of possible exchange rate determinants associated with the BEER approach is quite broad – see Frait and Komárek (2001). We try to choose those which from the theoretical and empirical points of view might be the most relevant to the Czech Republic and comply with our constraint on data availability. The significant determinants of the equilibrium exchange rate of the Czech koruna appear to be the productivity differential, the terms of trade, net foreign direct investment and the real interest rate differential.¹

A higher average **productivity** in the domestic economy relative to the foreign one is typically expected to result in an appreciation of the domestic currency, mainly due to higher domestic inflation as a result of faster productivity growth. This channel is traditionally associated with the Balassa–Samuelson effect. Assuming perfect

¹ The other variables, i.e. the degree of openness, net foreign assets and government consumption, which were included in the empirical analysis, were not significant.

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labour mobility, the latter effect tells us that if the productivity growth in the domestic tradable sector (manufacturing) is relatively higher than in the non-tradable sector (services), wages in the tradable sector tend to increase. The perfect labour mobility equalizes wages in the two sectors and increases the prices of non-tradable goods, hence increasing the overall price level in the domestic economy with respect to the foreign economy. The appreciation can, however, materialize through the nominal exchange rate as well, as the increase in productivity implies higher economic growth and higher demand for the domestic currency relative to the foreign currency.

A positive shock to the **terms of trade**, e.g. an increase in prices of exported goods, is assumed to generate two effects. A substitution effect, where the domestic production sector shifts production towards tradable (exportable) goods, resulting in higher wages in the tradable sector relative to the non-tradable sector. Wages subsequently equalize, due to sufficient labour mobility, inducing an increase in the overall domestic price level. The improvement in the current account and the higher domestic price level make the domestic currency appreciate. The income effect, on the other hand, comes about as the improvement in the trade balance raises the income of the domestic economy and higher demand for non-tradable goods emerges. To restore the internal equilibrium the real exchange rate is required to depreciate. The relative magnitudes of the substitution and income effects hinge on the relative price elasticity of the demands for imports and exports.

Foreign direct investment (FDI) inflow is expected to increase average productivity and result in an appreciation of the domestic currency in the short run. The effect of FDI through the financial account works along the same lines. Specifically, the higher supply of foreign currency as a consequence of the FDI inflow induces a nominal appreciation of the domestic currency.

In the long run, however, the current account deficit resulting from the factor payments on the productive FDI makes the currency depreciate as the debt grows. This variable has a substantial effect on the development of the real exchange rate in emerging market economies (strong effect to appreciation), where the FDI flows are indeed substantial.

Inclusion of **the real interest rate differential** is well justified by the BEER approach, which derives the real exchange rate model from the underlying uncovered interest parity (UIP) that the real interest rate differential is a part of. According to UIP, a currency with a positive interest rate differential is expected to depreciate so as to equalize the yields in domestic and foreign currencies. The latter is required to eliminate any possible arbitrage opportunity. Similarly, an increasing interest rate differential induces portfolio reallocation and higher demand for the currency with the relatively higher interest rate. Both theories suggest that a positive interest rate differential with respect to the foreign currency should result in contemporaneous appreciation of the domestic currency.

When employing the behavioural approach, it is possible to distinguish between two types of misalignments, i.e. deviations of the actual exchange rate from the estimates of its equilibrium values. The first deviation of interest is **the current (speculative) misalignment**, which is determined by the deviation of the actual real exchange rate from the estimated equilibrium real exchange rate given by the conditioning set of actual fundamentals. This misalignment measures the actual deviations from the equilibrium exchange rate of the Czech koruna in the short run. In chart 1 (lhs), we present the short-run misalignments for the weighted average of the three misalignments, where each misalignment² is scaled according to its relative variance. The estimates of the BEER imply that the Czech koruna

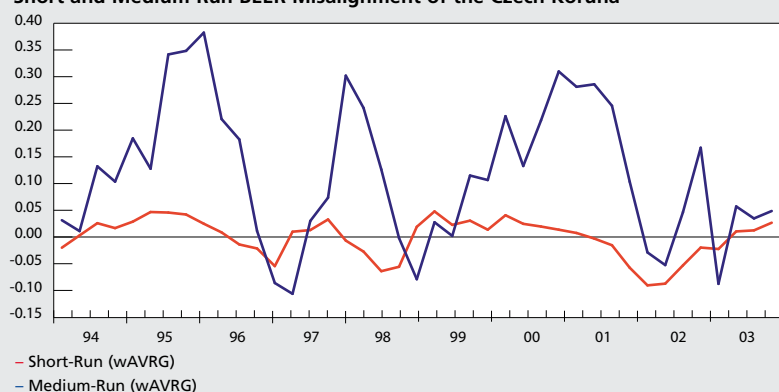
2 Dynamic OLS, ARDL and Johansen method.

was on average undervalued over the period 1994 to 2004 by about 7 per cent with respect to the short-run BEER. In general, the periods of major undervaluations appear to have happened at the end of 1996, at the beginning of 1998, and during 2001. The periods of major overvaluation then appeared around the beginning of 1997 and 1999, and at the beginning of 2003.

emerged about the beginning of 1997, in mid-1998 and during 2002. The BEER estimates based on the fundamental determinants of the Czech koruna (the productivity differential, the real interest rate differential, the terms of trade and net foreign direct investment) may become relevant in the context of the discussions about the central parity of the Czech koruna for the exchange rate mechanism (ERM II), which the prospective euro area members are required to enter.

CHART. I

Short and Medium-Run BEER Misalignment of the Czech Koruna



Note: (+) undervaluation, (-) overvaluation, wAVRG – weighted average of misalignments.

The second deviation is **the total (cyclical plus speculative) misalignment** determined by the deviation of the actual real exchange rate from the estimated equilibrium real exchange rate based on the sustainable values of the fundamentals. The sustainable values of the estimated equilibrium exchange rate are obtained by applying some cyclical filter to the latter estimates, one example being the Hodrick–Prescott filter. The resulting misalignment then corresponds to the equilibrium exchange rate of the Czech koruna in the medium run. The weighted average of this medium-run misalignment is presented in chart 1 (rhs), again using the relative variances as the scaling factors. The estimated PEER misalignments suggest that the major undervaluation periods took place during 1995 and from 1999 to the end of the first half of 2000. On the other hand, the major overvaluation

References

- CLARK, P., AND MACDONALD, R. (1998): "Exchange Rates and Economic Fundamentals: A Methodological Comparison of BEERs and FEERs". *IMF Working Paper*, 98/67.
- ECB (2003): "Policy Position of the Governing Council of the ECB on Exchange Rate Issues Relating to the Acceding Countries". European Central Bank, Frankfurt am Main, 18th December 2003.
- KOMÁREK, L., AND FRAIT, J. (1999): "Real Exchange Rate Trends in Transitional Countries". *Warwick Economics Research Papers*, Department of Economics, The University of Warwick, July 2001, No. 596.
- KOMÁREK, L., AND MELECKÝ, M. (2005): "The Behavioural Equilibrium Exchange Rate of the Czech Koruna". *Czech National Bank Working Paper Series*, No. 5/2005.
- MACDONALD, R. (1997): "What Determines Real Exchange Rates? The Long and Short of It". *IMF Working Paper*, 97/21.

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