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Do Candidate Countries Fit the Optimum-Currency-Area Criteria?

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Abstract

This paper attempts to assess the degree to which CEE candidate countries fulfill Optimal Currency Area criteria set out in the literature. The literature review provided focuses on the seminal contributions of Mundell (1961) and McKinnon (1963) and later evolution of the theory as well as papers related to CEE candidate countries. The empirical analysis indicates that candidate countries are already very open to trade with the EU, in many cases much more open than the members of the EU themselves. Nonetheless, results of the static real activity co-movements, with the exception of Hungary and Slovenia, point to weak or even negative correlations of shocks in the Euro-zone and respective acceding economies. Another approach pursued in the paper involves examining the nominal and real exchange rate variability to determine whether the exchange rate flexibility constitutes an important instrument of absorbing asymmetric shocks. From the comparison of the exchange rate stability in CEE with that of ClubMed countries in the years preceding the formation of the EMU it follows that the candidate countries as a group resemble the ClubMed countries in the early, rather than, mid 1990s.

1. Introduction

The question whether candidate countries fit the Optimum-Currency-Area (OCA) criteria has been the subject of growing empirical literature. Recently the issue was taken up in the context of European transition economies. No wonder, after the 8 countries of Central Europe and the Baltics as well as Cyprus and Malta will become members of the enlarged European Union in May 2004, upon fulfillment of the Maastricht criteria, they might decide on their own path of acceding into the Euro-zone. It is obvious that such a decision should be based on careful consideration of all pros and cons of becoming a part vs. staying outside of the monetary union. The OCA theory with its many empirical operationalizations offers a valuable and concise tool to assess these costs and benefits and thus might be very helpful in assisting the 10 new prospective EU members in taking this important decision.

The intention of the authors of this paper was to carefully review the existing literature of the OCA with the special focus on the seminal contributions of Mundell (1961) and McKinnon (1963) and the later evolution of the theory. The part of the literature review concerning the empirical applications of the OCA theory focuses on the growing volume of empirical literature concerning the candidate countries. The purpose of this part of the review was to describe the state of knowledge regarding the suitability of candidate countries to access the Euro zone, to present various approaches to measuring this suitability and to motivate the approach taken by the authors in the empirical part of the paper.

The empirical part of the paper involves investigating the OCA-implied criteria using two different approaches. First, we examine a number of conventional OCA criteria, like the openness to trade with the EU as well as business cycle co-movements between the Euro-zone and the accession countries. This is done using various indicators, several sample periods at both annual and quarterly frequencies to check the sensitivity of results and ensure robustness of conclusions.

The second approach involves examination of nominal and real exchange rate (RER) volatility and pursues another important stream in empirical OCA literature. The rationale for using exchange rate variability as an OCA criterion stems from the assumption that frequent and sizeable exchange rate fluctuations are the evidence for idiosyncratic shocks and suggest that by joining the currency union the country might deprive itself of an important adjustment instrument. It might be argued that such an approach ignores the other important sources of exchange rate volatility (such as for example “emerging market contagion”) but its undisputable advantages are the comprehensiveness with which it reflects the impact of the shocks. Instead of focusing on the efficiency of potential adjustment mechanisms (i.e. factor mobility, fiscal flows) or sources of potential idiosyncratic shocks (i.e. trade similarity) this approach uses all this information by looking at the actual pass-through of shocks to the exchange rate (Gros and Hobza, 2003).

The central part of the variance approach concentrates on investigating unexpected variances of real exchange rates between respective candidate countries and the European Monetary Union (EMU) members treated as a group as well as RER volatility of selected current EMU members before and after 1999.

2. Literature review

2.1 Origins of the OCA

Mundell's paper

The origins to the modern OCA theory are certainly to be traced to the 1961 seminal paper by Mundell (Mundell, 1961). Mundell presents a simple model of two entities (countries, regions) with fixed exchange rates that are initially in full employment and balance of payments equilibrium. These countries experience a demand shift from goods of entity B to the goods of entity A. Assuming that wages and prices cannot be reduced in the short run without causing unemployment and monetary policy counteracts inflation, Mundell presents 2 alternative cases. If these entities are countries with national currencies (with fixed exchange rate regimes), the demand shift from B to A causes unemployment in B and inflationary pressures in A. If these pressures are restrained by restrictive monetary policies in A, all the burden of adjustment is thrust onto B which has to go through a severe recession.

On the other hand, if these entities are regions in the same country (with the same currency), unemployment in B will trigger money expansion which will undoubtedly magnify inflation pressures in A. Consequently, a full-employment policy of the central bank will raise prices in region A and turn the terms of trade in favor of B which will complete the adjustment process.

A currency area whether comprising countries (with fixed exchange rates) or regions (with a single currency) will always imply a trade-off between willingness of countries/regions to inflate or thrusting the burden of adjustment on the real sector and provoking recessions in deficit countries/regions. Therefore Mundell suggests re-considering the domain of the currency areas, i.e. the division of the world into different currency areas with flexible exchange rates. These should correspond to the homogenous regions rather than heterogeneous nations or states. If the North American continent is divided such that the West produces lumber and the East produces cars, flexible US/Canadian exchange rate will not alleviate the problem in the case of sudden demand shift from cars to lumber. Such a shift will result in either unemployment in the East or inflation in the West or a combination of the two. Because the currencies correspond to nations rather than regions, flexible exchange rate will not serve the purpose of correcting imbalances in the balance of payments between regions. If instead, Western and Eastern currencies were in place, the depreciation of the Western dollar would restore the balance of payments equilibrium. In this case, by applying appropriate monetary policies to ensure constant effective demand, respective central banks could avoid inflation in the West and unemployment in the East.

In Mundell's view, the case for flexible exchange rates is only strong if it applies to regional rather than national currencies and thus makes an optimal currency area a region rather than a country. Therefore, the system of flexible exchange rates which was suggested as an alternative to the gold-standard mechanism (widely blamed for spreading the depression of 1929) only makes

sense if regional currencies are in use. Otherwise, recessions in specific regions will be transmitted to other regions precisely as was the case with countries during the Great Depression.

In an attempt to operationalize the concept of regions, Mundell points to factor mobility. Regions should be entities with high internal and low external mobility of factors of production. To the extent that regions so defined correspond to countries, a regional currency will be a national currency. However, when regions cut across borders of countries that are themselves multiregional, the case for national currencies is not valid any more and the optimal currency area theory calls for abandoning national currencies in favor of regional ones. With the view in mind that currencies are mainly an expression of national sovereignty, Mundell adds that such an approach to currency areas might be politically unfeasible, except in a few examples, such as ex-colonial areas and Western Europe.

Because of his advancements of the concept of a signel currency, Mundell is sometimes called the spiritual father of the euro. In his article, Mundell cites and comments the works of Meade (1957) and Scitovsky (1958) on the perspectives on a single European currency. Meade claims that these prospects are bleak because of lack of factor mobility in Europe. Even if Scitovsky, agrees with the importance of labor mobility and the need to improve it, he also argues that the common currency itself will be a strong mobility-stimulating factor. Thus, these authors point to the problem that will be later widely debated in the literature, i.e. the problem of endogeneity of criteria determining the optimal currency areas.

According to Mundell, factor mobility, because of its many dimensions and measurement problems, is better considered on a relative rather than absolute basis. This would imply that regions should be defined as narrowly as to reflect –every number of the unemployed due to labor immobility (which is clearly against common sense). If however one considers the costs of establishing and maintaining a separate currency, the inconvenience associated with dealing with abundant world currencies, the optimal number of common currency areas certainly drops. Nonetheless, Mundell does not offer any practical method to detect the OCA nor does he propose concrete criteria to measure the fitness of entities to form an OCA.

In conclusion, Mundell, states that the ‘stabilization argument for flexible exchange rates is only valid if it is based on regional currency areas […] within each of which there is factor mobility and between which there is factor immobility’ (p. 663). Being realistic about the unfeasibility of assigning the currencies to regions rather than nations, Mundell stresses that the ‘validity of the argument for flexible exchange rates […] hinges on the closeness with which nations correspond to regions’ (p. 664). Thus, the argument for floating exchange rates in order to achieve macroeconomic stability is strong if nations have full internal mobility and external immobility of factors, but weakens if this is not the case. Furthermore, if factors are mobile across countries, flexible exchange rates become unnecessary and may even be harmful.

McKinnon's paper

McKinnon develops the concept of the OCA by investigating the economic characteristics that determine the optimal size of the domain of a single currency. In this 'optimal' situation a flexible exchange rate against other currency areas along with sound macroeconomic policies should ensure the resolution of 3 (sometimes conflicting) goals: (1) full employment, (2) balanced international payments and (3) stable internal average price level. McKinnon develops a simple model of a single currency area which is small enough to be a price-taker (tradable goods) and maintains a flexible exchange rate with the outside world (itself a single currency area). The country produces tradables: exportables and importables as well as nontradables.

If the country is very open to foreign trade, i.e. exportables and importables make up a high percentage of domestic consumption, a devaluation of the currency would shift production from nontradable to tradable goods and consumption in the opposite direction. This would improve external balances but would also raise the price level (as tradables constitute a large share of the consumption basket) and will force monetary authorities to implement contractionary measures. Thus, in a highly open economy, using the exchange rate to improve the Balance of Payments (BoP) will necessarily mean raising the price level which, by itself, constitutes a conflict of objectives (2) and (3). McKinnon notes that for economies that become more open 'flexible exchange rates become both: less effective as a control device for external balance, and more damaging to internal price-level stability'. For such economies, fixing the exchange rate might be optimal. In a situation of a balance of payments problem, fiscal and monetary policies might act to reduce demand for both exportables and importables. Lower demand for exportables will release more of them for exports and lower demand for importables will directly reduce imports and thus balance of payments will be improved without resorting to the exchange rate. Since the nontradable sector is small, lower demand for non-tradables will lead initially to small unemployment which would be later reduced thanks to labor flows to the tradable sector. In general, the smaller the non-tradable sector, the more effective domestic macroeconomic policies are in preventing unemployment and improving the balance of payments without the use of a flexible exchange rate.

On the other hand, if the economy mostly produces non-tradables, i.e. is relatively closed to foreign trade, the optimal policy might be to actively use the exchange rate policy, and specifically to peg the currency to the non-tradable portion of the basket. Improving the trade balance would require exchange rate devaluation, which, due to the low share of tradable goods in the consumption basket, would not raise the price level excessively. In contrast, if contractionary monetary and fiscal policies are actively used to improve the trade balance deficit, unemployment will be higher than in the previous case. Relatively large sector of nontradables will suffer weak demand, and it might be necessary to push its prices down, before any trade balance improvement will take place.

Summing up, McKinnon stresses the fact that economies open to foreign trade will find their exchange rate a much less effective instrument in dealing with balance of payment problems, due to the pass-through of exchange rate movements to the internal price level which reduces the final effect on output. In closed economies, on the other hand, devaluing the exchange rate might prove a much better way of improving the balance of payments problems than the internal macro-policies. McKinnon mentions that that openness is a continuous characteristic and suggests that total exports and imports is a good measure of determining total production of exportables and importables.

In his article, McKinnon also discusses the monetary implications of the model and states that for small countries, it might be desirable to peg their currencies to a bundle of importables which means almost the same as pegging them to the outside currency. If a currency of a small country is not convincingly pegged and thus given appropriate liquidity value, the citizens of such country will accumulate foreign bank balances and trigger capital outflows.

In the final section of the paper McKinnon distinguishes between geographical factor mobility among regions and factor mobility among industries. In his opinion Mundell's paper (Mundell, 1961) largely refers to the former type of immobility. McKinnon considers two regions: A and B with distinct industries and asks what happens when the demand for products from region A rises and for products from region B falls. If there is a possibility to set up A-type industries in region B, factors need not move between regions while distinct currencies could ensure that monetary policies are well tailored to maintain internal stability in both regions. However, more often, developing A-type industries in the region B is not feasible (due to intra-industry immobility) and actual factor movements from B to A might be the only solution to prevent severe fall in unit incomes in B. Then, joining the two regions in a single-currency area might be the best way of overcoming the problem of immobility since the problem itself is endogenous[1] and might be alleviated by introducing common currency. He concludes by saying that the 'criterion of size and openness of a single-currency economy in facilitating inter-industry production shifts certainly has to be balanced with purely geographic factor-mobility considerations in determining the optimum extent of a currency area" (p. 725).

Conclusion

In essence, the original concept of the OCA presented in the papers by Mundell and McKinnon is based on weighing the costs and benefits of giving up exchange rate flexibility understood to be an instrument to deal with BoP shocks. If, for example, demand for exports from a particular country falls, a real depreciation might be necessary to maintain the BoP equilibrium and full employment. With a fixed exchange rate, the real depreciation has to be effected by reduction in money wages which takes time and brings about unemployment. Thus, it is argued, exchange rate

[1] McKinnon thinks that the problem of factor mobility in view of the recommended OCA changes should better be considered 'ex-post' since currency arrangements themselves influence factor mobility. He is the first author to point to the problem of endogeneity of OCA criteria which is further discussed in the remainder of this section.

depreciation and appreciation can effectively take the place of unemployment and inflation respectively in dealing with shocks to the BoP especially in the world of sticky nominal wages. Giving up this important stabilization instrument would only be justified in a homogenous environment with high factor mobility where shocks are symmetrical and well correlated. In such an environment, the benefits of exchange rate flexibility would not be needed anymore while benefits of currency unions will be fully taken advantage of.

2.2 Modifications of the theory and reservations

The original OCA theory as put forth in the Mundell 1961 paper relies heavily on the assumption of stationary expectations of the price level, interest rate and even exchange rate[2] (McKinnon, 2000). In this environment, asymmetric shocks suggest that single currency areas should be small, homogenous and with full factor mobility so that policymakers be in position to tailor macro-policies as to ensure constancy of demand in these areas. Common shocks are thus to be used as a criterion for determining the size of currency areas.

Several years later, Mundell modified his view on OCA by dropping the assumption of stationary expectations and instead focusing on the exchange rate uncertainty. His 1973 article "Uncommon Arguments for Common Currencies" (Mundell, 1973a) emphasized the forward-looking nature of the foreign exchange market and led to conclusions that are in some crucial aspects contrary to those of the 1961 paper. While the earlier paper held that asymmetric shocks disqualify regions from being a single currency area, the later paper focused on showing how having one currency can help reduce effects of such shocks by portfolio diversification and "economizing" on foreign reserves.

Mundell explains that when a country is hit by a negative shock it can better share the loss with the trading partner, if both are part of the single currency area and therefore both hold claims on each other's output in a common currency. In such environment a country hit by a shock can "run down its currency holdings and cushion the impact of the loss, drawing on the resources of the other country until the cost of the adjustment has been efficiently spread over the future" (Mundell, 1973a, p. 115). Mundell refers here to the automatic adjustment process that occurs when money flows from one region to another and regional price levels converge. If, on the other hand, countries have their own currencies with flexible exchange rates, the entire burden of the shock has to be borne by the affected country that after the devaluation finds its domestic-currency assets buy less on world markets.

Mundell proves that two countries economize on reserve holding if they decide to set up a single currency area[3]. From this point of view the optimum currency area is the world. However, as he points out, such a currency area is unsustainable due to 'persistent throbs of integrative and

[2] Even if the exchange rate was allowed to float

[3] This is so because after forming the union, the number of external transactions the citizens engage in is lower in comparison with the situation before the creation of the union due to internalising transactions among themselves (Mundell, p. 125).

disintegrative forces' that would arise in favor of regional arrangements favoring gold, silver or currency standards (p. 125-126).

In the paper three types of gains associated with monetary unions are identified. The first one is connected with insurance that countries gain by the means of risk pooling. Second has to do with the above mentioned reserve savings due to internalization of the formerly external trade. The third gain comes from the economies of scale associated with spreading overhead costs of transactions and many other types of economies related to the asset side of money.

In his paper "A Plan for a European Currency", Mundell (1973b) applies his modified argument to the European context. He considers the common currency to be the most efficient means to "kill the sporadic and unsettling speculation over currency prices" and postulates that exchange rate be given "less flexibility" and in general "taken out of both national and international politics within Europe" (p. 147). To reinforce his findings from the earlier 1973 paper, Mundell suggests that in spite of being hit by idiosyncratic shocks (or maybe because of this fact), European countries would be better off using one single currency which would cushion disturbances in the adversely hit countries thanks to capital movements.

This modification is further discussed in a series of papers by McKinnon (recently in McKinnon, 2000) who explicitly criticizes one of the basic assumption of early Mundell, i.e. the postwar Keynesian belief that national monetary and fiscal policies could successfully fine tune aggregate demand in response to shocks. Giving up this instrument is the central argument against adopting single currency in the original OCA theory and Mundell's discussion of asymmetric shocks as criteria for the cost-benefit analysis explicitly hinges on the assumption that the autonomy of the national macro-policies implies solely benefits and involves no risks and costs. In particular, the crucial assumption underlying Mundell's original OCA theory is the belief that a flexible exchange rate would be smoothly and continuously adjusting to stabilize the domestic economy. McKinnon (2000) observes that such an opinion was shared even by monetarists such as Milton Friedman, who were fond of Mundell's case for an independent monetary policy, albeit for a somewhat different reason. They thought that the autonomy of the monetary policy could be the best safeguard of domestic price levels and that the floating exchange rate would reflect naturally the stance of domestic monetary policy[4]. However, the great volatility of exchange rates in the 1970s and the series of currency crises in the 1990s obviously sheds new light on the assumption of benefits of floating and thus makes the original OCA theory somewhat less convincing. Over the years floating exchange rates have proved to provide not only an outlet for macroeconomic adjustments, but very frequently also to be a source of instabilities and a subject of speculations.

In recent papers Ching and Devereux (2000, 2003) re-visit Mundell's 1973 article and try to model costs and benefits of joining a single currency area in light of the Mundell's findings related to international risk sharing. In their 2000 paper, Ching and Devereux evaluate the risk sharing benefits of a single currency area by adding to the Mundell's reasoning the possibility of

[4] Appreciate in the case of tight policy and depreciate in the case of the loose policy.

international insurance arrangements through capital markets. Such markets provide an alternative to forming currency unions. Using the modeling approach, the authors show that currency unions may support risk sharing that could not be achieved under floating exchange regimes under the condition that the trade in national currency-denominated bonds is rather limited. This condition is met in the case of transition economies as evidenced in Eichengreen and Hausmann (1999). Quantitative evaluation of the model done by the authors suggests that the risk sharing benefits can be substantial.

In a more complete approach Ching and Devereux (Ching and Devereux, 2003) combine Mundell's OCA findings from 1961 with the later ones from 1973 and jointly model the benefits of single currency areas implied by risk sharing as well as costs related to the loss of the exchange rate as an adjusting instrument in the presence asymmetric shocks. With the assumption that capital markets are limited in their capacity to insure consumption, authors compare a single currency area to the group of autonomous currency areas. They find that the presence of country specific shocks may either reduce or enhance the benefits of a single currency area depending on the relative significance of the exchange rate instrument vis-à-vis the risk sharing.

Both papers constitute and important voice in the discussion on the OCA theory and offer interesting insights into the benefits of forming single currency areas. Nevertheless, they do not provide with any practical tool of measuring costs and benefits in a coherent and comprehensive manner. Thus, their findings remain on the theoretical level and wait to be implemented in the context of the concrete countries or groups of countries.

Another important challenge of the original OCA theory came from Frankel and Rose (1998) and Rose (2000). They argue with the 'static' concept of OCA criteria that were conventionally used to judge on the importance of autonomous monetary policy. To gauge the fitness of the country to join the currency area, the common approach has been to look at the following aspects of the candidate country's economy: the extent of trade with the currency area, similarity of shocks, the degree of labor mobility and the system of fiscal transfers. However, after the empirical analysis of the data spanning 30 years and 20 industrialized countries, Frankel and Rose (1998) came to the conclusion that most, if not all of these criteria are endogenous (or 'jointly endogenous')[5]. From the theoretical point of view increased trade need not lead to closer business cycle correlation. It does so if trade is mostly intra-industry and because of effects of demand shocks. On the other hand, if joining the union leads to industry specializations, then increased trade occurs mostly on the inter-industry level and may result in developing more and not less asynchronous business cycles. Supported by the empirical results, Frankel and Rose find a strong positive relationship between the degree of bilateral trade intensity and the cross-country correlation of business cycles. Thus, because accession to the currency area -through eliminating the currency risk and lowering of transaction costs- automatically produces a significant boost to

[5] Such opinions are already to be found in earlier works on OCA, including Mundell (1961) and Kenen (1969) but were not supported by empirical calculations.

trade and consequently, brings the countries' business cycles together, the related standard OCA criteria are endogenous and should better be considered ex-post.

Frankel and Rose argue that deciding on the appropriateness of countries' accession to currency unions based on historical data correlations constitutes a classic embodiment of the "Lucas Critique". Nevertheless, they do not reject the standard OCA criteria as irrelevant, but rather, argue that "a country is more likely to satisfy […] (them) *ex post* than *ex ante"* (Frankel and Rose, 1998).

2.3 Empirical contributions (CEE focus)

Since the seminal contributions of Mundell and McKinnon in the 1960s, the literature on OCA has expanded very quickly, most recently due to the interest triggered by the EU and EMU enlargement. The vast majority of papers involves attempts to verify empirically the advisability of forming new or expanding existing single currency areas. In spite of fundamental modifications of the theory done by the originator himself (Mundell, 1973) and investigated recently by Ching and Devereux (Ching and Devereux, 2000 and 2003), almost all of the empirical research is based on the early Mundell findings (Mundell, 1961). Specifically, assumption is commonly made that the asymmetry of shocks that the country (region) is subjected to is the main argument against joining the currency union. Thus, the smaller the asymmetry, the more appropriate a candidate for the union the country is considered. Much less frequently the issue of labor mobility and fiscal transfers as OCA criteria is being taken up. The line of empirical shock-asymmetry-related literature can be broadly divided into several groups according to the methodological approach they take in defining and measuring the shocks.

One part of this literature uses the methodology of Blanchard and Quah to estimate the shocks. In their seminal article (Blanchard and Quah, 1989), Blanchard and Quah estimate VARs to extract underlying demand and supply shocks. Demand shocks are identified from the VAR residuals as the component that has only temporary effect on output while supply shocks are allowed to have permanent effects. Demand and supply shocks extracted in such a way for the whole currency union are then compared for individual current and prospective union members.

This methodology has been used by Eichengreen and Bayoumi in several papers written during the 1990. In their 1993 paper, Bayoumi and Eichengreen verify whether the EMU constitutes the OCA. To do this they check correlations of supply and demand shocks recovered from the VAR[6] for individual countries with the German shocks. French and Belgian as well as (to a lesser extent) Dutch and Danish supply shocks were found to be very highly correlated with the German ones while the rest of the countries exhibited generally lower correlations (or even negative – in the case of Ireland). Correlations of demand shocks were found to be generally much lower. Based on their results, the authors divided the European Union into the "core" (evaluated as OCA) and "periphery" subject to bigger and more asymmetrical shocks. Authors compared the

[6] estimated using annual data over the period 1960-1988

magnitude of divergence of shocks to those among the US regions to conclude that 'underlying shocks are significantly more idiosyncratic across EC countries than across US regions, which may indicate that the EC will find it more difficult to operate a monetary union" (Bayoumi and Eichengreen, 1993). This opinion was confirmed by notions concerning alternative OCA indicators: labor mobility, wage flexibility, inter-state budgetary transfers are all lower and less flexible in Europe than in the US. The same authors updated their work in the later article (Bayoumi and Eichengreen, 1999) using 6 years of additional data. Conclusions regarding the degree and asymmetry of shocks remained largely unchanged which speaks against the hypothesis of the endogenous nature of the OCA criteria and specifically of the declining idiosyncrasy of shocks affecting countries already in the union.

Subsequently, the Blanchard-Quah methodology of extracting shocks was used in numerous papers to evaluate the optimality of currency areas constituted by the US states, post-colonial groups of countries as well as the EU. More recently, the interest is focused on the group of 10 new members of the EU that will have to decide upon their own strategies to enter the Euro-zone.

Frankel et al. (1999) used the analogous methodology to recover supply and demand shocks for the EU countries and most of the CEECs using quarterly data series for the period 1992Q1-1998Q2. The authors find that the correlation between the Euro area (proxied by Germany and France) and the non-euro EU countries is quite high, in contrast to the correlation with the CEECs. However, one has to bear in mind that the sample period includes early stages of transition (quite obviously full of idiosyncratic shocks related to structural changes) for most countries and ends in 1998 when joining the EU for most CEECs was a rather distant perspective. In other words, correlation between the business cycles in the CEESs and the Euro-zone was found very low as the real sector developments in CEE were driven by quite different forces than those in the Euro-zone (particularly in the first half of the 1990s).

Fidrmuc and Korhonen (2001) also use the Blanchard-Quah methodology to identify demand and supply shocks. They use an expanded quarterly dataset starting in the mid-1990s and ending in 2000 for most CEECs and for the first time calculate the correlation of shocks with the whole Euro-area (and not just Germany and France). The authors found that some accession countries have a quite high correlation of shocks with the Euro area. This is particularly true of Hungary (supply and demand shocks) and Estonia (supply shocks). A much lower correlation was found for Slovenia and Czech Republic. For all the rest of CEECs shocks remain mostly idiosyncratic. The authors also found that the economic integration of the current EU members is going at a high speed and is much higher now than in previous decades.

A different approach was taken by Korhonen (2001) who uses monthly indices of industrial production to estimate a series of bivariate VARs with industrial production in the Euro-zone and 9 CEECs. Business cycle co-movement was measured by the correlation of impulse responses of industrial production of both Euro area and respective accession country to the Euro area shock. High correlation was detected for Hungary and Slovenia while smaller for Czech Republic and Estonia. Furthermore, correlation coefficients for the most closely correlated accession countries

are close to those of the current members and in some cases even higher (e.g. Hungary seems to be better correlated with the euro area than Portugal).

In a more direct approach, Boone and Maurel (1998) check the correlation of business cycles by calculating the correlation between cyclical components[7] of industrial production and unemployment rate for the accession countries (except for the Baltic states) and Germany as well as the EU. Correlations with Germany are found to be much bigger than those for the entire EU. The same authors in their 1999 paper apply a different methodology to a limited sample of CEECs: Czech Republic, Hungary, Poland and Slovakia. They model unemployment rate in accession countries with the autoregressive terms as well as the EU unemployment rate. The degree of business cycle correlation is then evaluated by looking at the share of variation of the accession country unemployment rate explained by the EU and German unemployment rate. Additionally, correlation of impulse responses to the EU and German shocks are investigated. All countries are found to score high on the first correlation measure (particularly Hungary and Slovakia), while for the impulse responses indicator Poland and Slovakia are leading the group. In conclusion, the authors state that since the correlation with the German business cycles is quite close for all of them, benefits of joining the Euro zone outweigh the costs.

Fidrmuc (2001) investigates the Frankel and Rose (1998) endogeneity hypothesis using the cross-section data of OECD countries form the 1990s incl. the CEE OECD members. Frankel and Rose argued that joining the union significantly increases trade volume and that the reduction in business cycle divergences further propagates trade. Hence, both the degree of trade with the currency area in question (measured commonly by the share of exports to the area in GDP), similarity of shocks and correlation of business cycles, are themselves endogenous and must to be taken with highest caution as indicators of countries' readiness to join the union. Fidrmuc confirmed that intra-industry trade triggers convergence of business cycles but found no evidence of the relationship between business cycle and bilateral trade intensity. Furthermore, he finds business cycles in Hungary, Slovenia and (to a lesser extent) Poland to be quite closely correlated with the German business cycle (understood as de-trended industrial production). Also, thanks to an already high degree of intra-industry trade, there is a potential for decreasing business cycle divergences in the accession countries vis-à-vis the EU (the case for Hungary, Slovenia, Poland, Czech Republic and Slovakia).

Static OCA indicators were frequently analyzed to assess the accession countries' openness to trade with the EU and the vulnerability of foreign trade to Euro exchange rate fluctuations. Bratkowski and Rostowski (2001) as well as Fidrmuc and Schardax (2000) provide evidence that most accession countries have already managed to reorient their trade towards EU and intensify intra-industry trade with the EU and that the process is likely to continue. More recently, Gros and Hobza (2003) provide empirical evidence on the set of conventional OCA indicators for the accession countries. Conventional static indicators evaluated by the authors include the share of

[7] Cyclical components are obtained with the use of Hodrick-Prescott filter

exports to EU15 in GDP (data from 2000), correlations of real GDP growth, the rate of change of industrial production and changes in the unemployment rate (annual data 1993/4-2000) as well as intra-industry and trade structure similarity indicators (data from 2000). These indicators were calculated for 8 CEE accession countries as well as Germany and Greece. The results were mixed. Authors found that both trade structure and intra-industry trade in most cases approach the levels typical for current EMU members and share of EU-oriented exports might even be higher than respective share of current EMU members. However, the 3 indicators of business cycle co-movement provide mixed results with some countries (like Hungary and Slovenia) exhibiting high real GDP and industrial output correlations, while the rest being far away from close co-movement often exhibiting negative correlations. Unemployment rate changes were found negatively correlated in the case of most countries.

Another important stream of empirical OCA literature purses the investigation of exchange rate variability. The rationale here is straightforward. Instead of concentrating on potential sources of asymmetric shocks, authors look at the real exchange rate volatility assuming that unstable exchange rate would be a sign of adjustments to asymmetric shocks. Thus, this approach involves a more complete and straightforward measure of shocks and points to the extent to which economies adjust to asymmetric shocks through the exchange rate channel. Consequently, the stability of the observed real exchange rate is taken to be an evidence for the lack of asymmetric shocks and hence business cycle co-movement.

This approach was pioneered by Vaubel (1976, 1978) and relies on the conventional assumption that when markets are subject to asymmetric shocks, exchange rate would cushion these shocks and hence adjust upwards or downwards. The most useful aspect of this method is that it incorporates many fundamental economic factors, which determine real exchange movements: factor mobility, the degree of market diversification, fiscal integration, degree of openness, etc (see Vaubel, 1976 for details). The problem with this approach is that it is very difficult to capture exchange rate movements caused by, for example, exogenous shocks – namely, by contagion effects transmitted through financial flows or by other random exchange rate movements which are not necessarily related to asymmetric shocks.

Following Vaubel (1976), von Hagen et al., (1994) use the unexpected variance criterion to answer the question whether Europe is ready for a common currency. The authors compare the RER variance within the existing currency union in Europe constituted by the six West German Lander with the variance of the same six Lander with several European countries. Their results suggest a ‘Europe of Two Speeds’ and the further need for the reduction in real exchange variability, between the ‘the core’ and Denmark, Italy and the UK. They also report a further lowering in real exchange rate variability among six West German Lander, i.e., within an existing currency union.

The recent paper by Gros and Hobza (2003) also includes the analysis of exchange rate variability. The conclusion of this analysis is that real and nominal exchange rate of the 8 acceding

CEECs behaves in the same way as the one of *Club Med*[8] countries during the early 1990s. If the different degree of nominal variability is taken account of, the accession countries were found to have an even lower variability than the Club Med. Hence, the overall results suggest that most of the standard OCA criteria calculated for accession countries take on values that equally or even more strongly speak in favor of joining the EMU compared to the ones calculated for the Club Med in the early 1990s.

3. Standard static OCA indicators

In an attempt to answer the question of whether the candidate countries can be regarded as potential well-fitting members of the Euro zone, we made a selection of the conventional criteria offered by the OCA literature. The choice of the particular approaches that we adopted was mostly governed by their usefulness and methodological appeal as well as the intention to fill in the blanks in the CEEC-related OCA empirical literature. Therefore we followed a relatively infrequently applied approach of exchange rate variability as the most straightforward and comprehensive measure of the actual 'stabilizing' function of the exchange rate. In addition, in this chapter we examine standard indicators often mentioned and empirically verified in the OCA literature. This has been done in numerous papers so far (e.g. Fidrmuc and Schardax, 2000; Bratkowski and Rostowski, 2001; Gros and Hobza, 2003) but we think that it is important to monitor these crucial indicators closely and analyze most recent estimates.

In line with the original OCA theory openness to trade and the degree of shock asymmetry are crucial factors in any country's cost-benefit accounting related to joining a single-currency area. In our paper we analyze the following indicators calculated for the CEEC candidate countries vis-à-vis the European Union.

1. Correlation of the real GDP annual growth rates
2. Correlation of the annual growth rates of volumes of industrial production
3. Correlation of annual rates of changes of the unemployment rate
4. Share of exports to the EU15[9] as percent of GDP
5. Share of exports to the EU15 as percent of total exports.

3.1 Trade with the EU

The fourth and fifth indicators provide a straightforward measure of the extent of trade links with the EU, a criterion for the OCA analysis that can be traced back to McKinnon. Countries whose foreign trade pattern exhibit high gravity towards the Euro-dominated EU should be considered more appropriate candidates for joining the currency area.

[8] Greece, Italy, Spain and Portugal.

[9] Trade with EU15 was taken as a proxy for trade with Eurozone due to better data availability.

Table 3.1 presents both imports from and exports to EU15 as % of GDP for 9 accession countries, Bulgaria and Romania as well as EU15 member states for the period 1999-2002. The crucial parameter, i.e. share of exports in GDP for the full most recent available year 2002 has been marked bold. The main message that the table conveys is that of a surprisingly large and consistently growing importance of EU15 as market for exports for the accession countries. With the exception of Cyprus whose exports to the EU account for a mere 4% of GDP, all accession countries export to the EU well above 10% of their GDP: ranging from 15% for Poland to 38% for the Czech Republic. This is a particularly good result when compared with the current members of the Euro zone, particularly Greece (4%), Italy (11%), Spain (13%) and France (14%).

Table 3.1 Trade with EU as % of GDP, 1999-2002

Country	Trade with EU - 15 as % of GDP											
	1999	2000	2001	2002	1999	2000	2001	2002	1999	2000	2001	2002
	Imports				Exports				Imports + Exports			
Bulgaria	20.6	22.7	26.3	25.2	16.1	19.6	20.6	20.0	36.7	42.4	46.9	45.2
Romania	18.0	19.9	22.2	22.8	15.6	17.9	19.2	20.4	33.6	37.8	41.4	43.2
Cyprus	20.7	22.5	21.7	21.2	4.3	3.9	4.1	4.2	25.0	26.4	25.8	25.4
Czech Republic	32.8	38.7	39.4	35.2	33.0	38.7	40.3	37.7	65.8	77.4	79.7	72.9
Estonia	43.1	51.7	44.0	42.7	33.3	47.2	41.7	35.9	76.4	98.9	85.7	78.7
Hungary	37.6	40.2	37.6	29.8	39.7	45.3	43.7	36.3	77.3	85.5	81.3	66.1
Latvia	24.2	23.3	24.0	25.5	16.2	16.8	16.0	16.4	40.4	40.2	40.0	41.9
Lithuania	21.1	21.1	23.5	24.8	14.1	16.3	18.4	19.2	35.2	37.4	42.0	44.0
Poland	19.2	18.3	16.9	18.0	12.5	13.5	13.7	14.9	31.7	31.8	30.5	32.8
Slovenia	34.6	36.2	35.1	33.8	28.1	29.4	29.5	27.9	62.8	65.6	64.6	61.7
Slovak Republic	29.0	31.6	35.9	35.3	30.1	35.6	37.0	37.0	59.1	67.2	72.9	72.3
EU-15	14.6	15.8	15.5	14.7	15.5	16.9	16.8	16.1	30.2	32.7	32.3	30.8
Belgium/ Luxembourg	49.5	55.0	54.9	52.0	57.0	62.6	63.0	59.9	106.5	117.7	117.9	111.9
Denmark	18.2	19.4	19.2	19.3	17.4	18.8	18.3	18.1	35.7	38.2	37.4	37.4
Germany	11.9	13.8	13.8	13.1	14.5	16.6	17.0	16.8	26.3	30.4	30.7	30.0
Greece	16.1	14.8	14.8	14.0	4.7	4.2	4.2	3.9	20.9	19.0	19.0	17.9
Spain	16.5	17.2	16.3	15.4	13.2	14.0	13.7	13.1	29.8	31.2	30.0	28.5
France	12.2	13.9	13.6	12.8	13.2	14.4	14.1	13.7	25.4	28.3	27.8	26.5
Ireland	26.7	28.5	28.4	23.7	48.3	49.5	49.1	44.7	75.0	78.1	77.5	68.4
Italy	11.4	12.2	12.0	11.3	11.5	12.0	11.8	10.9	22.9	24.2	23.8	22.2
Netherlands	22.5	23.0	21.0	19.5	31.0	34.3	34.2	32.0	53.5	57.3	55.2	51.5
Austria	22.1	22.7	22.8	21.9	18.2	19.3	20.0	20.1	40.3	42.0	42.8	42.0
Portugal	27.0	28.1	26.9	24.2	17.7	18.3	17.8	16.7	44.7	46.4	44.7	40.9

Finland	13.8	14.7	14.0	13.4	18.1	20.3	18.2	17.4	31.9	35.0	32.2	30.9
Sweden	17.4	18.3	17.4	16.6	17.3	17.6	16.9	16.3	34.7	35.9	34.3	33.0
United Kingdom	11.1	11.1	11.0	10.7	10.0	10.5	10.1	9.5	21.1	21.6	21.1	20.2

source: CANSTAT – Candidate Countries Statistical Bulletin www.insse.ro/canstat_Q1/canstat.htm and AMECO database of the EUROSTAT

The following table, Table 3.2, presents the analogous indicators for the EU15 for the early 1990s, when the so-called Club Med (Italy, Greece, Portugal and Spain) was preparing to join the ERM to later adopt the Euro[10]. The share of exports to EU15 as % of GDP during 1991-1995 for Greece, Spain and Italy is much lower than respective values for 1999-2002 for Poland, which is the accession country with the lowest value of the indicator (except Cyprus). Portugal, the most EU oriented of all Club Med countries in terms of exports, was characterized by values in the range of 15-17% during first half of the 90s; very close to current values of Latvia, Lithuania and Romania, but more than twice lower than the accession leaders: Czech and Slovak Republics, Hungary and Estonia.

Table 3.2 Trade with EU as % of GDP, 1992-1995

	Trade with EU - 15 as % of GDP											
	1992	**1993**	**1994**	**1995**	**1992**	**1993**	**1994**	**1995**	**1992**	**1993**	**1994**	**1995**
Country	**Imports**				**Exports**				**Imports + Exports**			
EU-15	13.4	11.9	12.8	13.7	13.4	12.6	13.6	14.5	26.8	24.5	26.4	28.2
Greece	15.6	14.8	14.5	15.4	6.8	5.5	5.3	5.7	22.3	20.4	19.9	21.1
Italy	9.6	8.8	9.9	11.2	8.9	9.7	10.6	12.0	18.5	18.5	20.5	23.2
Portugal	23.9	21.0	21.9	23.2	15.3	14.3	15.9	17.5	39.2	35.3	37.8	40.6
Spain	10.5	10.0	11.7	12.6	7.8	8.4	10.2	11.1	18.4	18.4	22.0	23.7
Belgium/ Luxembourg	40.1	36.9	37.5	39.1	40.2	39.7	41.1	41.0	80.3	76.6	78.6	80.1
Denmark	15.4	14.1	14.7	15.9	17.3	15.6	15.4	15.7	32.7	29.7	30.0	31.6
FR. Germany	12.0	9.8	10.1	10.7	13.4	11.4	11.8	12.4	25.5	21.2	21.9	23.1
France	11.1	9.7	10.5	11.2	11.2	10.0	10.9	11.6	22.3	19.7	21.4	22.8
Ireland	28.9	25.5	27.3	27.3	40.7	41.2	45.4	47.6	69.6	66.7	72.7	74.9
Netherlands	27.1	21.7	23.2	23.4	30.9	28.3	29.5	30.5	58.0	49.9	52.7	53.9
Austria	20.0	18.1	18.9	20.2	15.9	14.2	14.6	15.6	35.8	32.3	33.5	35.7
Finland	11.5	11.9	12.7	7.9	14.4	15.6	16.8	10.5	25.9	27.5	29.6	18.5
Sweden	12.3	13.4	15.1	17.2	13.6	14.8	15.9	18.3	25.9	28.2	31.0	35.4
United Kingdom	11.7	10.5	11.8	12.7	10.6	9.6	11.0	12.2	22.4	20.1	22.8	24.9

Source: own calculations based on AMECO database.

Another indicator, trade with EU15 as % of total trade presented in table 3.3 examines to what extent countries are exposed to the effects of volatility of the common currency, i.e. it measures vulnerability to shocks from the third countries (see Bratkowski and Rostowski, 2001). For most

[10] Considering that some new members aspire to join the Euro-zone in 2006 or 2007 comparing their current performance to that of Club Med in the early 1990s makes a lot of sense.

accession countries, the exposition of extra-EU trade is in the range of that of the EU countries. The share of exports going to EU15 was about 60-70% of total exports in 2002 (with the exception of Lithuania's 48% and Cyprus' 50%) which is very much in line with the EU15 average of 60%. Thus, one can conclude that the exposure of the accession countries (as well as Bulgaria and Romania) to Euro volatility is not particularly different from that of the EU itself .

Table 3.3 Trade with EU as % of total trade, 1999-2002

Country	Trade with EU - 15 as % of total trade											
	1999	**2000**	**2001**	**2002**	**1999**	**2000**	**2001**	**2002**	**1999**	2000	2001	2002
	Imports				**Exports**				**Imports + Exports**			
Bulgaria	48.4	44.0	49.3	49.7	52.1	51.3	54.7	54.7	50.0	47.1	51.6	51.8
Romania	60.7	56.6	57.3	58.4	65.5	63.8	67.8	67.1	49.9	48.6	48.3	52.6
Cyprus	52.6	51.6	50.8	53.0	40.0	36.4	38.3	50.7	66.6	65.2	65.2	64.0
Czech Republic	64.2	62.1	61.8	60.1	69.2	68.7	68.9	68.1	68.2	68.6	62.1	62.0
Estonia	65.3	62.6	56.5	57.8	72.5	76.5	69.5	67.9	70.0	66.3	65.6	65.2
Hungary	64.4	58.5	57.8	56.3	76.2	75.2	74.3	75.1	57.5	57.0	55.7	55.6
Latvia	54.5	52.5	52.6	52.9	62.5	64.6	61.2	60.4	47.9	45.2	45.6	46.1
Lithuania	46.5	43.3	44.0	44.5	50.1	47.9	47.8	48.3	67.0	64.6	64.7	64.7
Poland	65.0	61.2	61.4	61.7	70.5	70.0	69.2	68.7	62.8	59.8	61.8	62.2
Slovenia	68.9	67.8	67.6	68.0	66.1	63.9	62.2	59.3	67.6	66.0	65.1	63.7
Slovak Republic	51.7	48.9	49.7	50.3	59.4	59.1	59.9	60.4	55.3	53.8	54.4	55.0
EU-15	59.4	56.4	56.6	57.0	62.2	60.8	60.7	60.5	60.8	58.6	58.7	58.7
Belgium/ Luxembourg	71.1	69.4	70.2	70.8	76.7	74.5	75.4	76.0	74.0	72.0	72.9	73.5
Denmark	71.3	69.0	69.3	69.0	61.6	60.7	59.5	58.3	66.2	64.6	64.1	63.3
Germany	52.9	51.8	52.3	52.6	56.2	56.5	55.4	55.0	54.7	54.3	54.0	53.9
Greece	66.7	56.4	56.5	57.8	53.8	43.8	45.6	45.7	63.3	53.0	53.7	54.6
Spain	67.3	63.1	63.4	63.5	71.5	69.7	70.3	70.3	69.1	65.9	66.4	66.5
France	61.6	58.5	58.4	57.7	64.2	62.4	62.3	62.4	62.9	60.4	60.3	60.1
Ireland	54.0	53.5	57.7	56.0	64.9	61.7	61.5	61.7	60.6	58.4	60.1	59.6
Italy	61.1	55.8	56.1	55.9	57.8	54.5	53.3	52.3	59.4	55.1	54.7	54.1
Netherlands	53.5	49.0	47.0	47.0	72.5	70.9	73.1	72.9	63.0	60.1	60.3	60.3
Austria	70.3	67.7	66.9	67.4	64.4	63.0	62.7	62.1	67.5	65.5	64.9	64.7
Portugal	78.1	75.1	75.1	76.9	83.2	80.3	80.1	79.6	80.1	77.1	77.0	78.0
Finland	55.7	52.1	53.3	53.2	55.5	53.8	51.9	52.1	55.6	53.1	52.5	52.6
Sweden	68.3	65.0	65.2	65.3	57.5	54.6	54.8	54.8	62.5	59.4	59.6	59.6
United Kingdom	51.4	48.4	49.0	50.7	55.2	54.5	54.9	55.4	53.2	51.2	51.6	52.8

Source: CANSTAT – Candidate Countries Statistical Bulletin www.insse.ro/canstat_Q1/canstat.htm and EUROSTAT

The overall impression is that the accession countries as well as the candidate countries (Bulgaria and Romania) have successfully re-oriented their economies towards the EU markets. On average, their exports to EU15 account now for a much higher percent of GDP than was the case with the Club Med countries in the first half of the 1990s when they were preparing to join the Euro-zone. Moreover, during recent years this indicator for all 8 post-socialist economies has been higher than for many current Euro-zone members. Therefore as far as the importance of trade with EU is concerned, accession countries score very well and–according to this standard OCA criterion- are expected to benefit greatly from joining the EMU.

3.2 Correlation of business cycles

Correlation of real growth rates, growth rates of industrial output and changes in unemployment are supposed to measure the extent to which real activity in individual countries moves together with the EU aggregate. Close (positive and close to unity) correlations are interpreted as an indicator of the symmetry of shocks and hence as a sign in favor of adopting the euro. To check robustness of results correlations will be measured at both annual and quarterly frequencies

It has to be mentioned that such correlations (quite like more advanced techniques of detecting co-movements in the real sphere such as VARs), although often found in the literature, should be examined with the highest caution in the case of transition economies. This increased caution concerns the problem with interpreting real GDP movements in post-socialist economies as business cycles. The shock related to transition from a plan to a market economy started for most investigated countries in early 1990s, but it continues to be a subject of debate when it ceased to dominate the developments of macroeconomic series. While this is very difficult to establish, one can be sure, that the data from the first half of 1990s carry very little information about the cycle (GDP, industrial production) or fundamental changes in the labor market (unemployment rate). They contain a great deal of noise related to structural changes in those economies, frequent changes in the law as well as purely methodological modifications of the way economic time series were defined and calculated. On the other hand, the more one moves towards the end of the 1990s[11], the more confident one can be that the effect of the transition shock becomes negligible and the data series contain a more credible and trustworthy information. Hence, in this study, we put a lot of effort to work on the most recent data and offer results calculated with many alternative time periods.

Correlation at annual frequency

Table 3.4 presents correlation coefficients between **real growth rates** of the Euro zone and respective countries during the periods 1994-2002 and 1991-1995 (for Club Med). For the period

[11] It is, however, very difficult to say precisely when this period starts for particular countries.

1994-2002, several sub-periods were checked in order to examine the sensitivity of results. The end of the sample was held constant at 2002 while the beginning was shifted forwards stepwise

Table 3.4 Correlation between annual real growth rates in the Euro-zone and respective countries

Country	Correlation between annual real growth rates in the Euro-zone and respective countries during:						
	1991-1995	1994-2002	1995-2002	1996-2002	1997-2002	1998-2002	1999-2002
Bulgaria		0.25	0.24	0.24	-0.05	0.09	0.10
Romania		-0.46	-0.52	-0.63	-0.58	-0.68	-0.76
Turkey		-0.06	0.04	0.03	0.14	0.12	0.08
Cyprus		0.67	0.66	0.76	0.73	0.91	0.90
Czech Republic		-0.25	-0.26	-0.38	-0.24	-0.24	0.01
Estonia		-0.12	0.02	0.03	-0.03	-0.10	-0.12
Hungary		0.52	0.58	0.74	0.95	0.95	0.96
Latvia		-0.16	-0.08	-0.06	-0.25	-0.35	-0.29
Lithuania		-0.38	-0.36	-0.36	-0.36	-0.42	-0.53
Malta		0.60	0.58	0.62	0.70	0.71	0.73
Poland		0.44	0.43	0.46	0.69	0.90	0.93
Slovakia		-0.34	-0.40	-0.50	-0.40	-0.62	-0.86
Slovenia		0.78	0.80	0.80	0.80	0.81	0.87
13 Candidate countries*		0.02	0.13	0.12	0.27	0.27	0.24
10 Acceding countries*		0.42	0.41	0.46	0.72	0.94	0.94
Greece	0.99	-0.03	0.10	0.19	-0.26	-0.25	-0.03
Italy	0.95	0.78	0.77	0.85	0.83	0.83	0.87
Portugal	0.84	0.55	0.77	0.79	0.90	0.92	0.96
Spain	0.97	0.76	0.91	0.95	0.95	0.96	0.97
Belgium		0.88	0.87	0.87	0.86	0.93	0.98
Denmark		0.53	0.75	0.76	0.87	0.96	0.95
Germany		0.98	0.98	0.99	0.99	0.99	1.00
France		0.85	0.89	0.93	0.93	1.00	1.00
Ireland		0.58	0.79	0.79	0.81	0.87	0.88
Luxembourg		0.81	0.84	0.94	0.95	0.99	0.99
Netherlands		0.77	0.81	0.81	0.88	0.90	0.92
Austria		0.82	0.81	0.84	0.87	0.91	0.95
Finland		0.72	0.73	0.73	0.79	0.92	0.91
Sweden		0.85	0.84	0.87	0.85	0.89	0.89
United Kingdom		0.60	0.73	0.73	0.77	0.95	0.96

* - Weighted mean of t/t-1 national growth rates (weights: gdp in t-1 in current prices in ECU/EUR)
Source: own calculations based on AMECO database.

from 1994 to 1999 resulting in time series of 9-4 observations. Such an analysis allows us to check whether the patterns of the investigated indicator is changing over time. In the case of the

real growth rates correlation, we expect the postulated correlation to be stronger for periods starting in the late 1990s rather than in the mid-1990s. This is mostly due to the transition shock that for most accession countries was still very visible in the mid-1990s and only began to wear off towards the end of the decade. The analogous correlation coefficients for the Club Med countries during the 1991-1995 will be used as a benchmark.

Unlike in the case of the EU exports, real growth rates correlation seems to be smaller for the candidate countries than for the EU members. While for EU members (except for Greece) these coefficients are all well above 0.5[12], respective figures for acceding countries are extremely dispersed and often take on negative values. Real growth rates in the Czech Republic, Slovakia, Latvia and Lithuania exhibit consistently negative correlation with the Euro-zone growth rates, while those for Estonia are close to zero. High positive correlation was detected for Poland, Hungary, Slovenia, Malta and Cyprus. For these countries, it is also very visible that the correlation gets stronger as we move the starting data of the sample forward. This indicates that the process of convergence is taking place and that the paths of GDP growth in these countries are moving closer and closer to those of the EU.

Comparison with the coefficients calculated for Club Med during 1991-1995 (all of which are very high) suggests that acceding countries are much more diverse and are still subject to many idiosyncratic shocks. However, the aggregate real GDP growth rate for all acceding countries has exhibited a rather high correlation with the euro zone GDP growth rate[13]. Nonetheless, big differences in individual growth rates correlation point to lack of homogeneity of the acceding group commonly thought to be rather homogenous.

The following table, table 3.5 presents correlation coefficients calculated in an analogous way between the **annual change of unemployment rates** in the Euro-zone and respective countries. Much in line with previous findings, relatively high correlation between changes in unemployment in the Eurozone and in the Eurozone members (with the exception of Greece and Denmark) is coupled with very strange patterns of correlation among accession countries. Relatively high positive correlation is detected for Hungary, Slovenia and Latvia while for the rest of the countries, correlation rates are very often negative and close to –1 (Lithuania, Estonia and Poland). This is very much in contrast with correlation of unemployment rate changes for Club Med countries during 1989-1994, all of which are positive and very high.

Moreover, unemployment rate correlation coefficients for accession countries do not coincide well with those of the real growth rate presented in table 3.4 This is a clear indication of problems that have to be dealt with when examining unemployment rates in transition economies. Fundamental structural changes, changing laws related to the legal status of the unemployment benefits and the evolution of a welfare state, all result in a lack of correlation between

[12] High correlation between growth rates of the Eurozone and its members is to some extent a result of the fact the aggregate figure is a weighted average of individual member GDP growth rates.

[13] The aggregate growth rate is an average of national growth rates weighted by previous-period national GDPs denominated in €/ECU. Therefore, big countries, like Poland and Hungary characterized by high correlation rates, have influenced the index to a big extent and decided on its high value.

unemployment changes with changes in real activity. Therefore, even though correlation between unemployment rate changes is a standard criterion used in the literature to gauge the appropriateness of a country joining a

Table 3.5 Correlation between annual change in unemployment rates in the Euro-zone and respective countries

Country	Correlation between annual change in unemployment rates in the Euro-zone and respective countries during:						
	1989-1994*	1994-2002	1995-2002	1996-2002	1997-2002	1998-2002	1999-2002
Bulgaria							-0.89
Romania						-0.23	-0.28
Turkey		-0.01	0.11	0.16	0.53	0.69	0.69
Czech Republic		-0.49	-0.52	-0.51	-0.47	-0.59	-0.60
Estonia		-0.39	-0.62	-0.72	-0.86	-0.95	-0.95
Hungary		0.16	0.69	0.70	0.69	0.74	0.76
Latvia		0.2	0.1	0.15	0.23	0.39	0.40
Lithuania		-0.39	-0.62	-0.72	-0.86	-0.95	-0.79
Poland		-0.50	-0.60	-0.62	-0.51	-0.32	-0.94
Slovakia		-0.53	-0.11	-0.06	-0.02	-0.59	-0.92
Slovenia		0.45	0.55	0.41	0.42	0.40	0.68
Greece	0.73	-0.01	-0.08	-0.09	-0.20	-0.27	-0.26
Italy	0.89	0.65	0.44	0.47	0.37	0.18	0.44
Portugal	0.87	0.74	0.60	0.60	0.60	0.71	0.98
Spain	0.97	0.87	0.79	0.79	0.83	0.91	0.93
Belgium		0.82	0.71	0.70	0.75	0.82	0.90
Denmark		-0.53	-0.11	-0.06	-0.02	0.87	0.90
Germany		0.83	0.88	0.91	0.88	0.95	0.97
France		0.91	0.89	0.91	0.89	0.87	0.93
Ireland		0.40	0.53	0.59	0.57	0.78	0.91
Luxembourg		0.74	0.54	0.61	0.63	0.82	0.85
Netherlands		0.58	0.29	0.28	0.34	0.72	0.94
Austria		0.51	0.85	0.85	0.82	0.90	0.93
Finland		0.43	0.10	0.12	0.10	0.63	0.70
Sweden		0.85	0.87	0.88	0.84	0.82	0.93
United Kingdom		-0.10	0.06	0.11	0.14	0.78	0.93

* for the period 1989-1994, Eurozone including West Germany.
Source: own calculations based on AMECO database.

currency area, in the case of new accession countries, most of which are former post-communist economies still undergoing many structural changes, these correlations need to be taken with the highest caution. As a consequence, the ability to infer much about the fitness of accession countries to join the EMU, is rather limited. On the other hand, low, and in many cases

negative correlation coefficients point to potential problems and indicate that real economic developments in acceding countries, as measured by changes in unemployment rates, might deviate significantly from those in the Euro-zone.

Correlation at a quarterly frequency

Another approach to measuring the above correlations is to use data of higher frequency in order to detect short-term co-linearity of real sector developments. Instead of using annual averages of unemployment rates and real GDP growth rates, we will now use quarterly values of these growth rates. This yields 4 data points for each year and enables to better track down short-term co-movements in key variables during more recent time periods. In addition to real growth rates and unemployment rate changes, we analyze growth rates of indices of industrial production. Real GDP and industrial production are average annual growth rates during a particular quarter, while changes in unemployment rates during a particular quarter are defined as average unemployment rate during this quarter minus an analogous value during the same quarter of the preceding year. To check the sensitivity of results to changing the sample period, correlations were calculated for periods 1999Q1-2003Q2 (18 observations), 2000Q1-2003Q2 (14 observations) and 2001Q1-2003Q2 (10 observations). Resulting correlation coefficients are presented in table 3.5. In addition to accession countries coefficients were calculated for Bulgaria and Romania as well as selected Euro-zone countries. Additionally, for comparison, the lower panel of the table contains analogous figures for Club Med countries during the period preceding their joining the Eurozone, i.e. 1990Q1-1995Q4.

Short-term correlations reveal yet another side of output co-movements between EU and accession countries. There are 2 countries that score very high at both annual and quarterly correlations: Hungary and Slovenia. Poland and Slovakia exhibit high correlation for industrial production but rather chaotic and negative correlation in the case of GDP. Coefficients for Latvia and Lithuania are very unstable and often negative (exclusively negative for the latter country). Czech correlations are positive and high (in contrast to annual correlations).

In the case of unemployment changes, Latvia, Hungary and Slovenia exhibit high correlation, but for the remaining countries correlations are unstable and mostly negative.

All this is in stark contrast with contemporary correlations of Euro-zone countries, the majority of which exhibit high and positive coefficients. Exceptions to this rule are Greece (GDP) as well as Italy and France (unemployment rate). Correlations between indicators of Club Med countries and Germany[14] in the early 1990s point to much closer links in the real economy than those detected for accession countries. For all 4 countries, both GDP and industrial production moved in line with the German one and correlation coefficients usually exceeded 0.5. Especially when the sample period is shortened, i.e. contains 3-4 years before the Club Med countries joined the ERM, the correlation in both indicators jumps to near-1 for most countries.

[14] Because of unavailability of quarterly data for early 1990s, data for Euro-zone were replaced by data for Germany – by far the biggest and most dominant member of the Euro-zone.

Summing up, it has to be mentioned that unlike shares of EU exports in GDP, that undoubtedly place accession countries in the Euro area, correlation in output and unemployment movements provide a mixed picture. Checked both at annual and quarterly frequency for various sample

Table 3.6 Correlation of business cycles at quarterly frequency

	Correlation between the Euro zone and respective countries								
COUNTRY	Annual Real GDP growth			Annual growth of industrial production index			Annual change in the unemployment rate		
	1999Q1-2003Q2	2000Q1-2003Q2	2001Q1-2003Q2	1999Q1-2003Q2	2000Q1-2003Q2	2001Q1-2003Q2	1999Q1-2003Q2	2000Q1-2003Q2	2001Q1-2003Q2
Bulgaria	0.17	0.38	-0.23	0.42	0.60	0.67	-0.76	-0.82	-0.74
Romania	-0.52	-0.75	0.16	0.16	0.28	0.42	-0.38	-0.19	-0.06
Czech Republic	0.21	0.63	0.57	0.21	0.37	0.80	-0.38	-0.06	0.30
Estonia	0.04	0.47	0.08	0.46	0.70	0.38	-0.68	-0.60	-0.21
Hungary	0.48	0.47	0.89	0.90	0.91	0.82	0.83	0.84	0.89
Latvia	-0.03	0.14	0.65	0.01	-0.23	0.52	0.70	0.71	0.43
Lithuania	-0.55	-0.65	-0.15	-0.21	-0.26	-0.02	-0.77	-0.86	-0.82
Poland	-0.38	-0.49	0.14	0.78	0.83	0.79	-0.72	-0.72	-0.79
Slovenia	0.52	0.64	0.30	0.55	0.67	0.35	0.32	0.39	0.24
Slovakia	-0.74	-0.85	-0.38	0.28	0.51	0.67	-0.40	-0.14	0.01
Germany	0.96	0.96	0.97	0.99	0.99	0.99	0.90	0.95	0.93
France	0.80	0.95	0.90	0.90	0.91	0.79	-0.41	-0.32	-0.47
Portugal	0.59	0.75	0.55	0.06	0.03	0.38	0.97	0.92	0.87
Spain	0.73	0.83	0.69	0.77	0.79	0.56	0.66	0.58	0.42
Greece	-0.04	-0.01	-0.36	0.67	0.83	0.61	0.29	0.16	0.11
Italy	0.93	0.96	0.92	0.96	0.97	0.97	-0.48	-0.44	-0.72
Finland	0.77	0.85	0.45	0.90	0.94	0.88	0.91	0.85	0.74
Sweden	0.77	0.79	0.22	0.90	0.92	0.79	0.96	0.93	0.98
	Correlation between Germany and respective club med countries								
	Annual Real GDP growth					Annual growth of industrial production index			
	1990Q1-1995Q4	1991Q1-1995Q4	1992Q1-1995Q4	1993Q1-1995Q4		1990Q1-1995Q4	1991Q1-1995Q4	1992Q1-1995Q4	1993Q1-1995Q4
Greece	0.60	0.70	0.86	0.94		0.07	0.27	0.55	0.57
Italy	0.22	0.23	0.75	0.90		0.39	0.67	0.82	0.89
Portugal	0.48	0.46	0.91	0.95		0.68	0.55	0.53	0.51
Spain	0.49	0.48	0.80	0.93		0.66	0.81	0.91	0.98

Source: own calculations based on CANSTAT (candidate and accession countries) IFS and websites of central banks and statistical offices of respective countries.

periods, these correlations point to substantial diversity within the group. The only countries whose correlation with the EU is close to that of current EU members are Hungary and Slovenia. For all other countries, the evidence for co-movements is very weak and sensitive to the indicator, time period or frequency of data. This is also the case for Poland, which exhibits high positive

correlation in the case of the average annual GDP and quarterly industrial production, but negative in the case of quarterly GDP growth rates and unemployment rate (at both frequencies). The opposite is the case for the Czech Republic, where positive correlation was found at quarterly frequency (except for unemployment rate), and negative for annual data. For Latvia and Lithuania (and to a lesser extent Estonia) no robust conclusions can be drawn, as correlation coefficients jump up and down chaotically depending on the time period and frequency (and stay negative in most cases). Correlation coefficients for Slovakia turn out almost solely negative, the only exception being annual industrial production changes measured at quarterly frequency.

This performance is in stark contrast with performance of the EU members (which is partly to be explained by the fact that most of them are members of the Euro zone) but also with the Club Med countries in the first half of the 1990s before they were admitted to the ERMI and subsequently to the EMU. Thus, traditional OCA indicators of business cycle correlations offer an inconclusive answer to the question of compatibility of most EU-acceding countries with the exception of Hungary and Slovenia that already exhibit strong and robust correlations.

However, as the OCA theory review in the second chapter makes clear these traditional indicators have been frequently criticized for being “static” and failing to account for endogeneity of business cycle indicators. It is argued that once a country is admitted to the currency area, business cycle correlations rise, shocks get more symmetrical and trade with the area soars (evidence for this taking place in CEEC can be found in Fidrmuc, 2001) . Therefore it does not make sense to gauge countries’ appropriateness to be admitted to the currency area based on the ex-ante values of those indicators.

On the other hand, even if we accept this criticism of traditional OCA criteria, it still leaves room for applying them in a comparative framework for countries that were also prior to their accession to the Union. In this paper, this has been done for Club Med countries during the first half of the 1990s. Even if one accepts that the computed indicators are in fact endogenous and would all improve in the wake of joining the Euro zone, it still makes sense to assume that the higher they are prior to joining, the higher they will be after the joining. Consequently, examining those indicators prior to adopting the euro gives a good estimate of where accession countries are now and where they could be should they become a part of the Euro zone.

4 Exchange rate variability approach to OCA

This chapter presents empirical application of another OCA approach in literature, i.e. that investigating real exchange rate volatility to measure the extent of shock asymmetry and thus coherence with the currency area. This approach has not been applied very often so far, but in our opinion constitutes a very straightforward and comprehensive way of assessing the real impact coming from idiosyncratic shocks.

4.1 Asymmetric shocks and other issues

The traditional OCA theory implies that if asymmetric shocks are present, then - in the light of some nominal wage-price stickiness - fixed nominal exchange rates will enhance the costs associated with forming a monetary union (i.e. it won't be possible to stabilize real domestic demand shocks). If exchange rates between two countries are stable, then the costs for these countries of giving up their own currencies (and consequently an independent monetary policy) will be lower. Of course, a flexible nominal exchange rate is not the only policy tool authorities have at hand to minimize the impact of asymmetric shocks on real exchange rate movements. Unfortunately, for a number of various reasons (such as sticky prices and wages, rigid labor markets, political cycles, etc) the alternative tools cannot be used immediately. Therefore, nominal exchange rate often serves as a stabilizing instrument.

By assuming the beneficial role of the exchange rate as a useful stabilization tool, we adopt the early Mundell (1961) reasoning. One can argue (in line with McKinnon, 2000) that if macroeconomic shocks were themselves induced by poor policies, creating a currency area with another country or a group of countries would minimize those shocks. Nevertheless, the more similar the structures of economies wishing to formulate a currency union, the lower the likelihood that common shocks will have asymmetric rather than symmetric effects.

Given the assumed importance exchange rate plays in cushioning real and financial shocks, the empirical implementation of the OCA theory adopted in this paper concentrates on estimates of variation of exchange rates in CEE candidate countries. The choice of this methodology – as described in the literature review - is governed by the fact that exchange rate variability seems to be the most comprehensive way of assessing whether joining the currency union will be more or less attractive than retaining the *status quo*. This is chiefly because it allows for incorporating other factors recognized as important for the creation of an optimal currency area (for example, factor mobility, the degree of market diversification, fiscal integration, degree of openness, etc).

Nevertheless, it has its disadvantages too. For example, the variance approach ignores the fact that exchange rate fluctuations are caused by a variety of factors, making it difficult to isolate effects of a particular event; it does not allow for separating out changes in real exchange rate caused by nominal factors, such as financial market movements from movements caused by real factors, such as increased degree of openness. As shocks to domestic money supply are short lasting and can actually be better tuned once a monetary union is created, this concern should not be ignored.

Another criticism of the approach is that the methodology ignores the fact that, for example, currency boards with an anchor different than the Euro naturally exhibit higher fluctuations of the euro exchange rate. This would be an important limitation in the context of our study since some accession countries have adopted currency boards anchored to USD or SDR while the others to DM. However, we argue that all accession countries, but Latvia either already have euro-based

currency boards or euro-dominated reference baskets (see Table 4.1 below)[15]. Moreover, in order to be admitted to the EMU, Latvia, as all accession countries, must limit fluctuations of its national currency against the Euro (+/- 15% around the central parity) and hence we are interested in fluctuations of NER against the Euro and not the USD or any other currency. Also, in our analysis we attempt to investigate to what extend nominal exchange rate plays a role in adjusting real exchange rate between regions (i.e., CEECs and EMU Member States) exposed to asymmetric shocks.

Table 4.1. Weight of EMU currencies/ euro in the currency basket[1]

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Slovenia	--	100	100	100	100	100	100	100	100	100	100	100	100	100
Estonia	--	--	100	100	100	100	100	100	100	100	100	100	100	100
Czech Rep.	58	58	58	65	65	65	65	100	100	100	100	100	100	100
Slovakia	58	58	58	60	60	60	60	60	100	100	100	100	100	100
Hungary	50	50	50	50	70	70	70	70	70	70	100	100	100	100
Lithuania	--	--	0	0	0	0	0	0	0	0	0	0	100	100
Poland	0	40	40	40	40	40	40	40	40	55	--	--	--	--
Latvia	--	--	0	0	0	0	0	0	0	0	0	0	0	0

(1) target currency in the case of managed float

Source: Egert and Kierzenkowski (2003)

These caveats notwithstanding, we think that the analysis of real exchange rate variability should give a more complex and complete insight into the issue of cycle-co-movements than would any static indicator or VAR-based methods. Instead of concentrating on potential sources of asymmetric shocks or restricting them to a one-variable level, the variability approach involves looking at the behavior of the exchange rate which is assumed to ultimately reflect adjustments to shocks. In this context, static methods seem rather primitive as they are bound to provide a very fragmented picture of macroeconomic conditions underlying the decision of joining the currency union. Moreover, their investigation *ex ante* risks being charged with the 'Lucas critique'.

Then again, VAR approach is commonly criticized for its restrictiveness (see the comments in section 2.3) that is especially problematic in the context of transition economies. Furthermore, any econometric estimation which uses data on transition countries (and VARs specifically) always involves a painful trade-off between the wish to work with the trustworthy dataset (and thus dropping observations from early stages of a transition period) and the wish to improve the econometric aspects of estimation (and thus maximally extending the sample period to the past). The additional reason why we decided not to estimate a VAR model in this paper is that on one hand there are relatively many studies of this kind carried out for the CEECs (most of them are

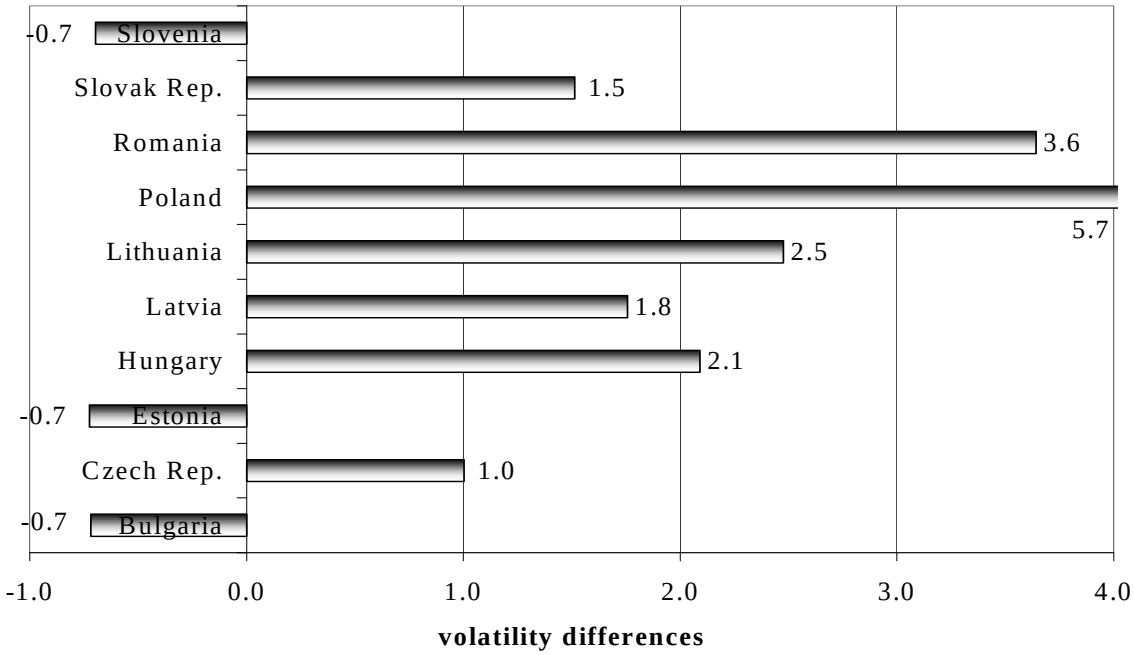
[15] The notable exception is Latvia, which has a SDR-based currency board (informally, formally, Latvia follows fixed but adjustable peg). Nevertheless, the structure of the economy is much more similar to that of other CEECs and it already has tight economic linkages with the EU member states. Moreover, the fact that Latvia pegs to a currency basket like SDR can mitigate impacts of exchange rate fluctuations among major international currencies.

reviewed in section 2.3). On the other hand, there is a very limited number of papers where the variance approach has been applied.

Nominal Exchange Rate Variability

As already pointed out, financial shocks can be better tackled once a monetary union is actually created. This is because a single currency minimizes impediments to money flows across national borders (European Parliament, 1998). From this perspective and given that candidate countries are going to face increased net capital flows (i.e., structural funds), giving up national currencies should reduce the distress related to nominal exchange rate movements. However, given market rigidities, it is often the nominal exchange rate that adjusts in response to required changes in the real exchange rate. A stable nominal exchange rate is not only a pre-requisite for minimizing costs of formulating a common currency area; it is also required by the Maastricht Treaty.

Figure 4.1 NER volatility: distance from the Club Med average (1996-1998)



Source: own calculation based on IMF IFS and ECB data.

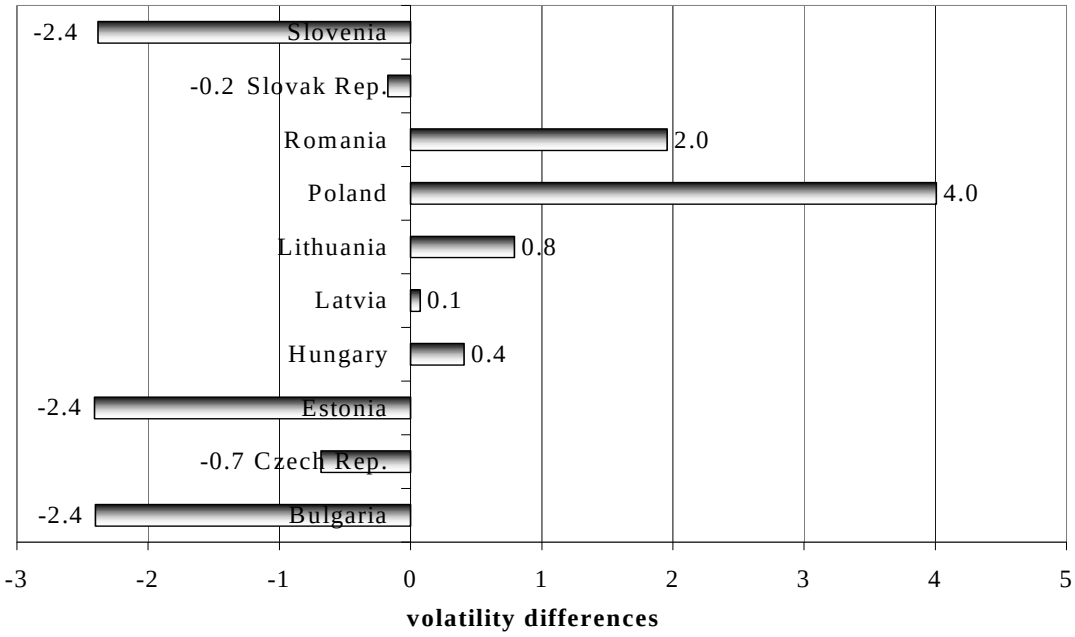
Figure 4.1 sets out a measure of nominal exchange rate (NER) stability for CEEC countries in terms of the difference between the average (2000-2002/03) NER volatility calculated for the respective candidate country vis-à-vis the euro and the average volatility of a ClubMed country vis-à-vis the euro over three years preceding the introduction of the common currency (1996-1998). Nominal exchange rate volatility in the CEECs was calculated over the three-year period (July 2000 to August 2003) and was defined (in line with Gurjarati, 2003) as a mean of the squared deviation of the first difference of the logged nominal exchange rate from its mean. The volatility of the ClubMed countries' exchange rates was calculated over the period 1996-1998 (January 1996 to December 1998) in the same way as the volatility for CEECs.

In all cases except for Bulgaria, Estonia and Slovenia, the differences in volatility are positive, indicating that candidate countries have more volatile nominal exchange rates than the 'periphery' EU members. Not surprisingly, Bulgaria and Estonia, countries with currency board arrangements (CBAs), have more stable nominal exchange rates relative to the ClubMed average. The stability of the Slovenian currency is clear, despite its *de jure* managed float regime; it exhibits negative differences in volatility. Among countries which still have volatile exchange rates, the country with the smaller distance from the ClubMed average is the Czech Republic, followed by the Slovak Republic, Latvia and Hungary[16]. Poland, Romania and Lithuania exhibit the most volatile nominal exchange rates[17]. Fluctuations of the Lithuanian exchange rate – despite its CBA – are explained by the fact that up to February 2, 2002, the currency was anchored to the US dollar and not the Euro (see also Appendix 1).

However, given that the two-year window for ERM participation for past candidates covers the period from March 1996 to February 1998, one can argue that for comparative analysis the early 1990s should rather be used as a reference point. Assuming that CEECs will join ERM II immediately after the accession to the EU (as most of them declare now), the period 2000-2002/3 represents approximately the same stage in the accession process as 1993-1995 for the ClubMed countries.

Figure 4.2 presents the difference between the average exchange rate volatility for CEECs (calculated as above) and the average volatility of ClubMed countries between 1993 and 1995 instead of between 1996 and 1998. The results are striking:

Figure 4.2 NER volatility: distance from the ClubMed average (1993-1995)



Source: own calculation based on IMF IFS and ECB data.

16 The recent devaluation of the central parity of the Hungarian Forint contributed significantly to its volatility. When we exclude 2003 from our analysis, the distance from the ClubMed average is the same as that of the Czech Republic.

17 We present a country-detailed volatility analysis in Appendix 1, which only confirms our results.

Now, only in the case of Poland, Romania and Lithuania exchange rates are significantly more volatile than the ClubMed average (i.e., have a distance greater or close to one). Countries like the Czech and Slovak Republics appeared on the other side of the scale; the distances for Hungary and Latvia are close to zero.

In conclusion, although Central and Eastern European countries still have quite volatile exchange rates when compared with the ClubMed average of 1996-1998, this does not appear to be the case when compared with the 1993-1995 average. Clearly, there are three countries which outscore and two countries which underscore the rest of the sample as well as the ClubMed average (irrespective of the comparable point in time). These are, respectively, Bulgaria, Estonia and Slovenia; and Poland and Romania[18]. However, the stability of Bulgarian and Estonian nominal exchange rate is not surprising given their currency board arrangements.

4.2 Empirical Analysis of Real Exchange Rate Movements

Now, we turn to the central part of our analysis, which focuses on real exchange rate fluctuations. In order to distinguish between real and nominal shocks, we work with different frequencies (i.e., monthly and quarterly data)[19]. We make a crucial assumption (in line with von Hagen et al., 1994) that high-frequency RER changes mostly reflect nominal shocks and low-frequency RER changes are principally due to real shocks. This distinction is the basis for evaluating the differences between asymmetric real and nominal RER shocks. Likewise, since the real variability is influenced by nominal variability, by working with different frequencies, we try to tackle the problem of the inability to distinguish between them which is the frequently criticized shortcoming of the variance approach to assessing costs criteria from OCA theory.

Methodology

Building on the findings set out above, we estimate unexpected (i.e., conditional) real exchange rate variances between respective candidate countries and the European Monetary Union (EMU) members treated as a group (i.e., real exchange rates were deflated by the ratio of prices between a particular accession country and the euro area HICP inflation)[20]. This approach draws on Vaubel (1976) and is similar to that of von Hagen, et al., 1994 and Gros, et al., 2003[21].

Given that the aim of the paper is mainly to address the question of whether the new accession wave could benefit from adopting the euro (based on the OCA cost-benefit analysis), the choice of the reference group seems to be appropriate.

[18] Again, the case of Lithuania is slightly peculiar due to the change in the anchor currency.

19 RER indexes as well as conditional variances for quarterly and monthly data were estimated with the use of the same definitions.

[20] The sample included Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia. Even if Bulgaria and Romania are still lagging behind and are not included in the first wave of an acceding group, for comparative reasons they were also included in the sample.

[21] Gros et al., 2003, however, look at observed rather than unexpected exchange rate variability.

To facilitate assessments of the magnitude of these RER variances (i.e., to decide when the variance should be considered large and when - small) estimates of the observed RER volatility of selected current EMU members are also provided[22]. Since looking at the historical euro real exchange rate volatility (i.e., prior to the actual creation of the union) might be considered questionable, we allow for various sensitivity checks. For example, we also look at real exchange rate volatility between a particular member state and Germany (i.e., the 'core' EU member) as well as at price differentials.

Sample and Data

In order to distinguish between different exchange rate regimes, as well as to separate out the early stages of the transition period, we divide our sample into three parts: the mid-transition period of 1993-95; the late transition of 1996-99; and the pre-accession period of 1999-02/03. These sub-samples more or less correspond to steps taken by some Central and Eastern European countries tin their movement towards more flexible regimes (see Egert and Kierzenkowski (2003)). The fact that respective CEE countries represent a broad range of exchange rate regimes allows us to comment on the impact of those arrangements on real exchange rate volatility. For example, we ask if Bulgaria, Estonia, Latvia and Lithuania have necessarily less volatile real exchange rates than Poland, the Czech Republic or Romania.

From the perspective of the Club Med countries, as well as France and Germany, the choice of the sample period was governed by two factors. Firstly, 1993 marks an end of the EMS and therefore allows for nominal exchange rates fluctuation within a band of +/-15 percent. This ensures minimum policy coordination between countries and is important for comparative purposes. Secondly, the fact that we also look at past data exchange rate variations and compare those with the exchange rate volatility of the current accession wave allows us to address the question of endogenuity. For example, we look at the time period where conditions for the ClubMed countries were not influenced by structural changes induced by the creation of the monetary union itself.

Data on monthly average nominal exchange rates against the US dollar as well as consumer price indices up to August 2003 - for all countries under consideration - come from the IMF IFS. In order to calculate exchange rates against the Euro we used the ECB reference Euro/ US Dollar exchange rate (against the ECU up to December 1998). The Eurozone price index (HICP) is sourced from the OECD. As this series only starts in 1994, before this date, it was approximated by a producer price index for the entire region.

[22] As a benchmark, we looked at RER variances of the ClubMed countries usually considered as a 'periphery' as well as France and Germany, which belong to the so-called 'core' group.

Estimation Techniques

We start our estimation of the conditional standard deviations of RER shocks from computing real exchange rates for candidate countries. We first log normalise price and exchange rate indices with a common base in 1995:1 and then define log real exchange rate for the accession country i as:

$$RER_{i,t} = \log P_t^* + \log S_{i,t} - \log P_{i,t} \qquad (1)$$

where $P_{i,t}$ is price level in the CEE country i at time t, P* refers to the eurozone price level and $S_{i,t}$ is the nominal exchange rate at time t between the accession country i and the eurozone (i.e., the CEEC currency per euro). An increase in the RER index indicates depreciation.

For ClubMed countries, as well as for France and Germany, we calculated three different representations of the real exchange rate. First, up to 1998, we used the same definition as for accession countries but we also calculated real exchange rates with respect to the German mark (i.e., in which case Germany was dropped from the sample)[23]. Since the nominal exchange rate between EMU countries equals 1 as of 1999, we also looked at price differentials between those countries and eurozone inflation over a full sample (rows marked *Union* in the tables presented in the next section). This provided us with the rough estimate of price convergence after the creation of the monetary union.

Then, we derive the unexpected component of real exchange changes (i.e., fluctuations which cannot be explained by past RER movements) for countries of interest by regressing seasonally adjusted RER changes on their own lags[24].

$$\Delta RER_{i,t} = b_1 + b_2 \Delta RER_{i,t-1} + b_3 \Delta RER_{i,t-2} + \ldots\ldots + b_{12} \Delta RER_{i,t-12} + u_{i,t} \qquad (2)$$

Residuals $u_{i,t}$ obtained from these regressions represent conditional real exchange rate shocks (see von Hagen, et. al., 1994).

Later, our analysis involves the standard deviation of these shocks:

$$s=[var(u_{i,t})]^{1/2} \qquad (3)$$

In some cases, the best performing equations were equations that not only contained autoregressive but also a moving average component (ARMA)[25].

[23] The magnitude of RER volatility for ClubMed countries against the German mark turned to be the same or slightly higher from the volatility of RER computed against the ECB reference rate and therefore it won't be presented here.

[24] Seasonally adjusted series were obtained as deviations from the 12-month centred moving average.

[25] In order to choose the appropriate number of lagged terms we applied a 'general-to-specific' method of estimation. The tests used were LM test for autocorrelation, Q-statistics and Akaike and Schwarz info criteria.

Because the unexpected component in our autoregressive model (i.e., residuals from the estimated model) is itself a generated regressor (i.e., a deviation from the mean)[26], we also tried to instrument the conditional standard deviations. However, the performed Hausman specification error test did not support this method of estimation.

To obtain white-noise errors ($u_{i,t}$) from our model (see eq. 2), where necessary, we used dummy variables. Necessarily, this lowered computed standard errors (and hence our measure of exchange rate variability). However, events responsible for lack of normality (i.e., financial crises, random exchange rate movements, contagion effects from other markets) are generally outliers and are unlikely to repeat themselves in the future in any systematic manner. To some extend, therefore, this also corrects for the negative bias (i.e., bias due to speculative pressures or irresponsible central bankers) of OCA suitability estimates.

In order to check whether volatility changes in real exchange rates are significant (i.e., test for variance equality between sub-samples), we performed various statistical tests. Von Hagen, et al. (1994) propose White's tests for heteroskedasticity. We additionally carried out an ARCH test, as we believe that financial market data often follow an ARCH process. Where it was the case, the presented standard errors are errors from a mean equation of an ARCH model[27].

Finally, unlike von Hagen, et al., 1994, we do not use interactive dummies on the lag terms from the autoregressive model (eq. 2) in order to allow for structural breaks, since we would argue that it is inappropriate to pool regressions for which variances are believed to be different (i.e. stability tests based on dummy variables or pooled regressions explicitly assume equal variances). Therefore, in order to obtain conditional variances, we decided to estimate separate regressions for each sub-sample.

Results

Table 4. 2. Short-run (monthly data) volatility (candidate countries)

VOLATILITY CHANGES		I	II	III	White Heteroskedasticity		ARCH	
		93-95	96-98	99-03	93-98	96-03	93-98	96-03
Bulgaria	No*/Yes*	3.502	5.988	1.136	0.171	0.000	0.059	0.000
Czech Rep.	No/Yes*	0.780	1.444	1.286	0.358	0.021	0.456	0.104
Estonia	Yes*/Yes*	1.087	0.702	0.493	0.003	0.001	0.099	0.000
Hungary	Yes/No	1.520	1.001	1.376	0.762	0.492	0.850	0.907
Latvia	Yes*/No	1.907	0.915	1.607	0.000	0.229	0.013	0.024
Lithuania	Yes*/No*	2.974	1.697	1.819	0.082	0.059	0.412	0.001
Poland	Yes*/No*	1.874	1.418	2.206	0.852	0.959	0.034	0.031

[26] See Adrian Pagan's seminal papers on this issue.

[27] We also performed CUSUM of Squares Test, as this test helps assess not only parameter but also variance instability. As the results of the CUSUMSQ test were in line with those obtained by White and ARCH tests they did not change our conclusions and therefore won't be presented here.

Romania	Yes*/Yes*	3.924	3.702	2.582	0.954	0.136	0.048	0.019
Slovak Rep.	No/No*	0.713	1.159	1.677	0.609	0.971	0.814	0.002
Slovenia	Yes*/Yes*	0.804	0.645	0.372	0.340	0.166	0.000	0.075
Average		*1.908*	*1.867*	*1.455*				

Note: Yes-convergence, No-divergence, i.e., we observe a decrease/increase in standard deviation of real exchange rates between the two tested sub-samples (I-II and II-III);

* - Statistically significant changes in standard deviation of real exchange rates between the two sub-samples (based on White Heteroskedasticity and Autoregressive Conditional Heteroscedastic (ARCH) errors tests and 10% significance levels). If the null hypothesis is rejected then errors are heteroskedastic, i.e., the changes in conditional RER variances between sub-samples are statistically significant. Columns from 6 to 9 report P-values of conducted statistical tests.

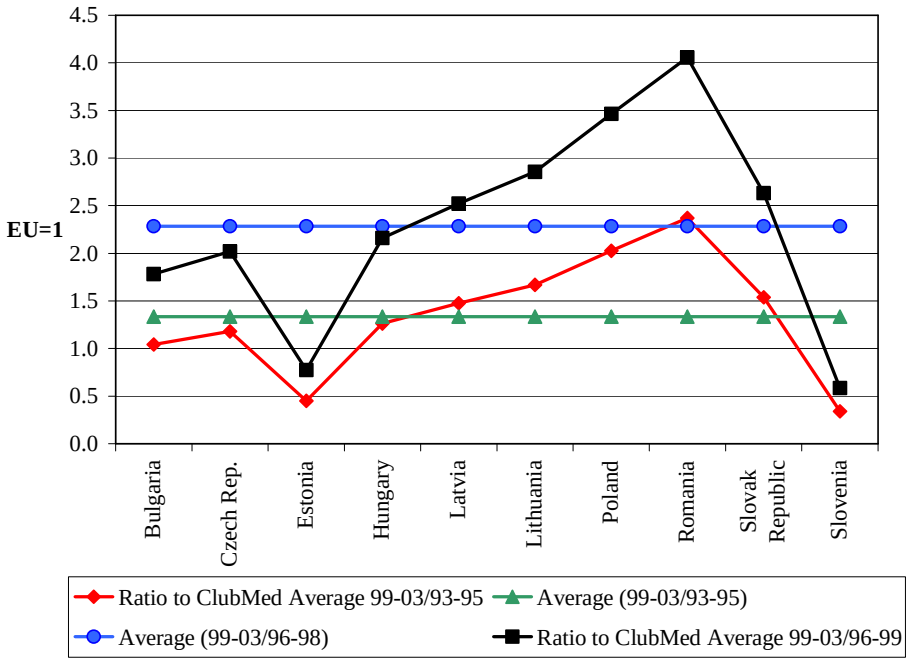
Source: own calculation based on IMF IFS, OECD and ECB data

Table 4.2 summarizes estimates of conditional standard deviations (STDs) of monthly real exchange rate shocks for 10 candidate countries. Among CEE accession countries, there are 3 countries for which standard deviations of real exchange rate shocks exhibit a consistent and decreasing trend. This is the case for Estonia, Romania and Slovenia. Moreover, between both estimated periods, volatility changes were statistically significant. Hungary, Latvia, Lithuania and Poland managed to decrease the variance of RER shocks between the II and I sub-sample (however in Hungary the change was statistically insignificant); in the III sub-sample real exchange rates again became more volatile. In Bulgaria there is clear evidence of stabilizing policies between 1998 and 2002/03. The same is true for the Czech Republic. As for the Slovak Republic, there was a continuous increase in RER volatility throughout the whole estimating period.

If we compare the magnitude of real exchange rate shocks of CEE countries with the ClubMed average in the early 1990s as well as in years preceding the creation of the monetary union (see Figure 4.3 which shows monthly real exchange rates shocks) the results are similar. Unambiguously, Slovenia is a leading example throughout the whole estimated period. The average volatility of the Slovenian real exchange rate between 1999 and 2002/03 was 42 per cent lower than the average volatility of the ClubMed in years 1996 to 1998 (and as much as 66 per cent lower when compared with the 1993-1995 average). In the case of Estonia, it was 23 per cent lower (as a percentage of 1993-1995 average it was 55 per cent lower). Other countries with lower than the ClubMed average exchange rate variability are Bulgaria, the Czech Republic and Hungary. For the rest of the countries the size of exchange rate shocks – even if compared with the early 1990s - is higher and ranges from 13 per cent for Latvia to 100 per cent for Romania.[28]

[28] See Chart 1 and 2 of Appendix 2.

Figure 4.3 Real Exchange Rate Shocks (monthly)



Source: own calculation based on IMF IFS, ECB and OECD data

On average, the real exchange rate volatility is over two times higher than the real exchange rate volatility of ClubMed countries in years preceding EMU membership (i.e. 1996 to 1998) and 1.3 times higher than the variance of ClubMed countries in the early 1990s[29].

Our assessment of the role of different exchange rate regimes for stabilization purposes, as in the case of nominal exchange rate volatility, shows that the fact that the 10 candidate countries adopted a broad range of different regimes seems not to matter for real exchange rate stability: The hypothesis that less flexible regimes contribute to more stable real exchange rates was not confirmed by the data (as illustrated by comparisons of Poland and Latvia, Slovakia and the Czech Republic, Poland and the Czech Republic). This fact can be interpreted as showing that nominal **exchange rate flexibility is not necessary to accommodate real exchange rate shocks.**

In Table 4.3 we present detailed results for selected EMU member states. The data presented here is, as in the case of CEECs, for estimated conditional standard errors of real exchange rates shocks. In the same table, lines marked '*Union*' are standard deviations of residuals from the regressions (equation 3) where real exchange rates were calculated with the assumption that nominal exchange rates are equal one (i.e., as the price differential between the respective EMU member state and the whole currency union).

The table shows unambiguously that all countries except for Greece intensified their effort in lowering RER volatility at the onset of the euro introduction. Moreover, in all countries the reduction

[29] For details see Table 1 and Table 2 of Appendix 2.

in volatility was found to be statistically significant. In all cases except for Spain and Greece, the price convergence is less clear. Despite the drop in years 1993 to 1998, it was not statistically significant.

If we compare the magnitude of conditional variance of price differentials with that of real exchange rates before the eurozone was actually created, it is clear that the nominal exchange rate played a destabilising rather than stabilising role in all countries under consideration. Nevertheless, once the union was formed, we fail to report a further price convergence.

Table 4.3. Short-run (monthly data) volatility (member states)

VOLATILITY CHANGES		I	II	III	White Heteroskedasticity		ARCH	
		93-95	96-98	99-03	93-98	96-03	93-98	96-03
Germany	Yes*	0.552	0.319		0.366		0.069	
Union	Yes/No	0.169	0.116	0.141	0.539	0.710	0.638	0.822
France	Yes*	0.385	0.346		0.331		0.081	
Union	Yes/No	0.145	0.102	0.142	MEAN EQ	0.708	0.326	0.131
Italy	Yes*	1.721	0.759		0.057		0.158	
Union	Yes/No	0.173	0.151	0.150	0.689	0.517	0.662	0.231
Greece	No	0.450	0.859		0.954		0.165	
Union	Yes*/ No*	0.380	0.255	0.286	0.736	0.035	0.106	0.098
Portugal	Yes*	1.066	0.545		0.629		0.026	
Union	Yes/ No	0.270	0.198	0.258	0.534	0.115	0.446	0.579
Spain	Yes*	1.121	0.383		0.659		0.003	
Union	Yes*/No*	0.143	0.093	0.143	0.004	0.397	0.012	0.080
Average (ClubMed)		*1.089*	*0.546*					
Average (ClubMed; Union)		*0.241*	*0.174*	*0.209*				

Note: Yes-convergence, No-divergence, i.e., we observe a decrease/increase in standard deviation of real exchange rates between the two tested sub-samples (I-II and II-III);

* - Statistically significant changes in standard deviation of real exchange rates between the two sub-samples (based on White Heteroskedasticity and Autoregressive Conditional Heteroscedastic (ARCH) errors tests and 10% significance levels). If the null hypothesis is rejected then errors are heteroskedastic, i.e., the changes in conditional RER variances between sub-samples are statistically significant. Columns from 6 to 9 report P-values of conducted statistical tests.

Source: own calculation based on IMF IFS, OECD and ECB data

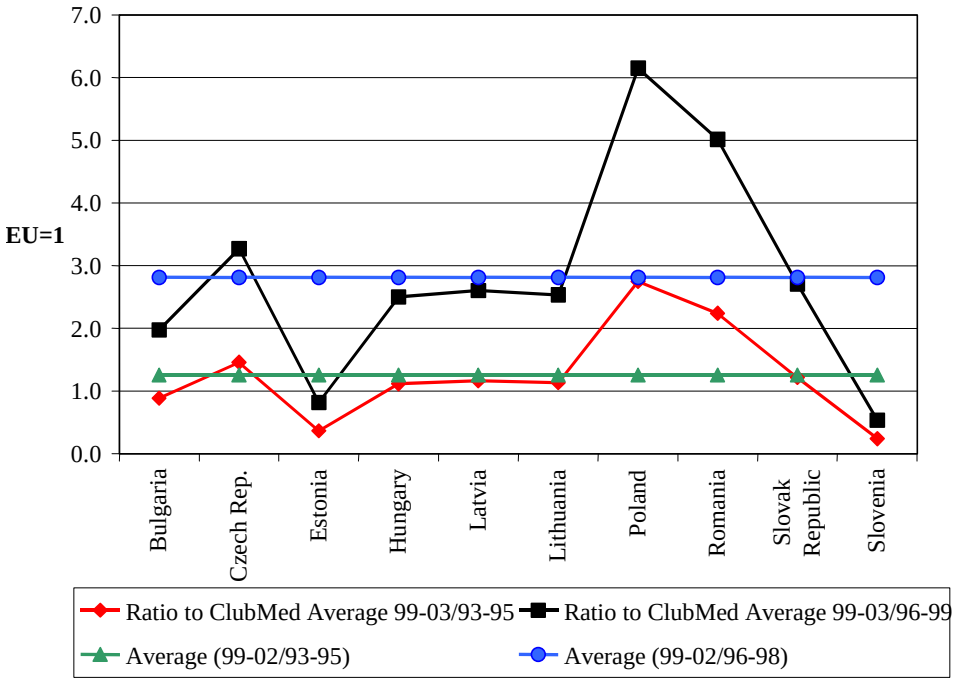
Quarterly Volatility Changes

Now we turn to estimates of conditional STDs of relative RER changes obtained for lower frequency (quarterly) data. As it was postulated, since the real variability of exchange rates is influenced by nominal variability, by working with different frequencies we try to eliminate the problem of nominal variability in real exchange rate movements. This distinction also serves us as a basis for evaluating the differences between asymmetric real and nominal RER shocks.

Looking at the output of our estimation for selected member states and comparing it with the output for the ClubMed, we draw almost the same conclusion as for high frequency data. The

average stance of CEECs between 1999 and 2003 is closer to that of the ClubMed between 1993-1995 than between 1996 and 1998. The relative magnitude of RER shocks in these two sub-samples were, respectively, 1.3 and 2.8 times higher. Since the results for the early 1990s are the same as for the high frequency data, we may conclude that neither the degree of nominal nor real shocks is more important for accession countries than was the case with average shocks for the ClubMed countries.

Figure 4.4 Real Exchange Rate Shocks (quarterly)



Source: own calculation based on IMF IFS, OECD and ECB data

In almost all cases the magnitude of individual quarterly RER variances was greater than of monthly changes[30]. Given that we assume unexpected quarterly RER volatility to reflect real shocks, it is clear that asymmetric shocks are still an important source of RER volatility for all CEE countries. Also, it is hard to say whether the reported long-run volatility decline was due to policy changes, or to common shocks hitting those countries. Compared with monthly changes, the decline was significant only for Bulgaria, Estonia, and Slovenia in the second sub-sample, and for Latvia and Lithuania in the first sub-sample. But even then, the size of shocks in Poland and Romania was, respectively, 2.8 and 2.3 times bigger than the ClubMed average of 1993-95.

[30] This result is somewhat in contrast with that of Gros et al., 2003.

Table 4.4 long-run (quarterly data) volatility (candidate countries)

VOLATILITY CHANGES		I	II	III	White Heteroskedasticity		ARCH	
		93-95	96-98	99-03	93-98	96-03	93-98	96-03
Bulgaria	No*/Yes*	4.404	7.079	1.679	0.732	0.013	0.016	0.000
Czech Rep	No/No*	1.365	1.753	2.775	0.395	0.800	0.933	0.045
Estonia	Yes/Yes*	1.952	1.559	0.693	0.480	0.054	0.870	0.517
Hungary	Yes/No	2.408	1.618	2.123	MEAN EQ	0.841	0.484	0.404
Latvia	Yes*/No	4.523	1.880	2.213	0.019	0.188	0.166	0.864
Lithuania	Yes*/Yes	6.134	4.007	2.151	0.096	0.890	0.462	0.151
Poland	Yes/No	1.951	1.902	5.220	0.402	0.849	0.111	0.303
Romania	No/Yes	8.692	8.803	4.255	MEAN EQ	0.430	0.381	0.564
Slovak Rep.	No/Yes	0.656	2.323	2.301	0.905	0.573	0.551	0.694
Slovenia	No/Yes*	0.521	1.122	0.456	0.454	0.055	0.606	0.656
Average		*3.26*	*3.20*	*2.39*				

Note: Yes-convergence, No-divergence, i.e., we observe a decrease/increase in standard deviation of real exchange rates between the two tested sub-samples (I-II and II-III);

* - Statistically significant changes in standard deviation of real exchange rates between the two sub-samples (based on White Heteroskedasticity and Autoregressive Conditional Heteroscedastic (ARCH) errors tests and 10% significance levels). If the null hypothesis is rejected then errors are heteroskedastic, i.e., the changes in conditional RER variances between sub-samples are statistically significant. Columns from 6 to 9 report P-values of conducted statistical tests.

Source: own calculation based on IMF IFS, OECD and ECB data

Turning to individual cases of selected member states, as in the case of monthly shocks, it is only Greece that failed to lower the unexpected RER fluctuations between two sub-samples leading to the EMU membership. The variance reduction was not statistically significant for France and Portugal as well. Similarly to CEECs, the long-run volatility for ClubMed countries was higher if compared with the short-run.

Comparing real exchange rate shocks with unexpected volatility of price differential in the respective sub-samples, it is obvious (with an exception of Greece between 1993 and 1995) that the nominal exchange rate did not cushion real vulnerabilities and that the exchange rate uncertainty could be eliminated by the creation of the currency union between counties.

Table 4.5. Long-run (quarterly data) volatility (member states)

VOLATILITY CHANGES		I	II	III	White Heteroskedasticity		ARCH	
		93-95	96-98	99-03	96-98	96-03	96-98	96-03
Germany	Yes*	0.751	0.601		0.5314		0.037	
Union	Yes*/No	0.290	0.208	0.244	0.1930	MEAN EQ	0.054	0.237
France	Yes	0.664	0.452		MEAN EQ		0.752	

Union	Yes*/No*	0.202	0.091	0.164	MEAN EQ	0.010	0.092	0.084
Italy	Yes*	3.216	0.779		0.044		0.005	
Union	Yes/Yes	0.314	0.200	0.170	0.257	0.732	0.227	0.601
Greece	No	0.433	1.537		0.776		0.136	
Union	Yes/Yes	0.614	0.495	0.310	0.690	0.409	0.336	0.738
Portugal	Yes	1.736	0.657		MEAN EQ		0.504	
Union	Yes*/No	0.628	0.319	0.385	0.025	0.354	0.716	0.893
Spain	Yes*	2.216	0.420		0.000		0.073	
Union	No/No*	0.389	0.234	0.357	0.331	0.019	0.682	0.057
Average (ClubMed)		*1.900*	*0.848*					
Average (ClubMed; union)		*0.486*	*0.312*	*0.306*				

Note: Yes-convergence, No-divergence, i.e., we observe a decrease/increase in standard deviation of real exchange rates between the two tested sub-samples (I-II and II-III);

* - Statistically significant changes in standard deviation of real exchange rates between the two sub-samples (based on White Heteroskedasticity and Autoregressive Conditional Heteroscedastic (ARCH) errors tests and 10% significance levels). If the null hypothesis is rejected then errors are heteroskedastic, i.e., the changes in conditional RER variances between sub-samples are statistically significant. Columns from 6 to 9 report P-values of conducted statistical tests.

Source: own calculation based on IMF IFS, OECD and ECB data

Persistence

As economies become more integrated the changes in real exchange rates should not only be smaller, but also less lasting (i.e., less persistent). This is because currency unions are characterized by increased interregional trade as well as factor movements. In short, within currency unions, purchasing power parity should not only be a long-run phenomenon, but should also hold in the short run (i.e., any price differentials between two regions should be quickly eliminated).

To test whether the real exchange rate shocks became less persistent and unpredictable in CEE candidate countries over the last decade, we follow von Hagen et al (1994) and look at first order autocorrelation coefficients and the quantity of significant coefficients. A negative AR(1) coefficient and a large number of significant coefficients indicate RER reversion over time. The negative AR(1) coefficient ensures that following the initial shock RER fluctuations decrease rapidly; the large number of significant coefficients minimizes unpredictability in RER fluctuations.

Table 4.6 Persistence (Candidate Countries, monthly data)

	93-95	96-98	99-03	93-95	96-98	99-03
	Autocorrelation Coefficient [a]			No. of Significant Coefficients [b]		
Bulgaria	0.242	-0.133	0.107	0	0	2
Czech Rep.	-0.253	0.104	0.135	3	2	0
Estonia	0.075	0.167	0.062	0	0	4
Hungary	0.103	0.141	0.135	1	0	0

Latvia	0.672	0.420	0.413	2	4	1
Lithuania	0.666	0.561	0.046	2	4	1
Poland	0.091	0.743	0.362	1	2	2
Romania	0.189	0.411	0.207	0	1	0
Slovak Rep.	-0.549	0.049	0.203	11	0	0
Slovenia	0.606	0.476	-0.078	1	1	3

[a] First-order autocorrelation coefficient of monthly, seasonally adjusted, RER changes.
[b] Number of significant coefficients on lagged terms of RER changes observed in each subsample.

Source: own calculation based on IMF IFS, OECD and ECB data

It is clear from table 4.6 that almost all AR(1) coefficients are of the wrong sign (i.e., positive, indicating that following the initial shock RER changes increase to a new level). Only Bulgaria, Czech Republic, and Slovenia have negative coefficients at least in one estimated sub-sample. Also, the number of significant coefficients is very small indicating that unexpected RER fluctuations are still present in CEE countries.

If we compare this finding with the situation of the member states, the results are not that much different. Despite more coefficients of the correct sign, the number of significant coefficients is only higher for fluctuations in the price differential (see lines in table 4.7 marked *Union*).

Table 4.7 Persistence (Member States, monthly data)

	93-95	96-98	99-03	93-95	96-98	99-03
	Autocorrelation Coefficient [a]			No. of Significant Coefficients [b]		
Germany	0.030	0.067		0	4	
Union	0.072	-0.141	-0.121	0	0	1
France	-0.021	-0.074		2	0	
Union	-0.016	-0.234	-0.237	0	3	3
Italy	0.680	0.261		4	1	
Union	-0.086	-0.141	-0.345	0	0	4
Greece	-0.029	0.439		3	2	
Union	0.057	0.088	-0.256	0	1	4
Portugal	0.121	0.232		0	0	
Union	0.470	0.113	0.101	1	1	0
Spain	0.036	0.026		0	5	
Union	0.728	0.220	-0.033	1	2	6

[a] First-order autocorrelation coefficient of monthly, seasonally adjusted, RER changes.
[b] Number of significant coefficients on lagged terms of RER changes observed in each subsample

Source: own calculation based on IMF IFS, OECD and ECB data

5. Summary and Conclusions

In addition to reviewing the most important theoretical literature on OCA and empirical papers related to the accession countries, we attempted to assess the degree to which candidate countries from CEE are ready to join the Euro-zone. We found that these countries are already very open to trade with the EU, in many cases much more open than the members of the EU themselves. While the share of exports to EU15 in GDP for the Euro-zone amounts to 16%, the analogous indicators reach 15% for Poland, 28% for Slovenia, 36% for Estonia and Hungary and 38% for the Czech Republic. Static business cycle correlations shed a different light. With the exception of Hungary and Slovenia, most measure of real activity co-movements point to weak or even negative correlations of shocks in the Euro-zone and respective acceding countries. The situation is particularly problematic in the case of the unemployment rate which for most countries exhibits negative correlation with the Euro-zone unemployment changes.

Using the nominal and real exchange rate stability criteria, and comparing them with those of ClubMed countries in the years preceding the formation of the EMU, our analysis showed that the candidate countries as a group resemble the ClubMed countries in the early, rather than, mid 1990s. Two countries – Estonia and Slovenia – exhibit RER fluctuations similar to or lower than the ClubMed countries (irrespective of whether we compared them with the more turbulent period of 1993 to 1995 or the less turbulent one of 1996 to 1998). As for Bulgaria, the Czech Republic,

Hungary, Latvia, Lithuania, Poland, Romania and Slovak Republic our results suggest that the real exchange rate variability still exceeds that of the ClubMed)[31].

However, bearing in mind that ClubMed countries had to maintain their exchange rates in a +/- 15 per cent band without devaluation (and the European Commission assessment of the countries' eligibility to enter EMU was even more severe and based on their adherence to ERM I margins of +/- 2.25 per cent) for two years prior the accession, we can conclude that average unexpected real exchange rate volatility for CEECs does not dramatically differ from volatility of the ClubMed countries in years 1993 to 95 and for countries like Estonia and Slovenia it is even lower.

Even if it was found that quarterly RER fluctuations exceed monthly changes for almost all countries, indicating that asymmetric real shocks remain a relatively important source of RER variation, it is difficult to treat this as an argument against EMU membership. This is because the same is true for ClubMed countries and even France and Germany.

Clearly, in the CEECs, nominal exchange rate instability is still higher than it was in ClubMed countries before the introduction of the Euro. But the fact that the nominal exchange rate in ClubMed countries (and in CEECs) did not suppress real volatility indicates that efficiency gains can be achieved once the currency union is formed (i.e., through the elimination of exchange rate uncertainty, contagion effects, etc).

[31] Even if Bulgaria and Lithuania are already in the Eurozone with their Euro-denominated currency boards, their long-run real exchange rate vulnerability is greater than that of the short run suggesting that more adjustment may be required.

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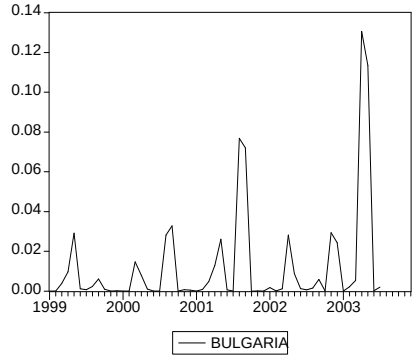
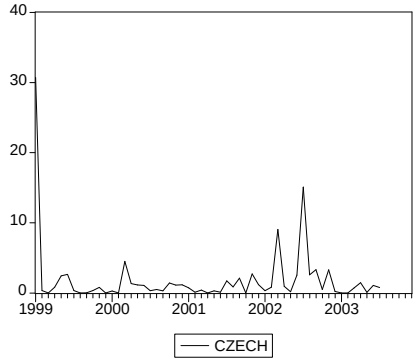
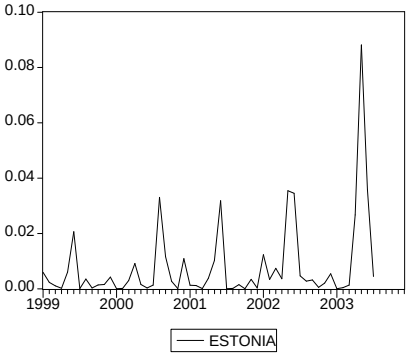
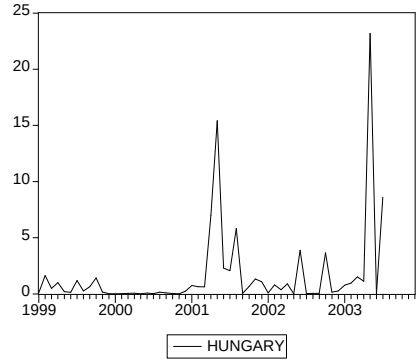
Appendix 1

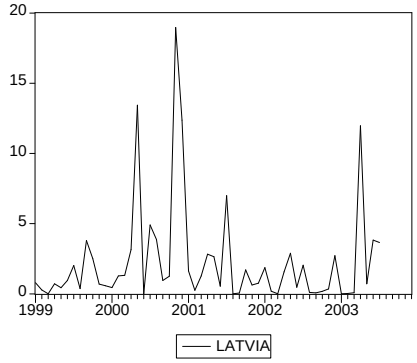
NOMINAL EXCHANGE RATE VOLATILITY
(Central and Eastern European Candidate Countries)

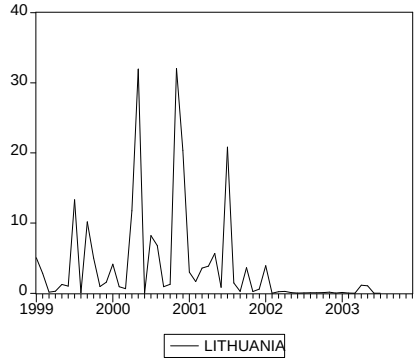


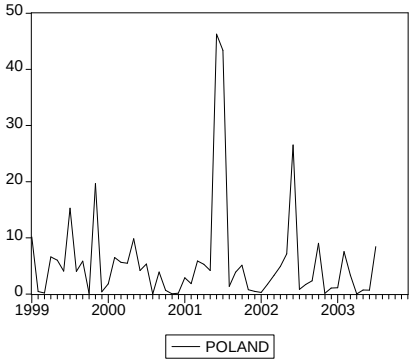


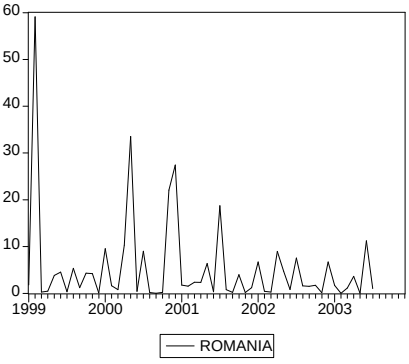


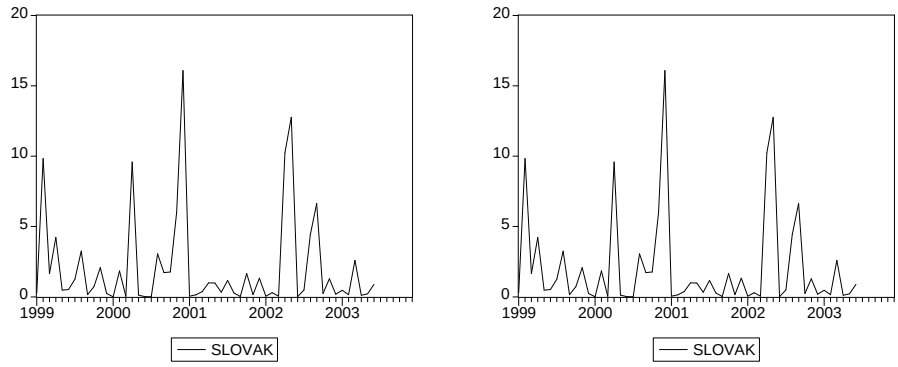












Source: own calculation based on IMF IFS and ECB data

Appendix 2

VOLATILITY CHANGES

(Central and Eastern European Candidate Countries)

Chart 1: Quarterly Volatility Changes (CEECs)

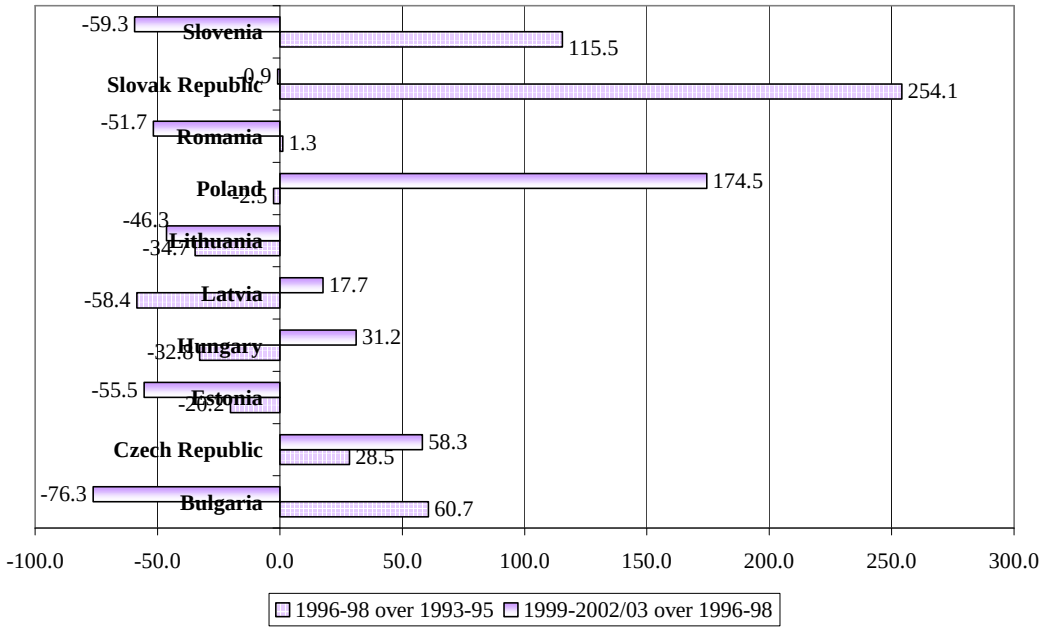


Chart 2: Monthly Volatility Changes (CEECs)

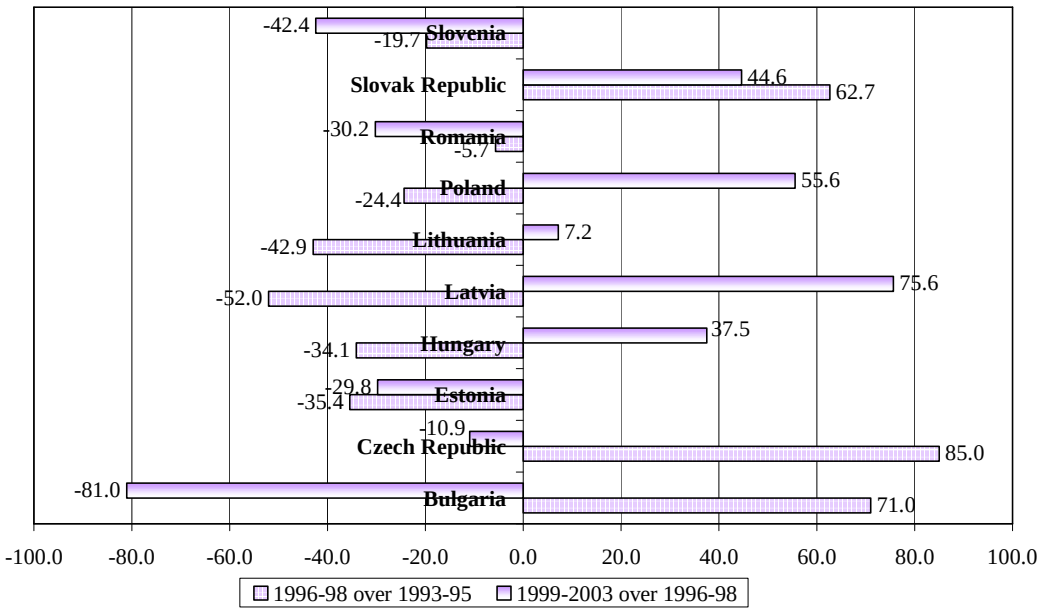


Table 1. Ratio to ClubMed Average (monthly)

	I	II	III		
	93/95	**96/98**	**99/03**	**99-03/93-95**	**99-03/96-98**
Bulgaria	3.2	9.4	1.8	1.0	1.8
Czech Republic	0.7	2.3	2.0	1.2	2.0
Estonia	1.0	1.1	0.8	0.5	0.8
Hungary	1.4	1.6	2.2	1.3	2.2
Latvia	1.8	1.4	2.5	1.5	2.5
Lithuania	2.7	2.7	2.9	1.7	2.9
Poland	1.7	2.2	3.5	2.0	3.5
Romania	3.6	5.8	4.1	2.4	4.1
Slovak Republic	0.7	1.8	2.6	1.5	2.6
Slovenia	0.7	1.0	0.6	0.3	0.6
Average	*1.8*	*2.9*	*2.3*	*1.3*	*2.3*

Source: own calculation based on IMF IFS, OECD and ECB data

Table 2. Ratio to ClubMed Average (quarterly)

	I	II	III		
	93/95	**96/98**	**99/02**	**99-03/93-95**	**99-03/96-98**
Bulgaria	2.3	8.3	5.5	0.9	2.0
Czech Republic	0.7	2.1	9.1	1.5	3.3
Estonia	1.0	1.8	2.3	0.4	0.8
Hungary	1.3	1.9	6.9	1.1	2.5
Latvia	2.4	2.2	7.2	1.2	2.6
Lithuania	3.2	4.7	7.0	1.1	2.5
Poland	1.0	2.2	17.1	2.7	6.2
Romania	4.6	10.4	13.9	2.2	5.0
Slovak Republic	0.3	2.7	7.5	1.2	2.7
Slovenia	0.3	1.3	1.5	0.2	0.5
Average	*1.7*	*3.8*	*7.8*	*1.3*	*2.8*

Source: own calculation based on IMF IFS, OECD and ECB data