Wirtschaftswissenschaftliche Fakultät
der Eberhard-Karls-Universität Tübingen

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Tübinger Diskussionsbeitrag Nr. 269
Oktober 2003

Wirtschaftswissenschaftliches Seminar
Mohlstraße 36, D-72074 Tübingen

De jure versus *de facto* Exchange Rate Stabilization in Central and Eastern Europe[1]

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Abstract:
The IMF classifications of the Central and Eastern European exchange rate arrangements are heterogeneous. While one group of countries reports tight pegs to the euro, a second group seems to have moved toward (more) exchange rate flexibility. Based on the recent discussion about the accuracy of IMF exchange rate arrangement classifications, low- and high-frequency exchange rate stability in Central and Eastern Europe is explored here. In this paper we find that *de facto* exchange rate stabilization is much more prevalent in Central and Eastern Europe than suggested by *de jure* exchange rate classifications. Most of the CEE countries peg their currencies to the euro, thereby contributing to a growing euro zone. Nevertheless, as exchange rate stabilization against the euro is pursued with different degrees and with different long-term drifts, intra-regional exchange rates are still far from being unified.

Keywords: *Foreign Exchange Policy, EMU, Euro Zone, Central and Eastern Europe.*

JEL: F31, F33

[1] I thank Sandrine Lavasseur, Ronald McKinnon, Slavi Slavov and the participants of the ICEG conference "Exchange Rate Strategies During the EU Enlargement" for helpful comments.

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1. More Exchange Rate Flexibility in Central and Eastern Europe?

The European integration has gained new momentum. In May 2004 ten mostly Central and Eastern European countries (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, Slovenia, Cyprus, and Malta) will join the European Union. Bulgaria and Romania are expected to follow by 2007.

The Eastern enlargement of the EU raises the issue of adequate exchange rate strategies during the EU and EMU run-up (Buiter and Grafe 2002, Corker et. al. 2000). As EU accession implies sooner or later ERM2 and EMU membership, exchange rate stabilization against the euro—as observed in Bulgaria, Estonia, Lithuania and Hungary—is a rational choice.

A second group of countries has (officially) moved towards more exchange rate flexibility. Learning from the capital market-related crisis of the second half of the 1990s—and following official IMF advice (Mussa et. al. 2000: 34)—the Czech koruna (1997), the Slovak koruna (1998) and the Polish zloty (2000) have joined the Slovenian tolar (and the Romania leu) in the group of *de jure* floating currencies (Table 1). Flexible exchange rates will allow the new member states to cope better with speculative capital inflows during the EMU run-up (Corker et. al. 2000).

Given the arguments in favour of both more and less exchange rate flexibility against the euro, the heterogeneity of the CEE exchange rate classifications as shown in Table 1 is not surprising. Yet, exchange rate stabilization against the euro might be *de facto* more prevalent than suggested, as—for instance—Reinhart and Rogoff (2002: 32) contend that "*the official history of exchange rates can be profoundly misleading, as a striking number of pegs are much better described as floats, and vice-versa.*"

Furthermore, Calvo and Reinhart (2002) measure the extent of open and hidden exchange rate stabilization for 155 exchange rate arrangements in 39 countries and identify a wide range of officially flexible exchange rates as pegged (*fear of floating*). Levy-Yeyati and Sturzenegger (2002) argue that an increasing number of countries has abandoned explicit commitment to fixed exchange rate regimes, while the *de facto* exchange rate policies have remained quite stable (*fear of pegging*). McKinnon and Schnabl (2003) show for the post-crisis East Asian countries that exchange rates are much less flexible than suggested by IMF classifications.

What about Central and Eastern Europe? Frömmel and Schobert (2003) argue that some CEE countries as Slovenia have adopted officially inflation targeting frameworks while implicitly adhering to exchange rate targeting. Given the approaching EU (and sooner or later

EMU) accession, exchange rate stabilization against the euro might be more prevalent than suggested by IMF classifications.

2. The Rationale for Exchange Rate Stabilization against the Euro

The rationale for pegging to the euro is threefold. It springs from macroeconomic stability, lower transaction costs for intra-European trade and lower risk premiums for short and long-term capital flows.

First, most emerging markets and in particular the transition economies lack a history of macroeconomic stability. Based on underdeveloped tax systems and government-controlled central banks, inflation tax is a common means to finance government expenditure. Since high inflation and depreciation discourage private consumption, (foreign direct) investment and international trade, establishing credibility by macroeconomic stability is a key objective of every macroeconomic consolidation and transformation process. Exchange rate pegs—which help anchor both inflation and expectations—have been an important tool for this purpose, also in Central and Eastern Europe.[2]

For the CEE economies, which tried to stabilize inflation and public debt during the 1990s with mixed success, macroeconomic convergence has been a key element of the EU accession process. The EC Treaty states that the economic policies are of common concern and are to be coordinated (art. 103). Central bank loans to the government are prohibited (art. 104) and the member states must avoid excessive budget deficits (art. 104c). In line with this required macroeconomic convergence process, starting with the accession negotiations in 1998, inflation rates dropped and the gradual depreciation of many CEE currencies abated (Figure 1 and Figure 2).

The restrictions on macroeconomic policies—and thereby the need for exchange rate stability against the euro[3]—will tighten even further after EU accession. Although the new members "*will not be expected to transfer their monetary sovereignty to the EU*" (ECB 2000: 46), inflation rates have to converge further towards the EMU benchmark, as the new member states "*will consequently be integrated into the European System of Central Banks*" (ECB 2000: 46). Exchange rate stability will be achieved by the ERM2 membership which is expected soon after EU accession (ECOFIN 2000).

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[2] Since 1997 inflation targeting frameworks have been implemented instead of exchange rate pegs as outlined by Frömmel and Schobert (2003).

[3] De Grauwe and Schnabl (2003) explore the discrepancy between the Maastricht inflation and exchange rate criteria under the assumption of relative productivity increases (Balassa-Samuelson effect).

The second motivation for pegging to the euro stems from international goods markets. Although there is no reliable evidence for a strong correlation between exchange rate stability and international trade (European Commission 1990, Dell'Aricia 1999), eliminating exchange rate uncertainty has been regarded as crucial for intra-EU trade integration. In support of this view De Grauwe's (1987) gravity model for intra-EMS trade between 1973 and 1985 finds a positive long-run correlation between less exchange rate volatility and more trade flows. More recently, Anderton and Skudelny (2001) have traced a statistically significant negative correlation between exchange rate volatility and trade among a panel of industrial countries.

Extending the argument to the case of a currency union, a gravity model by Rose (2000) finds that irrevocably fixed exchange rates triple foreign trade. The result is reconfirmed by Frankel and Rose (2002) who associate membership in the monetary union with considerable welfare gains. As Rose's (2000) sample is mainly based on small, low income countries the HM Treasury (2003) argues that for the United Kingdom the additional trade with the Euro Area resulting from EMU membership would be in the range of 5% to 50%.

To this end the benefits of (irrevocable) exchange rate stability against the euro for Central and Eastern European trade are twofold. As shown in Table 2, the European Union—defined in a slightly broader sense than the present EMU members as "EU+"—is by far the most important trading partner of the CEE countries. As in average 65% of CEE exports and 58% of CEE imports are with EU+, fixed exchange rates to the euro reduce the transaction cost for a substantial part of CEE trade. Further, based on De Grauwe (1987) and Rose (2000), the CEE countries can expect significant additional trade and welfare gains by further stabilizing exchange rates against the euro—and joining EMU.

Third, the rationale for exchange rate stabilization in emerging markets springs from underdeveloped capital markets ("original sin") as put forward by Eichengreen and Hausmann (1999). Due to a long tradition of inflation and depreciation, banks and enterprises in emerging markets and developing countries cannot use the domestic currencies to borrow abroad or to borrow long-term, even domestically. The consequence is either a currency mismatch—projects that generate domestic currency are financed with foreign currency—or a maturity mismatch—long-term projects are financed with short-term loans.

Hausmann, Panizza and Stein (2001) argue that due to this dollar (euro) liabilization, reducing long-term exchange rate fluctuations is equivalent to reducing default risk in balance sheets. Indeed, the econometric estimations by Devereux and Lane (2002) find a strong negative relationship between the stock of external debt and low frequency exchange rate volatility

relative to the creditor countries.[4] McKinnon and Schnabl (2003) explain the motivation for exchange rate stability at high frequencies—i.e. daily or weekly exchange rate changes. With incomplete capital and thereby missing forward markets, the aggregated foreign exchange risk of short-term external liabilities remains unhedged by definition.[5] By stabilizing exchange rates on a day-to-day basis the government can provide an informal insurance for the foreign exchange rate risk of short-term capital flows.

Both arguments in favor of low and high-frequency exchange rate stability apply for Central and Eastern Europe as—despite some recent success in creating long-term government bond markets—capital markets remain underdeveloped (Lanoo and Salem 2001). With foreign bonds increasingly denominated in euro (ECB 2002: 28) the incentive to minimize long-term exchange rate swings against the euro is growing. The same applies for short-term capital flows because trade invoicing and thereby short-term payments transactions are more and more in euro (ECB 2002: 39).

From a future perspective the capital markets provide an additional incentive to adopt the euro as soon as possible. By joining the Euro Area—and having the unique chance to irrevocably import the reputation of the European Central Bank—the CEE economies would be spared the costs of building up their own capital markets. Risk premiums on interest rates would shrink, thereby adding additional stimulus to the real convergence process.

3. Formal Tests for Exchange Rate Flexibility

Based on the strong rationale for euro exchange rate stabilization in Central and Eastern Europe, tests for exchange rate stabilization at low and high frequencies are carried out.

3.1. Low-Frequency Exchange Rate Stability

Calvo and Reinhart (2002) use three criteria to test for *de facto* exchange rate stabilization: monthly (percentage) exchange rate changes, monthly percentage changes of official foreign reserves, and monthly absolute changes in nominal short-term interest rates. For all three criteria they set (arbitrary) probability limits to quantify the extent of exchange rate stability.

First, the degree of exchange rate fluctuations indicates stabilization efforts. If, for instance, the probability is high that monthly exchange rate changes fall outside a band of

[4] Low frequency exchange rate fluctuations are defined as monthly, quarterly or yearly exchange rate changes.
[5] In the highly developed capital markets of the industrial countries an investor can hedge an open position in foreign currency through financial derivates (forwards) at low cost.

±2.5% (indicator ε), the currency is rated as freely floating. With a low probability the currency is classified as fixed.

Second, governments stabilize exchange rates by intervening in foreign exchange markets. To prevent the domestic currency from appreciating (depreciating), the monetary authorities sell (buy) domestic currency in exchange for dollars, euros or yen. The stronger the efforts to stabilize the exchange rate, the higher is the probability that monthly changes of official foreign reserves fall outside a predetermined band of ±2.5% (indicator φ_1).[6]

Third, monetary policy can be a tool for exchange rate stabilization. To prevent the domestic currency from devaluation (appreciation) the government might increase (cut) interest rates. If the probability is high (low) that absolute interest rates changes fall outside a predetermined band of ±4.0% Calvo and Reinhart (2002) consider it to be an indication for (no) exchange rate stabilization via monetary policy (indicator ι_1).

To draw a more comprehensive picture of exchange rate stabilization in Central and Eastern Europe, the Calvo-Reinhart criteria are augmented in four regards. First, exchange variability against both the euro and the dollar is measured. Second, percent changes of foreign reserves—which are reported in US dollars—are measured in both dollars and euros. Third, we add an alternative measure for exchange rate stabilization by dividing absolute changes of foreign reserves by the monetary base as suggested by Levy-Yeyati and Sturzenegger (2002) (indicator φ_2).[7] The (arbitrary) band width is set to ±5.0%.

Fourth, Calvo and Reinhart (2002) chose an arbitrary band of ±4.0% for their interest rate criterion ι_1. This bandwidth seems primarily apt to distinguish between high and low interest rate countries.[8] As in most CEE countries the probability that short-term interest rates change by more 400 basis points from one month to the other is small, the band is narrowed to ±0.4% (indicator ι_2).

Table 3 gives an overview over the Calvo-Reinhart exchange rate criterion (ε), the foreign reserve criteria (φ_1 and φ_2) and the interest rate criteria (ι_1 and ι_2) and their respective bands.[9] According to Calvo and Reinhart (2002) their probability criteria are superior to the use of

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[6] Official foreign exchange reserves not only change with foreign exchange intervention, but also for other reasons such as government payments in foreign currency and interest receipts on foreign exchange reserves (Neely 2000: 22). Further, the dollar value of foreign exchange reserves is altered if the dollar exchange rate of third currencies changes. Nevertheless, Neely (2000) argues that there is a positive correlation between changes in official foreign reserves and foreign exchange intervention with sharp increases in official foreign currency holding indicating intervention.

[7] For this purpose foreign reserves have to be reconverted from dollars into domestic currency which comprises a bias caused by changes in the dollar exchange rates of the CEE currencies.

[8] For low interest rate countries the probability that the interest rate changes from one month to the other by more than ±4.0 percentage points is (close to) zero, independent from the exchange rate arrangement.

[9] Sensitivity tests with different bands led to by-and-large the same results.

standard deviations as a measure of exchange rate volatility because they avoid distortions by outliers, particularly in the case of interest rates. Here, following Hernández and Montiel (2001) standard deviations are applied as additional indicators.

The observation period starts with the introduction of the euro in January 1999 and reaches up to the present with two exceptions. For Poland the observation period begins in April 2000, when it adopted flexible exchange rates. For Lithuania the observation period ends in January 2002 when it shifted its dollar peg to a euro peg. The euro/dollar exchange rate as well as the foreign reserves and the short-term interest rates of the free floaters Euro Area and the US are used as benchmarks.

Table 4 reports the results. According to the exchange criterion ε all four countries officially classified as fixed exchange rate regimes show in fact very low exchange rate volatility against the euro or the dollar. Of course, the currency boards of Bulgaria and Estonia have eliminated exchange rate volatility against the euro almost completely. The same applies for the currency board of Lithuania up to January 2002 against the dollar. Starting in February 2002 the same can be assumed for the euro. The Latvian lat, which is stabilized against a SDR[10] currency basket since 1994, exhibits low exchange rate variability against both euro (18.87%) and dollar (1.89%). The lower probability for the dollar is due to the higher weight of the dollar in the SDR based currency basket.

Hungary[11] (pegged exchange rate with horizontal band) and Romania (crawling peg) are presently classified as intermediate exchange rate arrangements by the IMF. Hungary shows rather small exchange rate variability against the euro. The probability of exceeding the ±2.25 band against the euro is 5.66% in comparison to 38.46% of the US dollar. The Romanian leu (35.85%) more resembles the freely floating US dollar than a pegged currency.[12]

Out of the group of *de jure* free or managed floaters—the Czech Republic, Poland, the Slovak Republic and Slovenia—three countries seem to peg their currencies *de facto* to the euro. The Czech koruna (7.55%), the Slovenian tolar (0.00%) as well as the Slovak Koruna (13.21%) show a much lower probability that monthly exchange rate fluctuations exceed the ±2.5% limit than the benchmark euro/dollar rate. Although the Slovian tolar was allowed to depreciate gradually against the euro (Figure 1), exchange rate volatility has been considera-

[10] The SDR's composition is 45% US dollar, 29% euro, 15% Japanese yen, 11% British pound.

[11] Hungary started shadowing the ERM2 exchange rate mechanism in 2001 with a fixed parity against the euro and horizontal bands of ±15%. In June 2003 the parity of the forint was devalued by 2.26% to facilitate the way into ERM2 by higher competitiveness of Hungarian exports in the EU markets.

[12] A footnote in the IMF classifications of Romania indicates that the *de facto* regime differs from the *de jure* regime.

bly reduced. This corresponds to the notion that Slovenia had been shadowing the DM before 1999 and is now shadowing the euro.

Only the free floater Poland (36.84% against the euro and 28.95% against the dollar) and the "crawling peg" of Romania (35.85% against the euro and 32.08% against the dollar) exhibit an exchange rate volatility similar to the euro/dollar exchange rate (38.46%) and can be classified as free floaters according to the exchange rate criterion ε. The standard deviations of monthly exchange rate changes support these results.

In contrast to the exchange rate criterion ε, the foreign reserves criterion φ_1 has to be interpreted more diligently, because percentage changes of foreign reserves can be biased by different stocks of foreign reserves.[13] When testing for the variability of foreign reserves measured in euro, for most CEE countries the probability that monthly changes of official foreign reserves exceed ±2.5% is significantly higher than for the US (40.38%) and the Euro Area (44.23%). But for Poland (23.53%) and the Czech Republic (33.33%) the probability is lower than for the benchmark free floaters. Romania (54.50%) is not identified as freely floating currency as suggested by the exchange rate criterion ε. The standard deviations of percent changes of foreign reserves yield a similar picture.

Measuring foreign reserves in dollars yields only slightly different results. In all CEE countries the probabilities are higher than for the Euro Area (13.46%).[14] But the probabilities of Poland (23.53%) and the Czech Republic (32.69%) are smaller than or close to the probability of the US (32.08%). Again Romania (53.85%) is not identified as a freely floating currency. The standard deviations of the monthly percentage changes of foreign reserves yield a slightly different picture ranging between 1.59% and 2.98% for the Euro Area, Poland and the US and between 4.59% and 10.63% for the remaining countries.

As the Calvo and Reinhart (2002) foreign reserves criterion φ_1 does not produce a result which is completely consistent with the exchange rate criterion ε, the indicator φ_2 is used to give additional information about the scope of foreign exchange intervention relative to the size of the monetary base. Table 4 shows the distinct difference between the large freely floating economies US and Euro Area and the small open economies of Central and Eastern Europe. For the US and Euro Area the probability that monthly changes of foreign reserves are larger than 5.0% of the monetary base is zero. In contrast, for the CEE countries the probabilities range from 19.23% in the Czech Republic up to 73.98% in Slovenia, showing the

[13] Given the same absolute change in foreign reserves the percentage change will be larger in (freely floating) countries with low stock of foreign reserves than in countries with large stock of foreign reserves.

[14] Fluctuations in the euro/dollar exchange rate have quite a large impact on the variability of foreign reserves.

significant impact of exchange rate stabilization on the monetary base. The same distinction can be made from the standard deviations of φ_2.

Among the CEE economies the changes of foreign reserves relative to the monetary base are comparatively low for the Czech Republic (19.23%), for Poland (31.25%) and Romania (28.85%) which possibly indicates less active foreign exchange intervention. But also for Latvia the value is comparatively low (28.30%). The remaining countries range from 41.51% (Slovak Republic) to 73.08% (Slovenia). Based on the standard deviations of φ_2 such a distinction among the CEE countries is not possible.

Additional evidence on the role of foreign reserves for exchange rate stabilization is given by the stocks of foreign reserves as plotted in Figure 3.[15] Sharp changes and large stock of foreign reserves indicate (past)[16] exchange rate stabilization. In particular, fast increases of foreign reserves indicate attempts to dampen appreciation pressure.

As shown in Figure 3, all CEE countries have experienced sharp increases of foreign reserves during most of the 1990s.[17] In Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania, the Slovak Republic and Slovenia the stock of foreign reserves has increased fast since the advent of the euro, in particular since the euro started appreciating against the dollar in 2002. The only exception is Poland where the upward drift in foreign reserves has abated since the shift to floating exchange rates in April 2000 confirming Poland's status as freely floating economy. Similar to Poland the foreign reserves of the US and the Euro Area (Germany) have been by-and-large constant or even declining.

Table 5 lists the cumulated foreign reserves as percentage of GDP and gives further evidence on the high stock of foreign reserves in the CEE countries in comparison to the benchmark free floaters. While in the US and Euro Area foreign exchange reserves are lower than 3% of nominal GDP, for the CEE countries the range is between 14.71% in Hungary and 35.63% in the Slovak Republic.

Finally, the interest rate criteria ι_1 and ι_2 are intended to reveal exchange rate stabilization via short-term interest rates. Absolute changes of nominal interest rates classified by a bandwidth of ±400 basis points (ι_1) draw a borderline between the high inflation country Romania and the remaining countries including the US and Euro Area. Reducing the bandwidth to ±40 basis points allows the identification of countries with extraordinarily sharp interest

[15] Foreign reserves are reported in US dollars with no information about the currency composition. If exchange rates are stabilized against the euro, it can be assumed that the euro will have a considerable share in foreign reserves. Thus, the stocks of foreign reserves reported in dollars are affected by euro/dollar exchange rate movements.

[16] Large stocks of foreign reserves might also indicate intended, future foreign exchange intervention.

[17] During some periods as in 1998, when some CEE currencies came under speculative attacks, foreign reserves stagnated or even declined.

rate changes as Bulgaria, Latvia, Lithuania and Poland (compare Figure 4). Again the Czech Republic seems an outlier as the probability that interest rate changes are less than ±0.4% per month is less (7.69%) than in the US (13.24%) and the Euro Area (7.55%). The Slovak Republic (12.82%) also has a similar value as the US. The standard deviations of absolute interest rate changes paint a similar picture. To this end the interest rate criterion does not allow too reliable statements about exchange rate stabilization.

All in all, based on the low-frequency criteria as listed in Table 4 Bulgaria, Estonia, Hungary, Lithuania, the Slovak Republic and Slovenia are identified as pegging their exchange rates to the euro. Latvia pursues an intermediate strategy by pegging to both euro and dollar. Poland has adhered to the free float since the year 2000. The Czech koruna and the Romanian leu can not be clearly identified as pegged or floating currencies. While the Czech koruna shows low exchange rate variability against the euro, this exchange rate stabilization is not reflected in the variability of foreign reserves and interest rates. In Romania, while the volatility of foreign reserves and interest rates is high, exchange rate volatility has been high as well.

3.2. High-frequency Exchange Rate Stability

High frequency data might provide additional evidence on the CEE exchange rate strategies. As shown by McKinnon and Schnabl (2003) daily exchange rate returns give evidence on exchange rate stabilization as they reflect the daily attempts of central banks to smooth out exchange rate fluctuations. If standard deviations of daily returns are significantly smaller than for the euro/dollar rate this indicates pegging at high frequencies.

The daily returns of the CEE currencies against the euro are plotted in Figure 5. At a first glance, seven currencies seem to have lower exchange rate volatility against the euro as opposed to the benchmark euro/dollar exchange rate: the Bulgarian lev since 1997, the Czech koruna before 1997 and after 1999, the Estonian kroon, the Hungarian forint, the Latvian lat, the Lithuanian lita since February 2002, the Slovak koruna since 1999 and the Slovenian tolar.[18] For the Lativian lat the exchange rate volatility can be assumed to be even smaller against the US dollar. In contrast, the daily volatilities of the Polish zloty (since April 2000) and the Romanian leu show the same characteristics as the euro/dollar exchange rate.

For a more formalized comparison of day-to-day exchange rate fluctuations, Table 6 reports the standard deviations of the daily exchange rate returns against euro and dollar for the CEE sample. The observation period is from January 1st 1999 up to August 12th 2003. The

[18] Most CEE currencies exhibit stronger day-to-day exchange rate fluctuations during the 1997/98 world financial turmoil.

standard deviations of daily percentage exchange rate changes are, of course, lowest for the currency board arrangements of Bulgaria (0.05% against the euro), Estonia (0.09% against the euro) and Lithuania (0.13% against the euro since February 2002).[19]

For the Czech koruna (0.37% against the euro), the Hungarian forint (0.34% against the euro), the Latvian lat (0.44% against the euro and 0.26% against the dollar), the Slovak koruna (0.31%), and the Slovenian tolar (0.23% against the euro) the standard deviations are higher than the for currency board countries, but significantly smaller than for the benchmark euro/dollar rate (0.66%). The Polish zloty and the Romanian leu have high standard deviations against both euro and dollar and thereby can be classified as freely floating currencies.[20]

4. The Path towards the Euro Zone

The tests for low- und high-frequency exchange rate stabilization as performed in section 3 yield similar results. Based on the strong rationale for exchange rate stabilization against the euro as outlined in section 2 euro pegs are much more prevalent in Central and Eastern Europe than suggested by *de jure* exchange rate classifications. We observe a growing euro zone consisting of Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, the Slovak Republic and Slovenia. Latvia pegs its currency to a currency basket which is dominated by the dollar (45%) and the euro (29%). Only two countries—Poland and Romania—remain completely outside the euro zone.

Figure 6 summarizes the development of euro and dollar as anchor currencies in Central and Eastern Europe starting from the beginning of the CEE transformations process in early 1990s. On the y-axis a value of 100% corresponds to a complete dollar or euro zone respectively. The quarterly values for euro and dollar are computed as follows: Up to 1997 pegging to currency baskets prevailed in Central and Eastern Europe as shown in Table 7 for Hungary. The composition of the currency baskets is taken from the official IMF classifications (IMF various issues) if there is no indication for a discrepancy between *de facto* and *de jure* exchange rate arrangements. The specific weights of the dollar and the aggregated weight of all European currencies are listed in the respective quarters of observation starting in the first quarter 1990. For instance for Hungary in 1990:01, a value of 0.426 (42.6%) is attributed to the dollar and a value of 0.574 (57.4%) is attributed to the European currencies (Table 7).

[19] The euro peg of the Lithuanian lita gets gradually tighter. For 2003 the standard deviation of exchange rate fluctuations against the euro is 0.02%.

[20] The standard deviations of the Romanian leu of 0.83% against the euro and 0.57% against the dollar might indicate (some) exchange rate stabilization against the dollar as argued by Frömmel and Schobert (2003).

If a country has adopted a unilateral peg, for instance to the euro, the maximal value of 1 (100%) is attributed to the euro, and 0 is attributed to the dollar. If there is no information about exchange rate stabilization or the exchange rate is independently floating the value of 0 is listed for both euro and dollar. Further, if there is evidence that a currency is *de facto* pegged to the euro while *de jure* classified as free float—as in the case of Slovenia and the Czech Republic after 1999—1 instead of 0 is attributed to the euro. When the exchange rate arrangements or the weights in the currency baskets change, the values are adjusted in the respective quarter. Finally, for every quarter the arithmetic middle is calculated.[21]

Figure 6 shows the time path of pegging to the dollar and to the European currencies (euro since January 1999). The dotted line marks pegging to the dollar. While during the mid 1990s the dollar had reached a considerable role as anchor currency in Central and Eastern Europe, the approaching EU Eastern Enlargement and the advent of the euro have triggered a steady decline. After the shift of the Lithuanian currency board from the dollar to the euro in January 2002, the dollar presently only retains a weight of 45% percent in the Latvian currency basket. When Latvia joins ERM2 this residual will also vanish.

The bold line represents pegging to all European currencies and since January 1999 to the euro. Up to 1998 several CEE countries pegged their currencies to the German mark or currency baskets which contained a considerable number of Western European currencies (in some cases ecu) as shown in Table 7 for Hungary. Representing the sum of the respective cumulated weights Figure 6 shows that the weight of the European currencies grew steadily up to 1994 and then by-and-large remained constant between 40% and 50%. After the advent of the euro in January 1999—despite the world wide wave of exchange rate crisis in 1997/98 and despite the shift of Poland to flexible rates—euro pegging has reached a record high in the new millennium.

With the first wave of EU accession in May 2004 the euro zone can be expected to grow further, approaching the 100% mark. As all new EU members will be expected to join ERM2 some time after accession (ECOFIN 2000), fully floating exchange rates as in Poland and pegs against anchors other than the euro as in Latvia will be incompatible with ERM2 (ECOFIN 2000). Romania will remain the only outsider of the CEE euro zone.

Furthermore, the rise of the euro zone will not be restricted to the new Central and Eastern European accession countries and the (still) EMU-outs Denmark, Sweden and UK. Given the network externalities of a large euro zone as stressed by Portes and Rey (1998) the

[21] A weighted average by country seize (GDP) would lead to a lower level of euro pegging since 1997 as the larger countries (Poland and Romania) have pursued flexible exchange rate arrangements.

countries at the periphery of the growing European Monetary Union might find it attractive to stabilize exchange rates against the euro.

As shown in Figure 7 which uses day-to-day euro exchange rate returns as proxy for exchange rate stabilization, besides the EMU outs also Croatia, Morocco, Norway, Switzerland and Tunisia peg their currencies more or less tightly to the euro. Other countries such as Bosnia-Herzegovina, Montenegro and Macedonia pursue tight currency board arrangements or use the euro as legal tender. In Yugoslavia the euro circulates as an unofficial currency.

To this end, the euro zone already exceeds the scope of the present and potential EMU members. With the euro zone undergoing such growth, other countries at the periphery such as Russia, Belarus, Ukraine, Algeria, Egypt or Turkey might reconsider their exchange rate strategies. The euro might challenge the dollar as the world currency.

5. Outlook

Based on a variety of tests for *de facto* low and high-frequency exchange rate stabilization, this paper has shown that Central and Eastern European exchange rate stabilization against the euro is much more prevalent than suggested by IMF classifications. Based on a strong rationale for euro stabilization, the euro zone in and around Europe is growing steadily.

This very positive finding leaves us with one caveat, however. The tests performed in section 3 were based on a relatively wide concept of exchange rate stabilization. It comprises rigid currency boards (Bulgaria, Estonia and Lithuania), a pegged rate with wide horizontal bands (Hungary), a downward crawling peg (Slovenia), a currency basket with 29% euro weight (Latvia) and more discretionary exchange rate stabilization with appreciation drift as observed in the Czech Republic. The exchange strategies in Central and Eastern Europe are still far from being unified.

Also EU and ERM2 membership is unlikely to make the CEE exchange rate strategies completely homogenous, as the relative wide ERM2 band will allow for a broad variety of stabilization strategies (De Grauwe and Schnabl 2003). In particular Poland—the by far largest CEE economy—might continue to pursue a comparatively flexible exchange rate strategy. This implies a considerable degree of intra-regional exchange rate fluctuations which can be associated with higher costs for intra-regional trade and a higher degree of macroeconomic instability.

This leaves us with the question of a more homogenous exchange rate strategy in Central and Eastern Europe. As observed by McKinnon and Schnabl (2003) for East Asia the common peg to dollar fostered intra-regional trade and macroeconomic stability. As shown in

Table 2 presently the intra-regional CEE trade integration is still rather weak. A further unification of the CEE exchange rate strategies could contribute to more intra-regional trade integration and macroeconomic stability thus adding an additional growth stimulus for the whole region.

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Table 1: Exchange Rate Arrangements in Central and Eastern Europe

	90	91	92	93	94	95	96	97	98	99	00	01	02
Bulgaria	3	8	8	8	8	8	8	2	2	2	2	2	2
Czech Rep.	3	3	3	3	3	3	6	7	7	7	7	8	8
Estonia	n.a.	n.a.	2	2	2	2	2	2	2	2	2	2	2
Hungary	3	3	3	3	3	6	6	6	6	6	6	4	4
Latvia	n.a.	n.a.	8	8	3	3	3	3	3	3	3	3	3
Lithuania	n.a.	n.a.	8	8	2	2	2	2	2	2	2	2	2
Poland	3	5	5	5	5	6	6	6	6	6	8	8	8
Romania	3	7	7	7	7	7	7	7	7	7	7	6	6
Slovak Rep.	3	3	3	3	3	3	6	6	7	7	7	7	7
Slovenia	n.a.	n.a.	7	7	7	7	7	7	7	7	7	7	7

Source: IMF (various issues).
1: exchange rate arrangements with no separate legal tender
2: currency board arrangements
3: other conventional fixed peg arrangements (within a band of most ±1%)
4: pegged exchange rate arrangements within horizontal bands (at least ±1%)
5: crawling pegs (with small, pre-announced adjustment)
6: exchange rates with crawling bands
7: managed floating with no pre-announced path for the exchange rate
8: independent floating (market-determined exchange rate and independent monetary policy)

Table 2: Direction of Trade of CEE Countries (Arithmetic Averages)

Exports	**EU+**	**CEE+**	**CIS**	**ROW**	**Imports**	**EU+**	**CEE+**	**CIS**	**ROW**
1992/93	52%	17%	16%	13%	**1992/93**	50%	13%	22%	14%
2000	65%	17%	7%	12%	**2000**	58%	12%	16%	14%

Source: IMF: Direction of Trade Statistics. EU+ = EU 15 + Island, Norway, and Switzerland; CEE+ = CEE accession candidates + Cyprus, Malta, Albania, Bosnia-Herzegovina, Croatia, Macedonia, Montenegro, Yugoslavia; CIS = former members of the Soviet Union except the Baltic countries; ROW = Rest of the World including US and Japan. The data for the single countries can be found in Table 8.

Table 3: Indicators for Exchange Rate Stability

	Exchange Rate (e)	**Foreign Reserves (f)**		**Interest Rate (?)**	
Criterion	$e = \frac{e_{t+1} - e_t}{e_t}$	$j_1 = \frac{F_{t+1} - F_t}{F_t}$	$j_2 = \frac{(F_{t+1} - F_t) * e_{t+1}}{M_{t+1}}$	$i_1 = i_{t+1} - i_t$	$i_2 = i_{t+1} - i_$
Band	±2.5%	±2.5%	±5.0%	±4.0%	±0.4%

Table 4: Indicators for Exchange Rate Stabilization as Outlined in Table 3 (1999:01–2003:05)

	Exchange Rate e (€)		Exchange Rate e ($)		Foreign Reserves j_1 (€)		Foreign Reserves j_1 ($)		Foreign Reserves j_2		Interest Rate i_1		Interest Rate i_2	
	P	s	**P**	s	**P**	s	**P**		**P**	s	**P**	s	**P**	s
Bulgaria	0.00%	0.42%	33.96%	2.60%	59.62%	4.92%	64.15%	5.15%	62.26%	9.56%	3.85%	1.37%	59.62%	1.37%
Czech Republic	7.55%	1.57%	37.74%	3.08%	33.33%	3.96%	32.69%	4.59%	19.23%	9.31%	0.00%	0.26%	7.69%	0.26%
Estonia	0.00%	0.00%	30.19%	2.57%	71.15%	7.98%	60.38%	8.38%	49.06%	10.34%	5.66%	1.60%	20.75%	1.60%
Hungary	5.66%	1.25%	28.30%	2.54%	69.23%	7.87%	64.15%	8.03%	64.15%	12.37%	0.00%	0.52%	26.42%	0.52%
Latvia	18.87%	1.59%	1.89%	1.24%	63.46%	6.19%	58.49%	5.67%	28.30%	5.53%	0.00%	1.15%	63.46%	1.15%
Lithuania*	37.84%	2.47%	0.00%	0.00%	69.44%	7.43%	62.16%	6.96%	51.35%	9.88%	0.00%	1.63%	72.97%	1.63%
Poland[%]	36.84%	2.66%	28.95%	2.67%	23.53%	2.57%	26.47%	2.52%	31.25%	5.38%	0.00%	1.17%	54.84%	1.17%
Romania	35.85%	2.57%	32.08%	2.61%	54.90%	6.06%	53.85%	6.22%	28.85%	7.58%	25.00%	7.37%	92.31%	7.37%
Slovak Rep.	13.21%	1.52%	37.74%	2.64%	48.08%	10.52%	58.49%	10.63%	41.51%	16.23%	0.00%	0.30%[#]	12.82%[#]	0.30%[#]
Slovenia	0.00%	0.51%	39.62%	2.66%	54.90%	5.18%	59.62%	4.91%	73.08%	19.84%	0.00%	0.62%	35.85%	0.62%
US ($/€)	38.46%	2.64%			40.38%	3.11%	32.08%	2.98%	0.00%	0.17%	0.00%	0.22%	13.21%	0.22%
Euro Area (€/$)			38.46%	2.64%	44.23%	2.79%	13.46%	1.59%	0.00%	0.42%	0.00%	0.18%	7.55%	0.18%

Source: IMF: IFS. P marks the probability that the respective criterion falls outside the predetermined band. s marks the standard deviation of the respective indicator. * As Lithuania changed the nominal anchor from the dollar to the euro in February 2002, the observation period for exchange rate stability is from 1999:01 to 2002:01. [%] starting in April 2000 with the official floating of the Polish zloty. [#] starting in January 2000 when data became available. Interest rates are money market interest rates except for Hungary and Romania where treasury bill rates were used.

Table 5: Foreign Reserves/GDP (both US Dollar)

Country	Foreign Reserves/GDP
Bulgaria	27.83%
Czech Republic	32.57%
Estonia	15.69%
Hungary	14.71%
Latvia	15.45%
Lithuania	15.89%
Poland	14.86%
Romania	15.76%
Slovak Republic	35.65%
Slovenia	33.18%
USA	0.32%
Euro Area	2.90%

Source: IMF: IFS. Foreign reserves in US dollars 2002:12. GDP 2002 in US dollars.

Table 6: Daily Exchange Rate Volatilities against Euro and Dollar

01/01/99 – 08/12/03	Euro	Dollar
Bulgarian lev	0.05%	0.62%
Czech koruna	0.37%	0.66%
Estonian kroon	0.09%	0.63%
Hungarian forint	0.34%	0.64%
Latvian lat	0.44%	0.26%
Lithuanian lita*	[0.66%] (0.13%)	[0.02%] (0.53%)
Polish zloty	0.69%	0.61%
Romanian leu	0.83%	0.57%
Slovak koruna	0.31%	0.71%
Slovenian tolar	0.23%	0.65%
euro/dollar	0.66%	0.66%

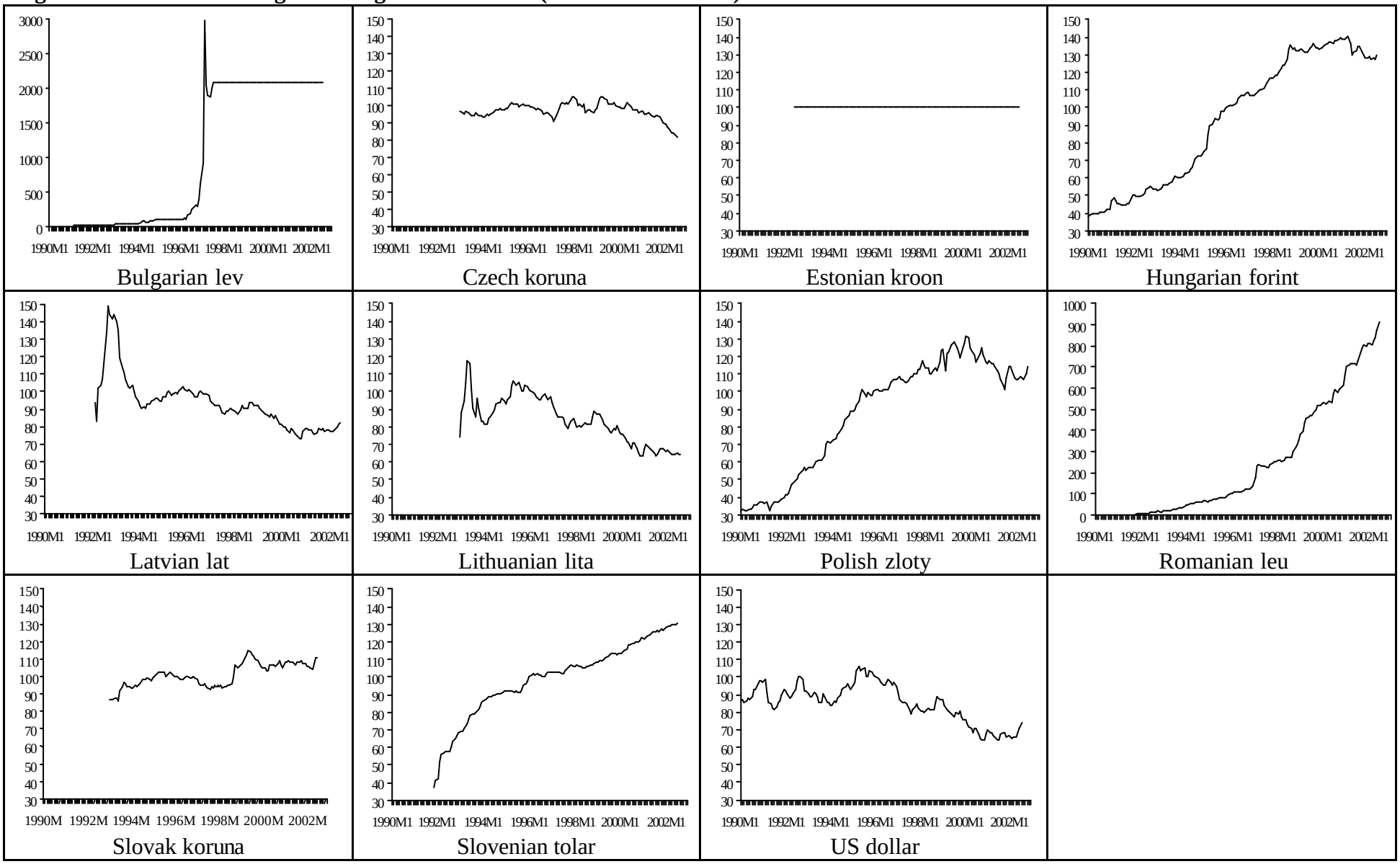
Source: Datastream. Volatility defined as standard deviations of daily exchange rate returns. * Note two sub-samples for Lithuania due to the shift in exchange rate regime: [01/01/99 – 01/30/02] (02/01/02 – 08/12/03)

Table 7: Development of the Hungarian Currency Basket

Date	Dollar	European Currencies
February 1990	42.6%	57.4% (DEM, ATS, CHF, ITL, FRF, GBP, SEK, NLG, FIM, BEC)
March 1991	50.9%	49.1% (DEM, ATS, CHF, ITL, FRF, GBP, SEK, NLG)
December 1991	50.0%	50.0% (ECU)
August 1993	50.0%	50.0% (DEM)
May 1994	30.0%	70.0% (ECU)
January 1997	30.0%	70.0% (DEM)
January 1999	30.0%	70.0% (Euro)
January 2000	0.0%	100.0% (Euro)

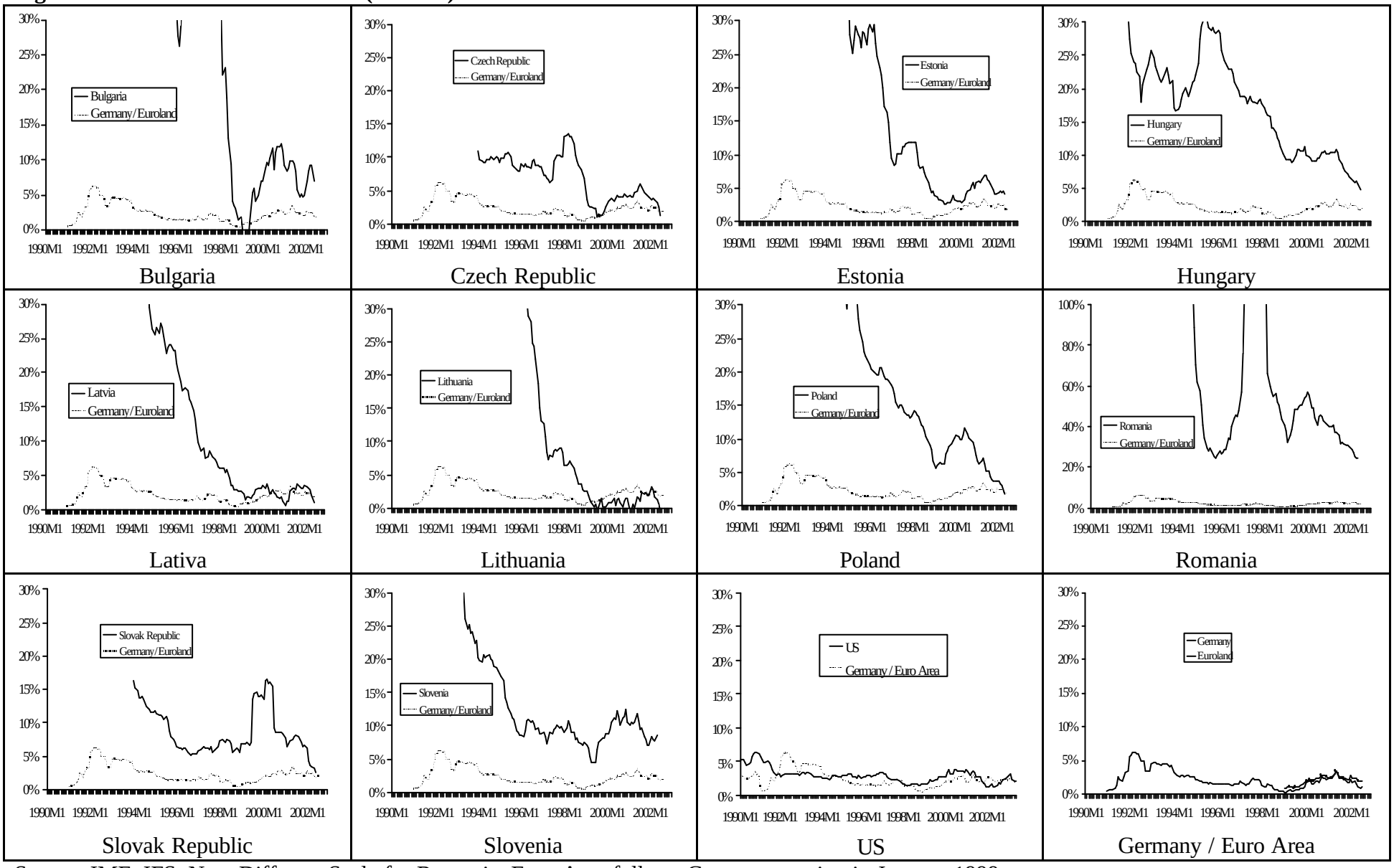
Source: National Bank of Hungary

Figure 1: Nominal Exchange Rates against DM/Euro (Index 1996:01=100)



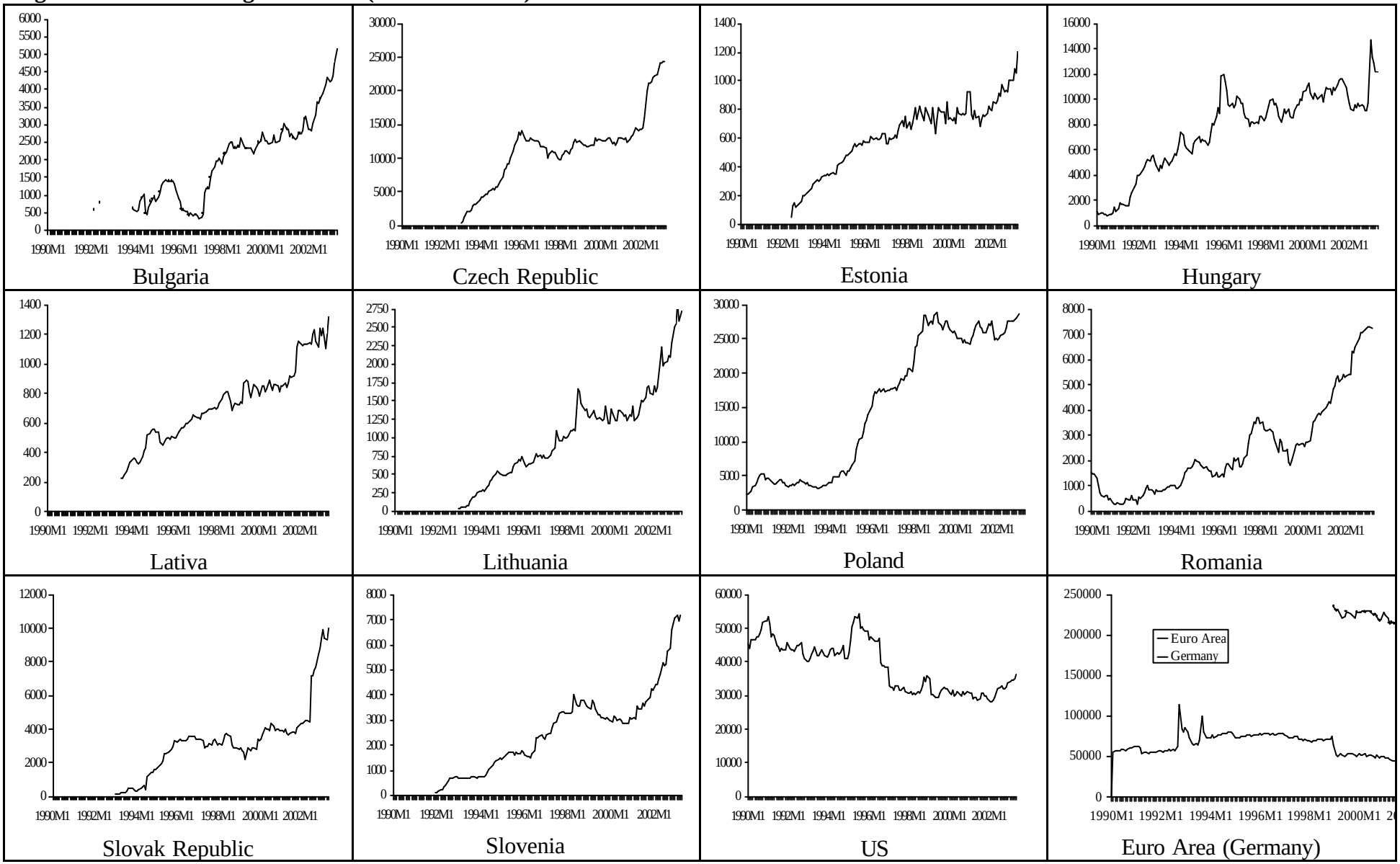
Source: IMF: IFS. Note different scales for Bulgaria and Romania. DM represents the euro starting from January 1999.

Figure 2: Consumer Price Inflation (Percent)



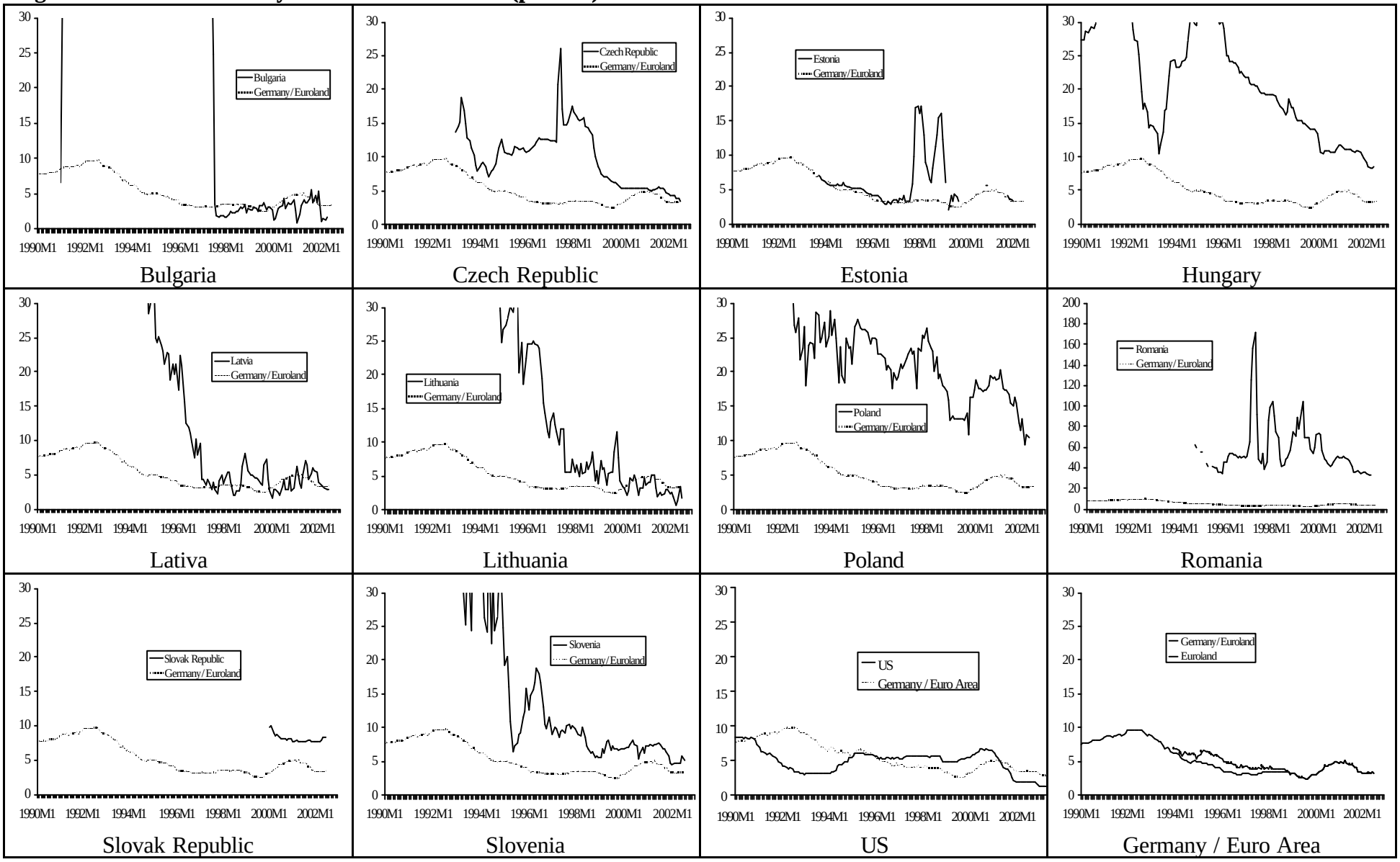
Source: IMF: IFS. Note Different Scale for Romania. Euro Area follows Germany starting in January 1999.

Figure 3: Official Foreign Reserves (Million Dollars)



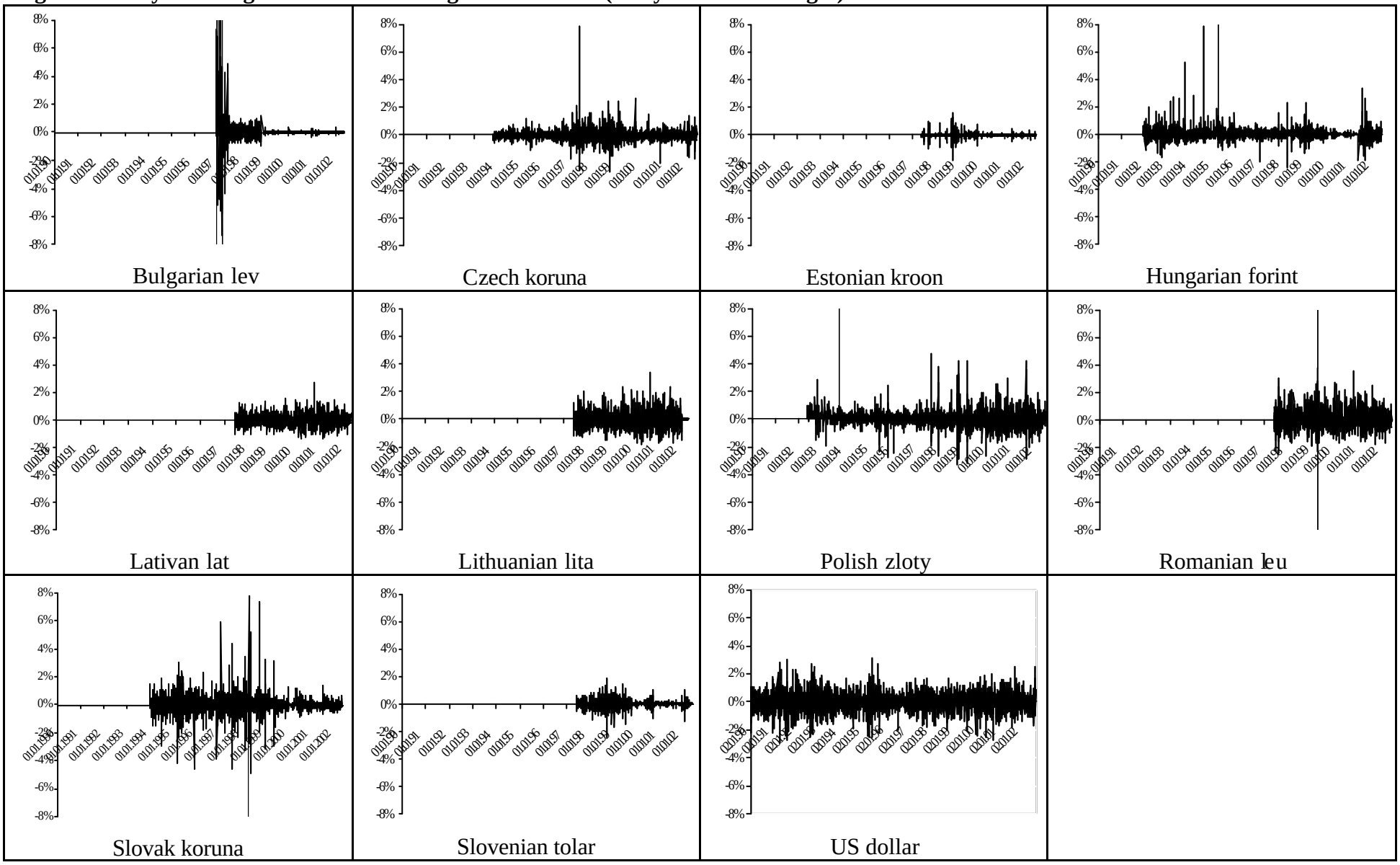
Source: IMF: IFS. Note different scales.

Figure 4: Short-term Money Market Interest Rates (percent)



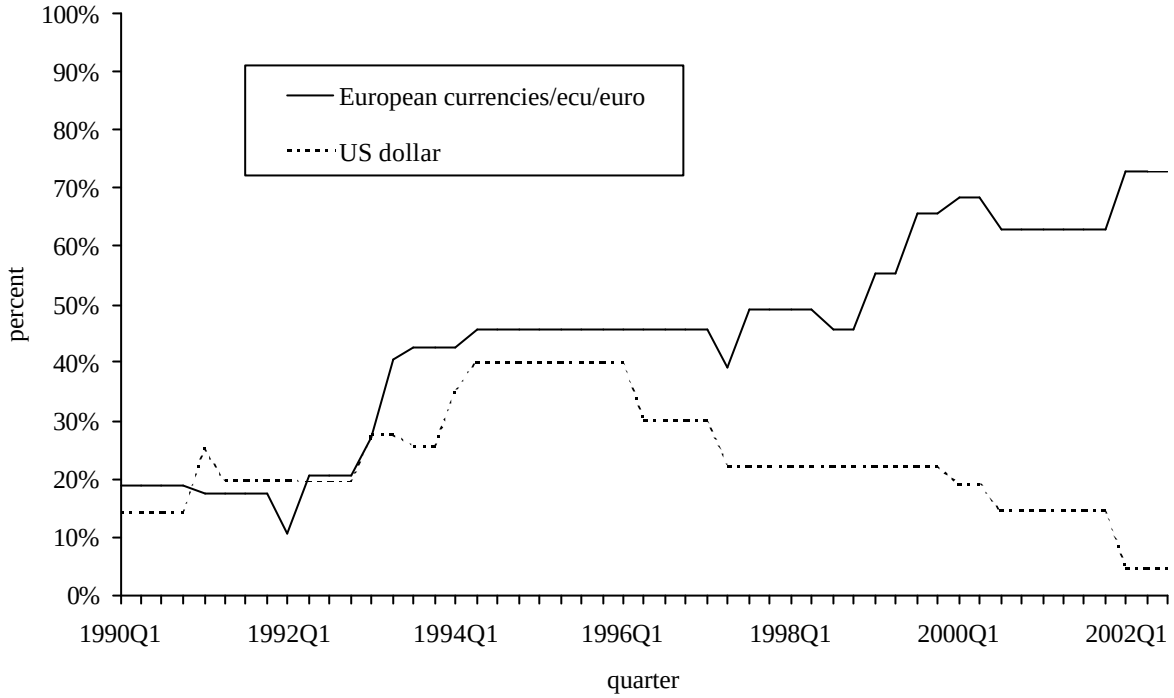
Source: IMF: IFS. Note different scale for Romania. Euro Area interest rates starting in January 1999.

Figure 5: Daily Exchange Rate Volatilities against the Euro (Daily Percent Changes)



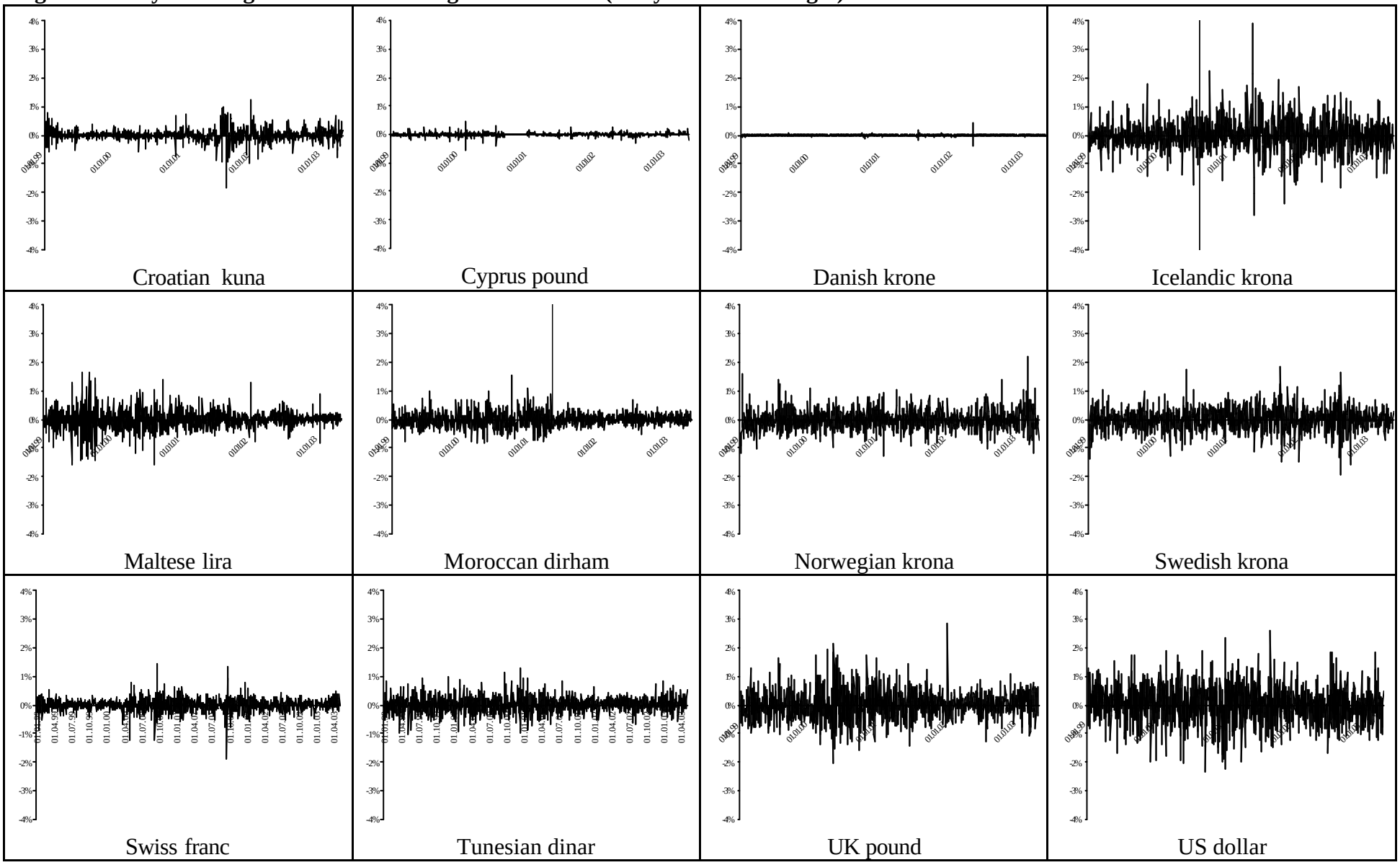
Source: Thomson Datastream.

Figure 6: Development of Euro and Dollar as Anchor Currencies in the CEE Countries



Source: IMF (several issues) and own calculations (arithmetic averages).

Figure 7: Daily Exchange Rate Volatilities against the Euro (Daily Percent Changes)



Source: Thomson Datastream. Note different scale in comparison to Figure 4.

Table 8: Direction of Trade of CEE Countries

Exports	EU+	CEE+	CIS	ROW	Imports	EU+	CEE+	CIS	ROW
Bulgaria					**Bulgaria**				
1992	48%	6%	10%	37%	**1992**	39%	5%	34%	22%
2000	53%	16%	8%	23%	**2000**	46%	7%	31%	25%
Czech Rep.					**Czech Rep.**				
1993	57%	27%	7%	9%	**1993**	54%	23%	15%	9%
2000	71%	18%	10%	8%	**2000**	65%	12%	8%	15%
Estonia					**Estonia**				
1993	49%	15%	30%	5%	**1993**	61%	7%	22%	10%
2000	72%	13%	10%	6%	**2000**	58%	7%	18%	16%
Hungary					**Hungary**				
1992	64%	5%	19%	12%	**1992**	60%	7%	28%	5%
2000	70%	8%	5%	17%	**2000**	60%	7%	10%	23%
Latvia					**Latvia**				
1992	41%	8%	45%	6%	**1992**	32%	7%	40%	21%
2000	66%	16%	9%	9%	**2000**	55%	22%	17%	6%
Lithuania					**Lithuania**				
1993	68%	18%	7%	8%	**1993**	51%	10%	32%	7%
2000	50%	25%	16%	9%	**2000**	50%	11%	32%	7%
Poland					**Poland**				
1992	65%	8%	9%	19%	**1992**	64%	6%	11%	20%
2000	72%	12%	7%	10%	**2000**	63%	8%	11%	18%
Romania					**Romania**				
1992	39%	7%	19%	35%	**1992**	44%	7%	17%	31%
2000	65%	10%	4%	21%	**2000**	58%	10%	13%	19%
Slovak Rep.					**Slovak Rep.**				
1993	30%	52%	8%	9%	**1993**	29%	40%	23%	8%
2000	61%	32%	2%	5%	**2000**	50%	21%	19%	9%
Slovenia					**Slovenia**				
1993	63%	21%	5%	12%	**1993**	64%	15%	4%	17%
2000	65%	22%	5%	7%	**2000**	70%	13%	4%	13%

Source: IMF: Direction of Trade Statistics. EU+ = EU 15 + Island, Norway, and Switzerland; CEE+ = CEE accession candidates + Cyprus, Malta, Albania, Bosnia-Herzegovina, Croatia, Macedonia, Montenegro, Yugoslavia; CIS = former members of the Soviet Union except the Baltic countries; ROW = Rest of the World including US and Japan.

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