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Brada, Josef C.; Ktan, Ali M.

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Zentrum für Europäische Integrationsforschung
Center for European Integration Studies
Rheinische Friedrich-Wilhelms-Universität Bonn



Josef C. Brada and Ali M. Kutan

**The Convergence of
Monetary Policy Between
Candidate Countries and the
European Union**

Working Paper

**B 07
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THE CONVERGENCE OF MONETARY POLICY BETWEEN CANDIDATE COUNTRIES AND THE EUROPEAN UNION*

Josef C. Brada
Arizona State University

Ali M. Kutan
Southern Illinois University – Edwardsville

Correspondence to: Josef C. Brada
Department of Economics
Arizona State University
Box 873806
Tempe, AZ 85287-3806, U.S.A.
e-mail: josef.brada@asu.edu

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ABSTRACT

We compare the convergence with German monetary policy of the monetary policy of transition-economy candidates for EU membership, of non-transition candidates and of countries that have recently joined the EU. We find significant long- and short-run linkages between German base money stock and that of the most recent members of the EU; the same holds true for the non-transition economy candidates. Among the transition economies, the ability to follow the policies of the Bundesbank is weaker or, for some countries, nonexistent. Such weak policy coordination may reflect the need for building up the financial sectors of these countries and allowing for a period in which they tie their policies more closely to that of the ECB.

I. Introduction

The successful accession to membership in the European Union (EU) by the current transition-economy applicants, the Czech Republic, Hungary, the Slovak Republic, Slovenia Poland and the Baltic republics, will depend to a large extent on their ability to align themselves with the institutions and the macroeconomic policies of the EU. Although structural change and institutional adaptation to EU norms will also be important in this process, in this paper we focus on the convergence of monetary policy between the candidate countries and the EU. The convergence of monetary policy between the EU and the candidate countries will be a necessary, though by no means sufficient, condition for establishing exchange rate stability between the Euro zone and the newly joining countries. We examine the prospects for such a convergence of monetary policies by investigating the extent to which the candidate countries have been able to achieve some measure of convergence between the evolution of their money stock with that of Germany, which we use as a historical proxy for the future monetary policy stance of the European Central Bank (ECB). We also compare the convergence achieved by the five most advanced transition-economy candidate countries to that achieved by countries that have recently become members of the EU, by several non-transition candidate countries and by some transition economies whose candidacy for EU membership has been deferred because they are making slower progress toward stabilizing their economies and introducing market mechanisms and institutions.

In the next section of the paper we motivate the inquiry and describe the exchange rate regime that is likely to govern the relations between the new members of the EU and the current members. We expect this exchange rate regime to display a tighter relationship between the

national currencies of the new members and the Euro than is allowed under the conditions of ERM II. Based on this characterization, we argue that, if the candidate countries were successful in having Germany "dominate" their monetary policy in recent years in the way that Germany was alleged to dominate the policies of other EU countries under the EMS, then the transition economies should have the potential to conform to the monetary policies of the ECB. The statistical tests of this domination of candidate-country monetary policy by Germany are developed and presented in Section 3 and the implications of these findings and the inter-country comparisons drawn from them are set out in Section 4.

2. EU Membership and Monetary Convergence

Much as the Maastricht criteria played a key role in the creation of a common currency among some of the EU member countries, macroeconomic performance will play a key role in determining which of the transition economies will join the EU and when. Indeed, the introduction of the Euro among a core subset of EU countries makes macroeconomic convergence a more pressing issue than it was for earlier entrants into the EU. As McKinnon (1999, p. 132) points out, the gains to the transition-economy candidates from joining the EU will only be realized if "trade takes place over an exchange-rate regime that is mutually acceptable between East and West". McKinnon argues that a regime of fixed exchange rates between the candidate countries and the Euro is the regime most likely to inspire such mutual confidence and to realize the full benefits of integration. In part this is so because fixed exchange rates between the currencies of these new member countries and the Euro will facilitate the rapid growth of the new members' exports to the rest of the EU without raising fears of "beggar-thy-

neighbor devaluations or unfair trading practices".¹ Moreover, a credible adherence to a Euro peg will serve as an important spur to the structural and institutional changes required of the transition economies, thus guaranteeing to the EU that its new members will not backslide in their efforts at structural and institutional reform. As for the non-transition candidates for EU membership, although they do not face as great a task in creating economic and social institutions consistent with EU membership as do the transition-economy candidates, they, too, face the need to align their exchange rate closely to the Euro to realize the benefits of membership.

Indeed, the fast-track transition-economy candidates for EU membership already have relatively tight links to the Euro, links that are quite consistent with McKinnon's proposed regime.² Estonia fixes its currency to the Euro while Poland and Hungary utilize a crawling peg to a basket whose largest component is the Euro. Slovenia and the Czech Republic have a managed float, although statements by the officials of the Czech National Bank suggest the existence of an informal peg to the D-mark, making the *koruna's de facto* exchange rate regime much less flexible than its *de jure* status would suggest. Of course, a peg established in the framework of EU accession would have to be seen as being more credible and durable than the voluntarily established exchange rate arrangements now in place. Moreover, as Wellink (1999, p.140) points out, "... any formal link to the euro should be *preceded* by policy measures which make the envisaged currency link a credible one." Among the policy measures that most observers would view as important markers of credibility for such an exchange rate link are

¹ McKinnon does envisage the possibility of a new member adopting a crawling peg against the Euro if its inflation is too high.

² The major difference is that most of the transition economies have liberalized short-term capital flows while McKinnon proposes capital controls to make the peg to the Euro more credible.

indicators such as the inflation rate, the current account, macroeconomic policy, interest rates, productivity and employment, and indebtedness.

However much observers can agree on the formal markers of stability and macroeconomic convergence, the process of transition itself renders highly problematic any quantitative judgment regarding the values that these markers should take in order to make a currency peg credible. Consider for example the inflation rate. The transition economies are undergoing considerable restructuring, and this restructuring will generate large and persistent Balassa-Samuelson effects (Kopits, 1999). In addition, a large gap exists between the price level of the transition economies and those of the EU member countries (Jana ková, 2000; Richards and Tersman, 1996). Large Balassa-Samuelson effects mean that there is scope for a corresponding real appreciation of the equilibrium exchange rate that would come about through rates of inflation that exceeded those in the EU. Because the *ex ante* measurement of the Balassa-Samuelson effect is fraught with considerable difficulty, a policy of targeting inflation to a level equal to the sum of the EU's rate of inflation plus the Samuelson-Balassa effect is impractical at best and quite dangerous to the long-term viability of a peg to the Euro at worst. Price equalization in the presence of a peg also requires that the transition economy maintain a rate of inflation that exceeds that of the EU, but, as with the Balassa-Samuelson effect, with a differential that cannot be accurately predicted.³ The transition economies will also continue to experience greater relative price changes than those occurring in the EU, and this factor, too, will contribute to higher rates of inflation in the transition countries (Coorey *et al.*, 1998). In addition, inflation rates in transition economies may not properly reflect actions of central banks because of the periodic liberalization of administered prices and because of the introduction of, or

³ See Mateus (1999, pp. 164-166) for Portugal's experience with price convergence in the process of entry into the EU.

increases in the rates of, VAT and fuel taxes, which serve as random inflationary impulses. In sum, inflation in the transition economies at rates higher than the EU average should be expected after accession, but there is no effective way of gauging *ex ante* whether the resulting real appreciation is so large as to undermine the credibility of that peg, and, thus, even medium-term convergence of inflation rates is not a good indicator of the credibility of a transition economy's peg to the Euro.

Similar reservations can be raised about the use of other traditional markers of macroeconomic performance. For example, interest rates in these countries are unlikely to reflect EU levels or cyclical fluctuations, even if the transition economies were to follow closely the monetary policies of the ECB. In part this is due to the large differences in risk faced by depositors in the transition economies and in the EU. In the transition economies there remain banks whose loan portfolios are troubled by non-performing loans and problems of moral hazard as firms struggle to survive by accumulating debts that may never be repaid, and, as a result, risks in transition economies are much higher than they are in the EU. On the other hand, the return to capital may also be higher than it is in the EU due to the opportunities offered by the restructuring of economic activity. Finally, government policy has acted to preserve a high spread between lending and deposit rates as a way of helping the banking system deal with losses from problem loans. Likewise, given the great changes in resource allocation in the transition economies and the problems of establishing a proper social safety net and socially acceptable means of bargaining over wages, the evolution of the natural rate of unemployment in transition economies will also be hard to define (Cross, 2000).

This leaves the money stock as the best measure of convergence between the transition economy candidates for EU membership and the Euro-zone countries. If the candidate countries

are able to follow the policies of the ECB in terms of a monetary aggregate target, then, as their financial systems mature and as the transitory effects of transition on inflation and interest rates recede, they will be able to achieve the same outcomes in terms of inflation and interest rates as are achieved by the ECB. In the meantime, so long as they can mimic ECB policies regarding the growth of the money base, then any inflation differential between themselves and the EU can be seen as reflecting Balassa-Samuelson effects and the process of price convergence. Hence, such a "revealed" measure of these two effects should not undermine the credibility of these countries' peg to the Euro. Following the ECB's policies on money supply growth will thus be the best guarantee that the transition-economy members of the EU will achieve a measure of policy convergence that will allow them, first, to maintain a credible peg against the Euro and, eventually, to consider adopting the Euro as their currency as well.

In the empirical work reported in this paper, we focus on base money, the narrowest monetary aggregate available. We choose this monetary aggregate over broader measures of money supply for two reasons. The first is that we are concerned with policy convergence or the domination of transition-economy monetary policy by the Bundesbank and, ultimately, by the ECB. Consequently, we focus on that measure of money that best reflects the policy stance of the monetary authorities, and base money serves this purpose better than do broader monetary aggregates because it better captures central bank policy and is less diluted by the intervention of other agents in the financial system. Moreover, broader measures of money are likely to experience growth or contraction over time as the result of innovations in, or reforms of, the financial system, and we expect that such shocks will continue to be quite important in transition economies. Thus, to maintain focus on central bank policies rather than on their outcomes, we use base money as our monetary aggregate.

The ability of these countries to follow the policy leadership of the ECB cannot be determined directly, principally because the ECB has not been in existence long enough to develop a sufficient track record of policy setting. However, it is commonly accepted that the ECB hopes to follow rather conservative policies, reflecting in large part the approach of the Bundesbank. At the same time, many of the transition economies did, at various times in the 1990s, maintain a peg or a crawling peg *vis a vis* the German mark. Consequently, if it can be demonstrated that these economies were able to follow the leadership of the Bundesbank in setting the growth of the base money stock, then we can have a high degree of confidence in the ability of these countries to follow the leadership of the ECB in setting the same aggregate.

As McKinnon (1999) observes, such an exchange rate regime would resemble the European Monetary System that was created in 1979 but with the Euro as the focus of the exchange rate policies of the new members. Indeed, there would be two major differences between the EMS and the new regime. The first is that the Euro would play an explicit role as the currency to which nonEuro-zone EU members would peg. This would greatly simplify the task of central banks relative to the EMS, where a system of cross rates had to be maintained by each central bank. The second is that the monetary policy of the Euro zone, meaning the policy of the European Central Bank, would come to dominate the policies of the central banks of the new members. The latter would have “the primary responsibility of bending [their] monetary policy by maintaining [the] exchange rate with the euro”... (McKinnon, 1999, p. 132).

If the central banks of the new members were to accept this role, as seems likely, they would not only have to frame policies that were “dominated” by the goals of the ECB, but they would also have to adopt similar tactics for pursuing these goals. The stated goal of the ECB is to follow a policy of medium-term price stability, with the goal set out in quantitative terms

(ECB, 1998). To achieve its objectives, the ECB will focus on the growth of a reference monetary aggregate and guide itself by a broadly based assessment of price developments.

Conceptually, the notion that the ECB's policies will dominate those of the new EU members may have much in common with the alleged domination of other European countries by the Bundesbank in the EMS. This hypothesis of the German domination or leadership in the EMS meant that other members of the EMS closely aligned their monetary policies to those of Germany in order to benefit from the reputation of the Bundesbank and the credibility of its policies.⁴ Although the literature on this hypothesis did not reach a definitive conclusion as to the existence of such leadership by the Bundesbank, it does raise the question of whether the new members can successfully be "dominated" by the ECB, that is, whether they can successfully mimic the ECB's policies and gradually achieve the convergence between their rates of inflation and those of Euro zone that will be necessary for their effective membership in the EU.⁵

There is a number of conditions that the transition economies must meet if they are to achieve such a convergence between themselves and the Euro zone. One is that they must have the political will to do so, and their central banks must have the freedom to pursue appropriate policies, and financial markets must be developed enough to provide for the effective transmission of central bank policies to the economy.⁶ Another is that they must choose the appropriate indicator to which they will seek to converge. The literature on German domination of the EMS considered a number of macroeconomic aggregates or indicators, including interest

⁴ Whether following the Bundesbank's monetary policy in the absence of appropriate fiscal policy was sufficient to maintain the EMS is a separate question.

⁵ See, for example, von Hagen and Fratianni (1990), Karfakis and Moschos (1990), MacDonald and Taylor (1991), Kutan (1991), Kirchgässner and Wolters (1993), and Hafer, *et al.* (1997) for a sampling of methodologies and conclusions.

⁶ For an assessment of these capabilities, see Kutan and Brada (2000).

rates, the growth of the money stock, and exchange rates, as variables whose evolution could shed light on German leadership. In the foregoing discussion, we have already explained why, in the case of the transition economies, some of these variables would be inappropriate indicators of convergence. Consequently, we focus our inquiry on the stock of base money.

3. Tests of Bundesbank Domination of Candidate-Country Monetary Policy

Monthly data on base money in national currency units were obtained from line 14, "reserve money", of the IMF's IFS tape. Our sample of countries includes the leading Central European transition-economy candidates for admission to the EU, two Baltic countries, Estonia and Latvia, who are also likely to be considered for admission soon, and two Balkan countries, Bulgaria and Romania, whose membership is some time off. We also included in our sample Cyprus, Malta and Turkey, market economies that are also seeking to enter the EU as well as Austria, Finland and Sweden. The former group of market economies is included in our sample to enable us to determine whether market-economy candidates for EU membership are more responsive to German monetary policy than are transition-economy candidates. The latter group of market economies consists of the most recent members of the EU, and their inclusion will enable us to judge the degree to which these countries' policies were dominated by German monetary policy shortly before and then after their joining the EU. We excluded data from the pre-1993 period, both to avoid the early transition period and its financial chaos and to be able to include the Czech and Slovak Republics in the analysis, and, in some cases, data availability forced us to truncate the data set somewhat. The sample ends in 1998-2000 depending on data availability.

The data are set out in Figures 1-5. An examination of these Figures reveals some significant similarities and differences among the groups of countries. The five transition-economy candidates (Figure 1) exhibit growth of base money that is generally more rapid than that of Germany and that also exhibits greater variance, especially in the early part of the sample. Much the same observation applies for the two Baltic countries (Figure 5). By way of comparison, with the exception of Sweden, which encountered considerable financial turbulence in connection with its devaluation, the three most recent members of the EU show roughly similar rates of growth as that of Germany and considerably less variation in base money than the transition economies (Figure 2). In the second half of the sample period, this description also applies to Sweden. Of the non-transition countries seeking to join the EU (Figure 3), Cyprus and Malta have rates of growth of base money that are somewhat greater than Germany's and that exhibit variance similar to those of the front-running transition economies. Turkey is the obvious outlier, with very rapid growth of base money. Finally, the two Balkan transition economies, Bulgaria and Romania, exhibit somewhat different patterns (Figure 4). Romanian base money grows at a rapid pace throughout the sample period, while Bulgaria's base money growth is checked to some extent in the latter part of the period, perhaps as the result of the successful introduction of a currency board.

A. The Long-Term Relationship between German and Transition-Economy Base Money

The first step in our analysis is to determine the time-series characteristics of the data.

As the relevant procedures are well known from the literature on the German domination of the EMS cited above, we merely report that the series on base money, seasonally adjusted and in logs, for the countries examined in this paper are all $I(1)$, meaning that they must be first-differenced to make them stationary.⁷ These findings allow us to test whether each of the candidate country's base money data are cointegrated with those of Germany. If such cointegration exists, then there exists a long-term relationship between the two series, and the two series will move together over time (Engle and Granger, 1987). Moreover, Engle and Granger show that such cointegrated variables can be represented by an error-correction model and that there must exist Granger causality (Granger, 1969) in at least one direction, that is from one of the cointegrated variables to the other. Findings of cointegration mean that the candidate country's base money stock responds to changes in the base money stock of Germany, and that, thus, in the language of the literature, the base money stock of the candidate country is Granger caused or "dominated" by Germany.⁸

We employed the Phillips-Perron test for cointegration (Phillips and Perron, 1988). This test is based on a correction of the t-statistic for the test coefficient on the assumption that the series are characterized by higher-order serial correlation. This correction is nonparametric, and it is robust to autocorrelation of unknown form and as well as to heteroskedasticity. We also employed the augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981), but this test was

⁷ Because, as Elliott *et al.* (1996) show, there is no uniformly most powerful test for this problem, we used both the Dickey-Fuller(1979) and Phillips-Perron (1988) tests. Both yielded similar results. While the sample period may be viewed as short by time series standards, the acceptance of the test results needs to be viewed as much in the light of the decisiveness of the test statistics as in the light of the length of the sample. Test results are available upon request.

⁸ We do not test here the hypothesis that there is Granger causality running in the other direction, that is, from the base money of candidate countries to that of Germany. Both in terms of the size of the candidate countries *vis a vis* Germany and in terms of their influence on German policy making, such Granger causality seems implausible.

less powerful in most cases than the PP test, and thus we do not report the ADF results. Although Gonzalo (1994) suggests that the Johansen (1988) test may be more powerful than the two step method used here to identify cointegration, this applies only if there is a need to identify multiple cointegrating vectors. In our bivariate model there can be at most one cointegrating vector. Moreover, if the variables are cointegrated, then OLS estimates, as obtained in this paper, are "super-consistent" estimates of the cointegrating parameters. In addition, Stock (1987) demonstrates that the OLS estimates of the cointegrating parameters generated by our approach converge more rapidly than do estimates in OLS models using stationary variables. Nevertheless, because any errors in step one of our two-step procedure could be carried over to step two, we also used the Johansen test, and the results of support the conclusions drawn from our two-step procedure.⁹

Table 1 reports the PP test statistics for cointegration between the base money series of the sample countries and Germany. It also gives the sample period for each country. Although the critical values for the PP statistics are precisely those given for the DF tests, the DF critical values are generally not valid for PP cointegration tests. This is so because Engle and Granger's (1987) two-step method amounts to testing for a unit root in the residuals of a first stage regression, but, because these residuals are estimates of the disturbance term, the asymptotic distribution of the test statistic differs from the one for ordinary series. Therefore, the DF critical values are not appropriate for unit root tests in the residuals of a regression. Engle and Yoo (1987, Table 2) provide the correct critical values. Consequently, we use the appropriate critical values provided by Engle and Yoo in Table 1. In addition, because the critical values are sensitive to the presence of a constant and/or a trend term and number of lags used in

⁹ The results of these tests are available from the authors.

estimations, we first tested the significance of these terms and also used a standard model selection procedure to select an appropriate number of lags. The latter is based upon Akaike's information criterion. The details are reported in Table 1.

Among the Central European transition-economy candidates for membership in the EU, three, the Czech and Slovak Republics and Slovenia exhibit cointegration between their base money stock and that of Germany, while the hypothesis of cointegration is rejected for Poland and Hungary. These results suggest that the ability or willingness to follow German monetary policy is not tied to any particular exchange rate regime. For example, the Czech Republic pegged its currency to the dollar and the DM and then abandoned the peg in 1997 in favor of a float.¹⁰ The Slovak Republic maintained a peg against the dollar and DM, while Slovenia operated a managed float. Hungary and Poland, on the other hand have maintained a crawling peg, with Poland's weighed more heavily against the dollar and recently operating with a widened band. It may be that the crawl allowed their central banks to avoid the need to follow German monetary policy as closely as did the three other countries. Turning to the Baltic countries, Estonia's cointegration comes as no surprise given its peg to the DM and its strong currency board arrangement. Latvia, which informally shadowed the SDR through a managed float, on the other hand, displays no cointegration with German monetary policy. For the Balkan countries, Bulgaria and Romania, the hypothesis of cointegration with the German money base is rejected, a result that is consistent with their difficulties in stabilizing their economies.

The results for the non-transition economies are less mixed. Of the three non-transition candidates for EU membership, two, Cyprus and Malta, and the three most recent EU members, Austria, Finland and Sweden, all exhibit cointegration between their base money stocks and that

¹⁰ Although the *koruna* was floated, the Czech National Bank sought to maintain a stable relationship against the DM.

of Germany. Indeed, for Austria and Finland, the PP test statistic is quite high, and that of Sweden would doubtless also be higher were we to exclude the period of financial turmoil surrounding that country's devaluation. Only for Turkey in this group of countries can we reject the hypothesis of German domination, a result unsurprising from an examination of Figure 3.

The domination by Germany of the monetary policy of the most recent members of the EU and of two of the non-market economy candidates for EU membership is strong evidence that participation in the EU, and eventually, in the Euro zone, will require the domination of the ECB over the monetary policies of new members. In this regard, the mixed results for the transition economies must be interpreted with some caution. If their failure to follow the policy making leadership of the Bundesbank is due to the desire of monetary authorities in these transition economies to achieve alternative economic goals, such as the stimulation of growth and economic restructuring at a rate that exceeds that of EU countries or the lowering of inflation at a pace that differs from that of Germany, then EU membership on the basis of a framework such as that proposed by McKinnon might still be possible. If these countries do have the central bank independence and sufficiently developed financial markets to align their monetary policies to those of the ECB, then it may be possible for them to do so on the eve of their accession to membership. This may well be the case for Hungary and Poland, countries that have achieved very high rates of growth of output but that have central banks that are both independent and well run and that are serious about following anti-inflationary policies. Even in the case of these countries, however, one should be cautious. The examples of the market economy candidates as well as those of the three recent members of the EU show convergence with German monetary

policy over the entire sample period, suggesting, perhaps, that a such a long period of policy convergence is appropriate and necessary for countries seeking to join the EU.

The policy conclusions are more discouraging for countries with central banks that are less independent and whose financial systems are weaker, such as Bulgaria and Romania among the transition economies and Turkey among the market-economy candidates. If the failure to follow German policy is due to their central bank's inability or lack of freedom to implement the appropriate monetary policy or to control the stock of base money, then, for these countries, the results above serve as a strong warning sign on the road to EU membership.

B. The Short-Run Dynamics of the German-Transition Economy Base Money Relationship

As mentioned above, if two series are cointegrated, then there exists an error-correction representation of the relationship between the first differences of the two series. The error correction term measures how rapidly the money base in the candidate country reacts to deviations from the long term relationship between the two money stocks. We therefore estimated the standard VAR specification augmented by an error correction term for each of the countries for which we accepted the cointegration hypothesis. Table 2 reports the results of the regressions as specified by Equation 1:

$$M_{x,t} = c_x + \sum_{i=1}^p \alpha_{x,t-i} \Delta M_{x,t-i} + \beta_x M_{Germany,t-i} + \gamma_x EC_{x,t-1} + \epsilon_{x,t}$$

Eq. 1

where M is the logarithm of the stock of base money of country x in national units, and EC is the difference between that country's actual base money stock and its base money stock as predicted

by the long-run relationship between the logarithm of the country's stock of base money and that of Germany. In this specification, the evolution of the growth of the national stock of base money depends on the magnitude of the coefficient of the error correction term, α , on the persistence of domestic monetary policy as given by $\rho_{x,t-i}$, and on the responses of the country to short term fluctuations in German monetary policy as given by $\rho_{x,t-i}$. We set t equal to 12, meaning that changes in national and German money stocks were lagged for 12 months, but, in several cases, a likelihood ratio test indicated that a lag of only 6 months yielded satisfactory results, and we thus opted for the more parsimonious specification. For several countries, a dummy variable was used to capture a structural break caused by turbulence, change in exchange rate regime, etc. These dummy variables and the time period they cover are also reported in Table 2.¹¹

The greater the value of α , the more rapidly a country's monetary authorities react to any divergence in the long-term relationship between their base money stock and that of Germany. An examination of Table 2 reveals significant differences between the three categories of countries as well as some differences within each category. Of the three EU member countries, Austria and Finland react the most rapidly to disturbances in the long-run relationship between their money base and that of Germany. The time needed to eliminate the gap ranges from slightly over one month for Austria to about 7 months for Sweden, with Finland adjusting in about 3 months. Malta and Cyprus, the market-economy candidates for EU membership, adjust in about 6 and 9 months, respectively, perhaps because, not being members yet, they do not perceive the

¹¹ One dummy that we did not incorporate was a dummy for the formation of the Euro zone. A referee suggested that this change in regime should also be represented by a dummy. However, a Chow test showed no structural breaks in either German monetary policy or in that of the countries whose results would have been changed by the inclusion of this dummy. Moreover, including the dummies makes it more likely that the dominance hypothesis will be accepted. Indeed, by including the dummies, the results change to the extent that we accept cointegration between German and Hungarian money stock series.

need for as close a coordination with the Bundesbank's policies as is the case for the EU member countries in our sample. The somewhat larger sample of transition economies yields a range of estimates of adjustment time that ranges from 3 months for Slovakia to almost 10 months for Slovenia. The former country's close adherence to German monetary policy may be somewhat surprising, as neither Slovakia's central bank nor its financial system have the strong international reputation enjoyed by the central banks and financial markets of its transition-economy neighbors. Thus, the close tracking of German policy trends may reflect the reluctance of Slovak monetary authorities to follow a policy that diverges too much from those of Germany, its largest trading partner, and of its neighbor, Austria, which, as we have seen above, also hews closely to the Bundesbank's policies. It may also reflect a lack of confidence on the part of the Slovak central bank in pursuing a more independent policy. Nevertheless, we note that, compared to its transition-economy neighbors, Slovakia's economic performance in terms of growth of output, inflation and export performance have been more than creditable. The other two transition economies, the Czech Republic and Estonia, respond within a period of seven months, a span only marginally longer than that of the Malta, but significantly longer than that of the EU member countries, Austria and Finland. Overall, there is a rough but clearly positive correlation between the intensity of the relationship that a country has with the EU and the speed with which that country's monetary authorities act to eliminate divergences in the long-term relationship between their money base and that of Germany. Nevertheless, those transition economies whose monetary policies are dominated by the Bundesbank tend to react more slowly to divergences between the long-term trends in their monetary policies and those of the Bundesbank than do the market economies in our sample.

Even if candidate countries do not maintain a fixed long-run relationship between their base money stocks and that of Germany, they may choose to follow the policy lead of the Bundesbank by shadowing the short-term fluctuations in German policy. To do this, they would expand their stock of base money in response to the Bundesbank's decisions to increase the growth of Germany's stock of base money, and they would slow the growth of their base money stock when the Bundesbank does so. Evidence of such short term coordination would be that the coefficients in Equation 1 that reflect the influence of lagged German money growth on the growth of a country's money stock, $\alpha_{i, \text{xt-I}}$, would be positive and significant.

The results of this hypothesis test are reported in Table 3. The values of $\alpha_{i, \text{xt-I}}$ for those countries whose money stock is cointegrated with that of Germany are drawn from Table 2; those for the other countries in our sample are drawn from a VAR specification that is identical to Equation 1, with the exception of the error-correction term, which is absent for these countries. Panel C of Table 3 reveals that Finland and Sweden do respond to short-term changes in German monetary policy, although Finland does so in a way that offsets rather than reinforces German short-term policy decisions. That Austria does not appear react to short-term swings in German monetary policy. This finding is not surprising given the speed with which Austria adjusts to any disturbance in the long-term relationship between its monetary policy and that of Germany. Cyprus and Malta, the two cointegrated market-economy candidates, also track short-term fluctuations in German monetary policy. By way of contrast, none of the transition-economy countries who follow German monetary policy in the long run respond to short-run swings in the growth of the German money base (Table 3, panel A). Finally, of the countries that exhibit no long-run ties to German monetary policy (Panel B) only two, Bulgaria and Turkey, respond to short-run variations in the German monetary base.

These results mirror those regarding the long-term relationship between German monetary policy and that of candidate countries. The recent EU members have a stronger tie to German policy in the short run, as do the two non-transition candidates, Cyprus and Malta. The transition economy candidates are less strongly connected to German policy in the short-run, much as in the long run.

4. Conclusions

The motivation for our inquiry was the observation that membership in the EU for both transition and market economy countries will yield mutual benefits only if an exchange rate regime between new members and the Euro-zone countries can be worked out that will be acceptable to both sides. A necessary, if not sufficient, condition for the long-term viability of such a regime is that the new members be able to follow the lead of the ECB in setting their monetary policy. Our results show that such domination of national monetary policy by the Bundesbank, which we see as a proxy for the ECB, quite clearly characterizes the behavior of the most recent members of the EU, Austria, Finland and Sweden. We also find a strong connection between the Bundesbank's policies and those of Cyprus and Malta, two of the market economy candidates for EU membership. Among the transition economies, the ability to follow the policies of the Bundesbank is weaker or, for some countries, not in all cases those that are the most backward in their stabilization and transformation efforts, nonexistent. While we cannot conclude that the failure to follow German monetary policy closely or not at all by the transition economies is an absolute barrier to their joining the EU, such weak policy coordination may reflect the need for a further building up the financial sectors of these countries as well as the

need for a period in which these countries do tie their policies more closely to that of the ECB before they join the EU.

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Table 1 – Bivariate Cointegration Tests
Phillips-Perron (PP) Test Statistics on Estimated Residuals¹

Panel A: EU Candidates

Country	PP test statistic	Sample Period
Bulgaria	-1.68	93:01-98:11
Cyprus	-1.98**	93:12-00:02
Czech Rep.	-2.87*	93:01-00:02
Estonia	-2.79*	93:01-00:01
Hungary	-1.61	93:01-00:02
Latvia	-1.59	93:07-00:02
Malta	-2.08**	93:01-00:01
Poland	-1.36	93:01-00:01
Romania	-1.78	93:09-00:02
Slovak Rep.	-3.66*	93:01-00:02
Slovenia	-2.57**	93:01-00:02
Turkey	-1.52	93:01-99:11

Panel B: Recent EU Members

Country	PP test statistic	Sample Period
Austria	-5.06*	93:01-98:11
Finland	-3.97*	93:01-98:12
Sweden	-2.07**	93:01-00:02

Notes:

1. The reported test statistics are based on the residuals from the following long run equation:

$$\text{Log } X_t = a + b \log(\text{German monetary base})_t + e_t,$$

where X represents the monetary base for an individual country under investigation and e is the error term . Cointegration requires that the error term be stationary. Following Engle and Yoo (1987)'s suggestion, up to 12 lags were initially included in unit-root tests for the error term, and the optimal lag length was chosen based on Akaike's information criterion (AIC). A lag length of three was found to be the optimal lag length in all cases, with the exception of Slovakia for which 6 lags were used.

2. Because the critical values are sensitive to the presence of a constant and/or trend term, cointegration tests were initially conducted using the following three models: model 1 includes a time trend and a constant term; model 2 has a constant term only; model 3 has neither time trend nor constant. The test statistics reported above are based on the best

fitting model. In all cases, model 3 was the best fit except for Finland, for which model 1 was chosen.

* and ** denote significance at the 1% and 5% level respectively.

Table 2: Error Correction Estimates

Panel A: EU Candidates

Variable	Czech Rep.	Estonia	Malta	Slovak Rep.	Slovenia	Cyprus
Constant	0.01	0.04**	-0.01	0.04**	0.08***	-0.05**
Ger (t-1)	-0.92**	-0.73	0.64***	-1.78	0.46	-0.43
Ger (t-2)	-0.17	1.70	1.11**	-2.49	-0.19	1.43*
Ger (t-3)	0.21	0.28	0.64	0.65	0.37	0.55
Ger (t-4)	1.12*	-0.77	0.74	1.78	-0.39	0.32
Ger (t-5)	0.71**	-1.34***	-0.37	2.10	-1.05	0.60
Ger (t-6)	-0.07	0.31	0.27	-0.17	-1.26	0.35
Ger (t-7)	-1.01***	-0.91	-1.03	-1.49	-0.91	-
Ger (t-8)	-1.46**	-0.68	-0.74	-2.39	-1.16	-
Ger (t-9)	-1.30**	-1.33	-0.34	-4.90**	-0.35	-
Ger (t-10)	-1.61**	-1.63	1.13	-4.04***	-1.81	-
Ger (t-11)	0.46	0.16	0.07	-0.68	0.41	-
Ger (t-12)	0.36	0.09	0.85***	-0.21	-0.55	-
Own (t-1)	0.15	-0.58*	0.17	-0.16	-0.70*	0.07
Own (t-2)	0.25**	-0.08	-0.05	0.16	-0.27	0.01
Own (t-3)	-0.16***	-0.20	0.33**	0.17	0.17	0.02
Own (t-4)	0.15	-0.21	0.14	0.15	0.09	-0.03
Own (t-5)	0.24**	0.03	0.31***	0.15	0.14	-0.01
Own (t-6)	0.01	0.02	0.10	0.21	0.08	0.02
Own (t-7)	0.16***	-0.07	-0.01	0.02	-0.19	-
Own (t-8)	0.07	0.05	-0.09	-0.08	-0.21	-
Own (t-9)	0.03	-0.04	0.15	0.06	0.28**	-
Own (t-10)	0.05	0.42**	-0.13	0.08	0.24***	-
Own (t-11)	0.04	0.08	0.08	-0.04	0.10	-
Own (t-12)	-0.01	-0.25	0.04	0.03	-0.02	-
Error corr.	-0.14**	-0.14**	-0.17*	-0.34**	-0.10***	-0.11*
Adj. R ²	0.34	0.49	0.15	0.09	0.53	0.19

Table 2 Continued: Error Correction Estimates

Panel B: Recent EU Members

Variable	Austria	Finland	Sweden
Constant	0.01	0.01	0.02
Ger (t-1)	-1.13*	-1.15*	1.27***
Ger (t-2)	-0.48	-1.53***	1.36**
Ger (t-3)	-0.08	-0.30	-0.18
Ger (t-4)	-0.07	-0.04	0.21
Ger (t-5)	-0.01	1.03	0.60
Ger (t-6)	0.01	0.66	0.33
Ger (t-7)	0.43	0.27	-
Ger (t-8)	-0.30	-0.59	-
Ger (t-9)	0.05	-0.92***	-
Ger (t-10)	-0.43	-0.44	-
Ger (t-11)	-0.24	-0.15	-
Ger (t-12)	-0.76*	-0.47	-
Own (t-1)	0.45	-0.10	0.27**
Own (t-2)	0.42	-0.18	0.25*
Own (t-3)	0.43	0.06	0.16*
Own (t-4)	0.45**	0.27**	-0.32*
Own (t-5)	0.41	0.23***	0.07
Own (t-6)	0.33	0.30***	0.22***
Own (t-7)	0.22	0.15	-
Own (t-8)	0.21	0.18***	-
Own (t-9)	0.07	0.12	-
Own (t-10)	-0.08	0.08	-
Own (t-11)	-0.09	0.18**	-
Own (t-12)	0.86*	0.20**	-
Error corr.	-0.64**	-0.31*	-0.14*
Adj. R ²	0.81	0.32	0.42

Notes:

1. The reported significance levels are based on the Newey-West (1987) heteroskedasticity and autocorrelation consistent standard errors. *, **, and *** denote significance levels at 1, 5, and 10 percent level, respectively.
2. For some countries, there was a break in the monetary base growth rates, and we used a (0,1) dummy variable to capture the break. These include Sweden (zero until 97:02 and 1 afterwards), Slovenia (zero until 95:03 and 1 afterwards), Cyprus (zero until 95:12 and 1 afterwards), and the Czech Republic (May 1997=1, and zero otherwise).

Table 3 - Short-Run Dynamics

chi-square test statistics for the significance of German money growth coefficients in individual money base growth equations

Panel A: EU Candidate Countries Cointegrated with Germany

Variable	Sum of coefficients	Chi-Square test stat.
Cyprus	2.86	2.84 (0.09)***
Czech Republic	-3.69	1.47 (0.22)
Estonia	-4.69	1.08 (0.30)
Malta	2.98	9.13 (0.00)*
Slovak Republic	-13.63	2.30 (0.13)
Slovenia	-6.46	2.00 (0.16)

Panel B: EU Candidate Countries not Cointegrated with Germany

Variable	Sum of coefficients	Chi-Square test stat.
Bulgaria	8.78	7.07 (0.00)*
Hungary	-1.46	2.07 (0.15)
Latvia	0.91	0.22 (0.64)
Poland	0.06	0.01 (0.96)
Romania	1.43	0.41 (0.52)
Turkey	3.27	2.68 (0.10)***

Panel C: Recent EU Members

Variable	Sum of coefficients	Chi-Square test stat.
Austria	-3.02	2.36 (0.12)
Finland	-4.03	6.98 (0.00)*
Sweden	3.59	6.21 (0.01)*

Notes:

1. The number of lagged German money coefficients used for Panel A and C countries are based on those reported in Table 2, while 12 lags are used for Panel B countries.
2. P-values are in parentheses. *, **, *** as in Table 2.
3. In estimations, we also accounted for a structural break for the following Panel B countries: Turkey (1994 crisis from May through November) and Latvia (August 1998).

Figure 1 Base Money for Germany and Transition-Economy Candidates

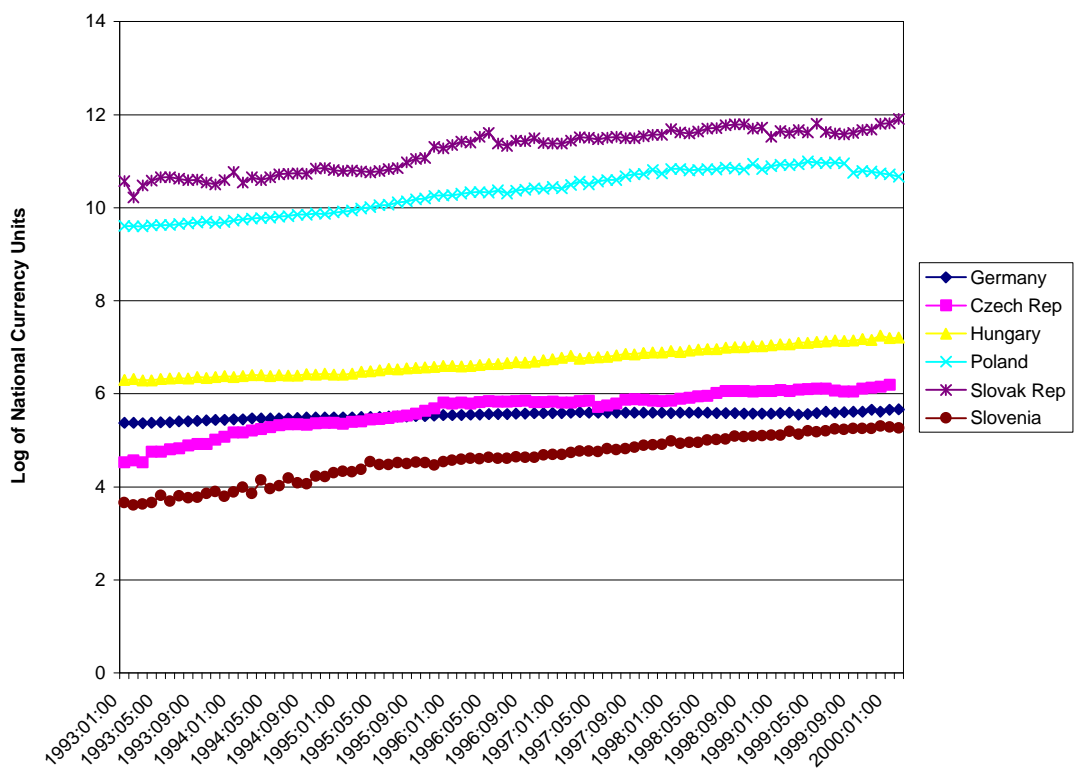


Figure 2 Money Base for Germany and Recent EU Members

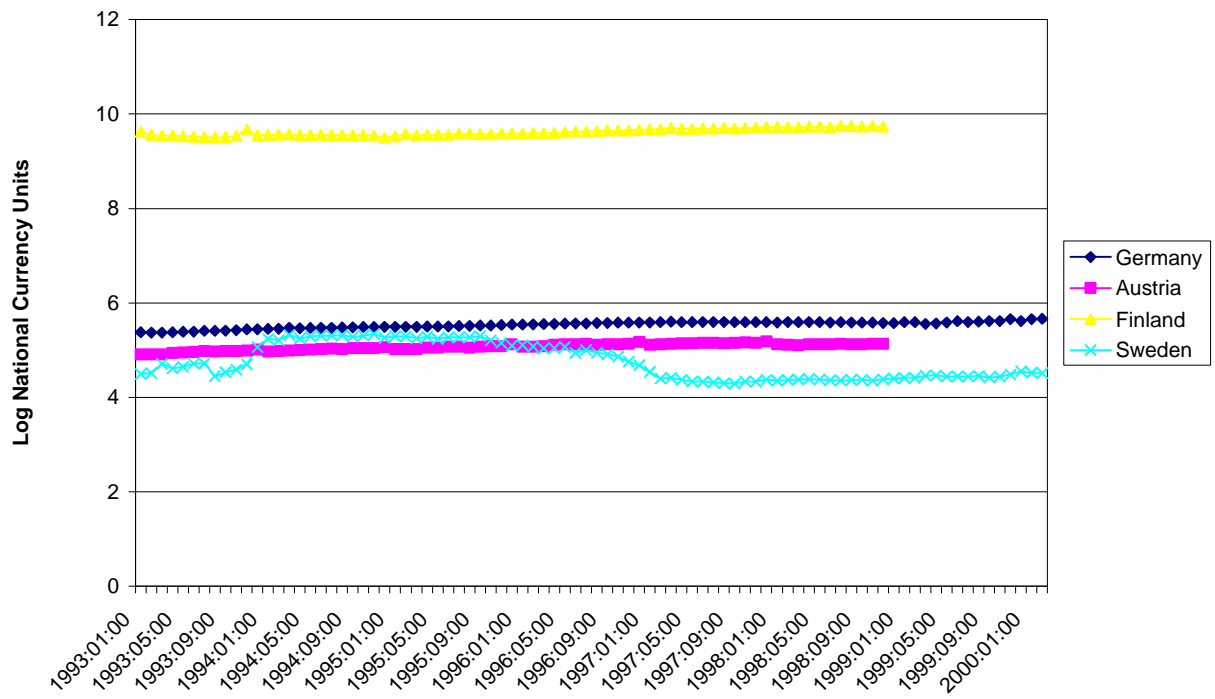


Figure 3 Money Base for Germany and Non-Transition Candidates for Membership

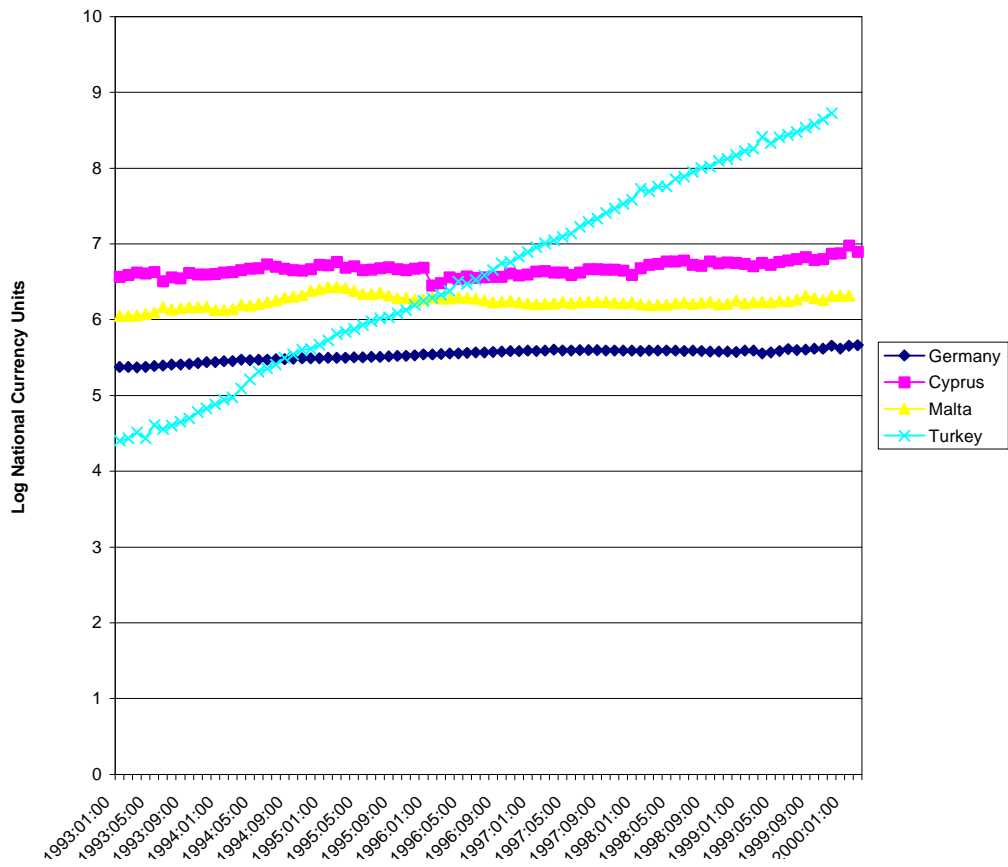


Figure 4 Base Money for Germany and Balkan Countries

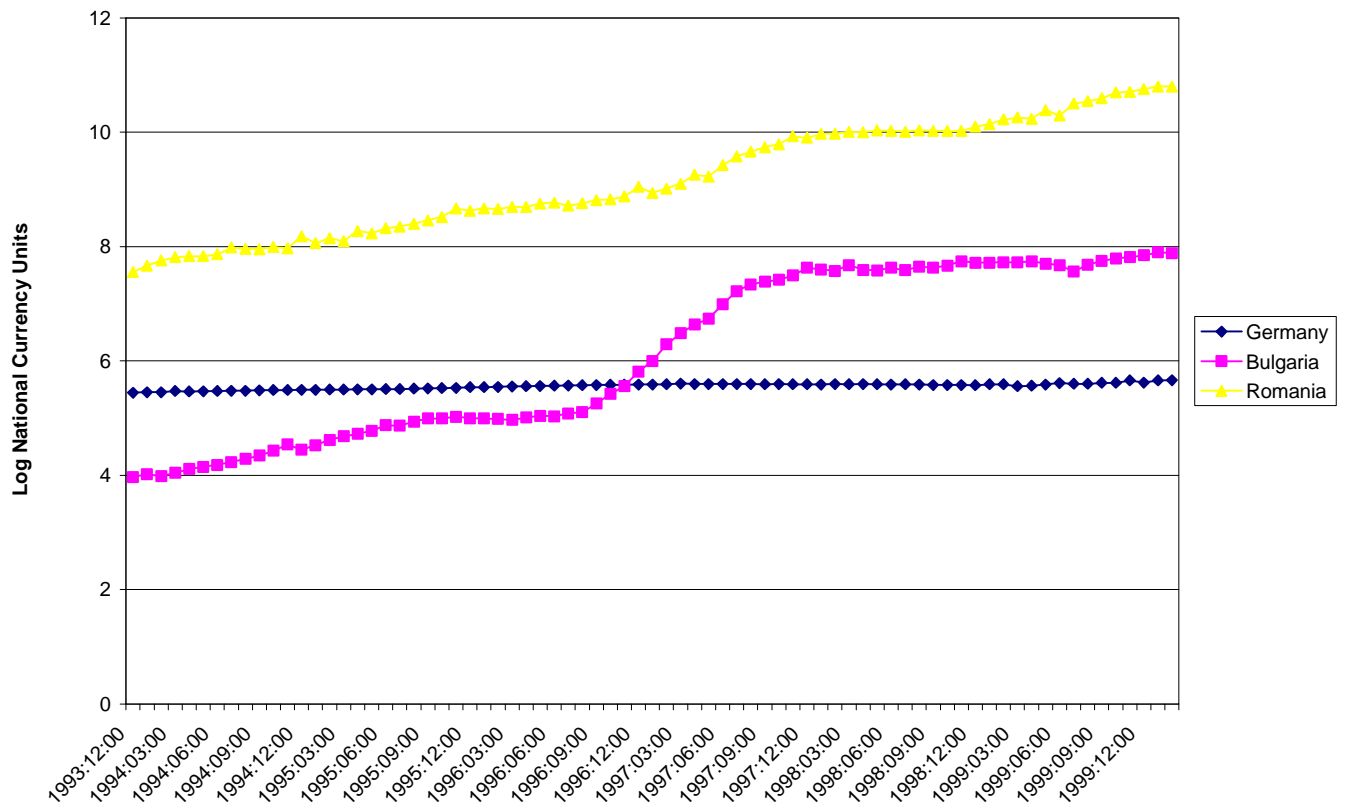
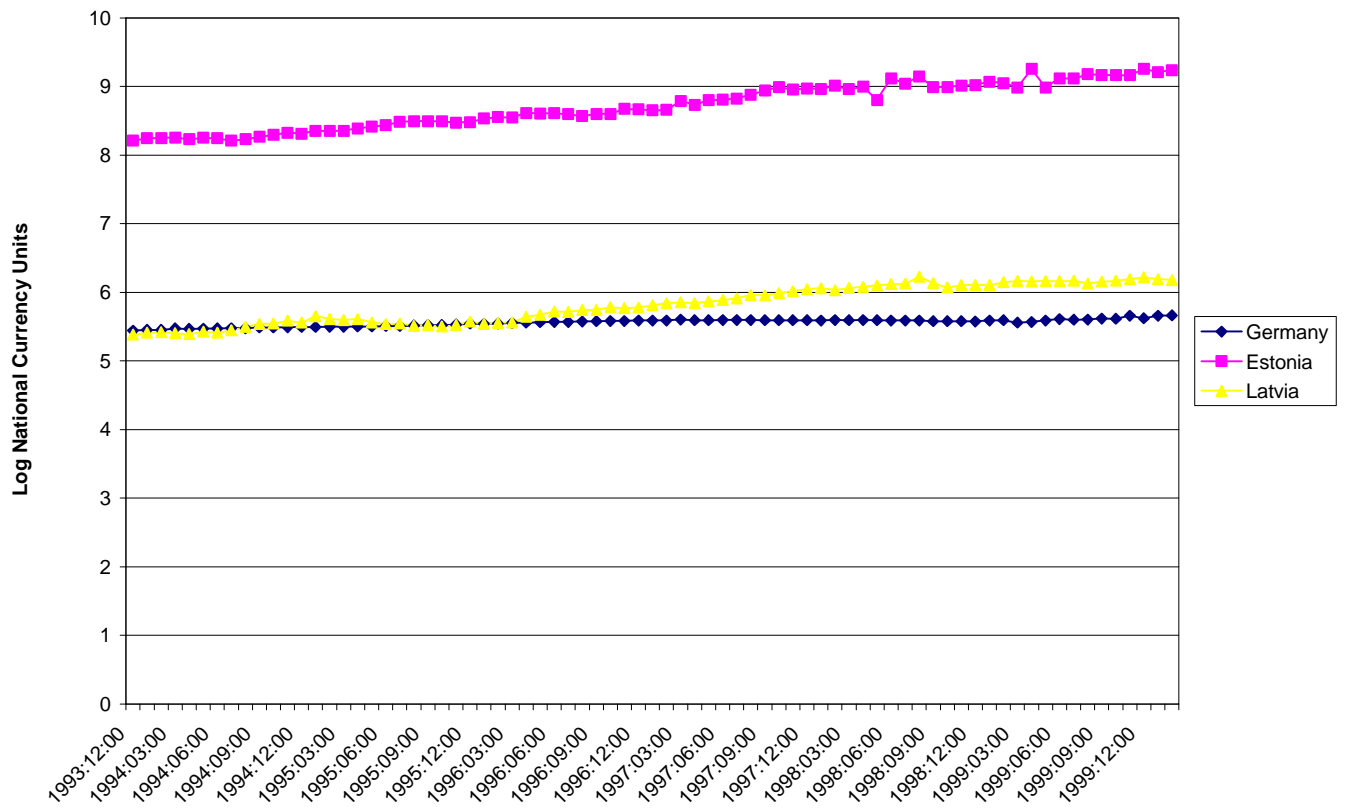


Figure 5 Base Money for Germany and Baltic Republics



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Zentrum für Europäische Integrationsforschung
Center for European Integration Studies
Rheinische Friedrich-Wilhelms-Universität Bonn

Walter-Flex-Strasse 3
D-53113 Bonn
Germany

Tel.: +49-228-73-1732
Fax: +49-228-73-1809
www.zei.de