Nominal versus Real Convergence with Respect to EMU Accession
- EMU Entry Scenarios for the New Member States

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Abstract:
This paper explores the conflict of real and monetary convergence during the EMU run-up of the Central and Eastern European new EU member states. Based on a Balassa-Samuelson model of productivity driven inflation, it finds a high probability of higher inflation in the new member states. It compares the policy options which might make the compliance possible, i.e., fiscal tightening and nominal appreciation within the ERM2 band. Nominal appreciation within ERM2 seems the better option to achieve the compliance with the Maastricht criteria as no discretionary government intervention is necessary and losses in terms of real growth are less. Having once opted for nominal appreciation within ERM2 by fixing the ERM2 entry rate as the ERM2 central rate (Irish model), a high degree of flexibility is provided in coping with erratic short-term capital inflows. Setting the ERM2 entry rate above the ERM2 central rate (Greek model) implies a clear exchange rate path within ERM2 and thereby less exchange rate volatility. Despite the merits of nominal appreciation, countries committed to hard euro pegs or with high budget deficits might choose fiscal contraction as a solution, which will require a high degree of fiscal flexibility and thereby decisive structural reforms.

Keywords: *EMU, ERM2, Balassa-Samuelson effect, real appreciation, monetary union, Central and Eastern Europe.*

JEL: E52, F31

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1. Introduction

The enlargement of the European Union (EU) heralds the enlargement of the European Monetary Union (EMU). With their EU accession all new member states have become members of the EMU—although with a derogation. While the obligatory EMU membership can be postponed by not meeting the Maastricht criteria (as presently Sweden does), most new member states want to join as soon as possible. They expect welfare gains in terms of enhanced macroeconomic stability, more trade, and lower interest rates (De Grauwe and Schnabl 2004).

Given the considerably lower stage of economic development, the compliance with the Maastricht criteria will be more difficult than for the present EMU members. Assuming that the ongoing real economic catch-up process of the new member states is likely to lead to higher inflation than in the euro area the incompatibility of the Maastricht inflation and exchange rate criteria has been stressed (Halpern and Wyplosz 2001, Buiter and Grafe 2002, De Broeck and Sløk 2002).

Several studies have explored solutions to the Maastricht "dilemma". Following McKinnon (1984) Buiter and Grafe (2002: 41-42) propose to apply the Maastricht inflation criterion to traded goods only to exclude the productivity driven CPI inflation from the convergence process. Szapáry (2002) suggests "*a waiver*" or "*derogation*" to the inflation criterion for countries with a strong Balassa-Samuelson effect. But both the renegotiation and the complete derogation of (one of) the nominal Maastricht criteria would violate the "*prerequisite of equal treatment*" (European Central Bank 2004: 7-8).

As the Maastricht criteria are likely to be applied in a strict manner (ECB 2004: 8), the Deutsche Bundesbank (2003) suggests a "careful timing" of EMU accession. If the new member states join the EMU after having accomplished their economic catch-up process, productivity driven inflation differentials will be negligible. The downside of this approach would be an (in the new member states) undesired long waiting period.

If they want to achieve a fast EMU membership, restrictive macroeconomic policies in the EMU run-up may be necessary. Begg et. al (2001: 40-41)—who scrutinize the impact of international capital inflows to the present southern EMU member states during their EMU accession period—argue that tighter fiscal policies were helpful in controlling inflation and overheating. Buiter and Grafe (2002: 41) suggest that the candidate countries need a transitional recession to depress inflation. Gros et al. (2002) argue that a restrictive macroeconomic policy would dampen the price gap between traded and non-traded goods and thereby the upward-drift of consumer price inflation. Fiscal contraction to curb inflation may be supported by a "non-inflationary wage policy" as suggested by the National Bank of Slovakia (2003).

While fiscal contraction may be an adequate tool to comply with the nominal (and simultaneously the fiscal) Maastricht criteria, it will require a high degree of fiscal flexibility and cause significant losses in terms of real growth. We therefore explore nominal appreciation within the ±15% ERM2 band as an alternative adjustment mechanism to productivity driven inflation to ensure compliance with the Maastricht criteria in the EMU run-up.

2. The Balassa-Samuelson Effect with Respect to EMU Accession

In the 1960s, Balassa (1964) and Samuelson (1964) observed that developing countries experienced higher productivity gains in the tradable sector than industrial countries. At the same time higher consumer price inflation contributed to a secular "catch-up" of prices.

2.1. The Basic Model

Our basic version of the Balassa-Samuelson model is a two-country model with a tradable goods (industry) and a non-tradable goods (services) sector as described by De Grauwe and Skudelny (2002). We assume perfect competition in the tradable goods markets and perfect mobility in the national labour markets—but no labour mobility between the two countries. There is no direct competition between the non-traded sectors of the two countries and no competition between the traded and non-traded goods sector within each country.

The production of traded and non-traded goods in each country is based on two Cobb-Douglas production functions for the traded goods sector T and the non-traded goods sector NT:

$$Y^i = A^i (K^i)^{\gamma^i} (L^i)^{1-\gamma^i} \quad \text{with } 0 < \gamma^i < 1 \text{ and i = T, NT} \tag{1}$$

In equation (1) Y^i is the (real) output, A^i is technology, K^i is (fixed) capital, and L^i is the employed labour force in sector i.[1] In both sectors output is generated by combining technology, capital and labour. Assuming competitive markets and profit maximization the marginal productivity of labour $((1-\gamma^i)\frac{Y^i}{L^i})$ must correspond to the real wage in the respective sector. The real wages in the two sectors are defined as nominal wage divided by the price level of the respective goods:

$$(1-\gamma^i)\frac{Y^i}{L^i} = \frac{W^i}{P^i} \tag{2}$$

[1] The overall labor force of the economy $\overline{L}$ is assumed constant: $\overline{L} = L^T + L^{NT}$

Nominal wages in the traded and non-traded sectors are assumed to be equal as perfect labour mobility between the traded and non-traded sector is assumed ($W^T = W^{NT} = W$). This yields:

$$-c\frac{Q^T}{Q^{NT}} = -\frac{P^{NT}}{P^T} \tag{3}$$

where Q^i are the labour productivities in the respective sectors ($\frac{Y^i}{L^i}$) and c is a positive[2] constant depending on the respective weights of the tradable and non-tradable goods ($\frac{1-\gamma^T}{1-\gamma^{NT}}$).

If productivity in the non-traded goods sector is assumed constant, according to equation (4), an increase in traded goods productivity increases the relative price of non-traded goods. As the overall consumer price level is a composite of traded and non-traded goods, the general price level will rise.

Pegging the Exchange Rate

The increase of non-traded goods prices relative to traded goods prices can be achieved in two ways relying on the monetary framework. In the new member states we currently observe a broad variety of exchange rate arrangements ranging from hard pegs to the euro in Estonia and Lithuania to (more) flexible exchange rates in the Czech Republic and Poland.

First we study the impact of fixed exchange rates on the adjustment mechanism that applies for the group with tightly fixed exchange rate arrangements. We assume that Euro Area (E) tradable prices (P_E^T) are exogenous for the accession country (A) and for simplicity constant ($\overline{P}_E^T$). Further, we assume that purchasing power parity holds for the traded goods sector. Traded goods prices in the accession country (P_A^T) are determined based the exchange rate against the euro ($E_{A/E}$) and on traded goods prices in the Euro Area and ($P_A^T = E_{A/E} * P_E^T$).

Now, if the exchange rate of the accession country currency is assumed constant against the euro ($\overline{E}_{A/E}$), traded goods prices in the accession country are constant ($\overline{P}_A^T$) as well. As shown in equation (4), given fixed nominal exchange rates, productivity gains higher in the traded goods sector will lead to higher inflation in the non-traded goods sector. As the consumer price index is a

[2] As γ^T and γ^{NT} are larger than 0 and smaller than unity.

composite of traded and non-traded goods, consumer price inflation will be higher than in the euro area. This leads to a real appreciation of currency A, which is in line with the relative productivity gains.[3]

$$-c\frac{Q^{T}\uparrow}{\overline{Q}^{NT}}=-\frac{P^{NT}\uparrow}{\overline{P}_{E}^{T}*\overline{E}_{A/E}}=-\frac{P^{NT}\uparrow}{\overline{P}^{T}} \tag{4}$$

Pegging Inflation

An alternative adjustment mechanism is provided when a country chooses to "peg" inflation, i.e., to adjust consumer price inflation (close to) the EMU level while allowing the exchange rate to float (more) freely. While all Central and Eastern European countries had adopted macroeconomic frameworks based on exchange rate stabilization throughout most of the 1990s, recently some countries—Poland, the Czech Republic and implicitly the Slovak Republic—have moved recently towards inflation targets leaving the exchange rate (more or less) free to float (Schnabl 2004).

If inflation is brought (close) to the Euro Area level—as required by the Maastricht inflation criterion—relative productivity will adjust via the nominal exchange rate. With prices of foreign traded goods assumed exogenous and constant ($\overline{P}_{E}^{T}$) and (non-traded goods) inflation fixed to the EMU level ($\overline{P}_{E}^{NT}$), the nominal exchange rate will appreciate. Because inflation is equal to the Euro Area level, the nominal appreciation against the euro is equal to the real appreciation, which is again in line with the relative productivity gains.

$$-c\frac{Q^{T}\uparrow}{\overline{Q}^{NT}}=-\frac{\overline{P}^{NT}}{\overline{P}_{E}^{T}*E_{A/E}\downarrow} \tag{5}$$

2.2. Critique and Empirical Evidence

There are short-comings to the Balassa-Samuelson model as presented in section 2.1. The assumptions such as perfect competition in international goods markets, perfect labour mobility between sectors, and absent competition in services may be too restrictive. Furthermore, the real appreciation

[3] Real appreciation will also induce an adjustment of the current account to net capital inflows. As additional net capital inflows will be spent on both traded and non-traded goods, the current account deficit would be ceteris paribus smaller than net capital inflows. The higher relative prices on non-traded goods will shift the demand to traded goods to ensure that the current account is matched by the capital account.

pressure which originates in supply side productivity gains may be weakened or enhanced by other factors outside the Balassa-Samuelson framework.

Productivity gains are not restricted to the industrial sector. Besides the catch-up in the industry, the Central and Eastern European countries are undergoing significant structural changes in the service sector such as banking, insurance, transport and retailing (Mihaljek and Klau 2003). This may be even more the case, because an increasing number of services are becoming tradable thereby accelerating efforts to restructure. If productivity growth would be the same in the industrial and service sector, based on equation 3 relative prices between the traded and non-traded goods sectors would remain constant and the Balassa-Samuelson effect would be absent.

To shed light on this issue Table 1 shows productivity changes in the large new member states where data on value added (volumes) in both the industrial and the service sector are available.[4] We observe that productivity changes are more volatile in the industry than in the service sector. Industrial productivity growth is high during periods of economic expansion and falls rapidly in times of recession. For instance, during the 1998/99 Czech economic crisis or during the 2001/2002 economic downturn in Poland and Hungary industrial productivity growth was slowing sharply or even became negative. Productivity changes in the service sector are less volatile.

Yet in average, for all four countries industrial productivity has been growing significantly faster than in the service sector. For the period from 1994 up to 2002 the yearly averages for all countries are 6.97% for the industrial sector in comparison to 3.52% for the service sector. The upshot is that productivity growth in the service sector may soften, but would not invalidate the Balassa-Samuelson effect.

[Table 1 about here]

Furthermore, non-traded goods inflation is not solely driven by the supply side as suggested by the Balassa-Samuelson model. Also the demand side matters (Bergstrand 1991). As wages, income, wealth and consumption increase in both the industrial and service sector, the relative price of non-traded and traded goods is affected depending on the private consumption pattern: (1) If the demand for both traded and non-traded goods grows at the same rate, the demand effect is neutral and the relative price between non-trade and trade goods is solely driven by supply side effects. (2) If the growth of private aggregate demand is biased towards the traded goods sector the supply side effect is (partly) offset by the income effects. (3) If consumer demand is biased towards non-traded goods the Balassa-Samuelson effect is enforced.

[4] Productivity measures as sectoral output per employee lead by and large to the same results, but the sample would be more fragmented due missing data.

Option (3) is the most likely outcome. If incomes rises due to increased productivity, the demand for services is likely to increase relative to traded goods because "*nontraded services are luxuries in consumption while traded commodities are necessities*" (Bergstrand 1991: 325): Countries with rising (real per capita) income will exhibit higher demand for non-traded services relative to traded (industrial) goods. The relative price of non-traded to traded goods is likely to rise thereby enhancing the supply-side driven appreciation pressure.

Given that the Central and Eastern European economies are very open, in specific for trade with the EU15, the (cyclical) demand side effects on prices may even originate abroad, independent from domestic productivity gains. For instance, as experienced in 2003 sluggish demand (and low inflation) in EU center countries contributed to lower inflation in the new member states. When the economies in the western part of the European Union started to recover in 2004, inflation in the new member states resumed quickly (Table 2).

To this end, even if both supply and demand side effects are taken into account, inflation in the EMU accession candidate countries is difficult to predict and the single determinants are difficult to disentangle. Nevertheless inflation is likely to be higher than in the Euro Area. Empirical estimations suggest the Balassa-Samuelson effect (and other reinforcing effects) to be in the range of 1.0% to 3.0% per annum (Mihaljek and Klau (2003: 4) give an overview).

Empirical evidence on the likelihood of higher inflation in the new member states is shown in Table 3, Table 4 and Table 5. Table 3 lists whole economy productivity gains for the new member states in comparison to Germany. Productivity in new Central and Eastern European member states has been and is expected to grow considerably faster. Based on the information given in Table 1, a considerable part of this productivity growth can be assumed to originate in the industrial sector.

The changes of consumer prices relative to wholesale prices can be used as an indicator for (expected) productivity driven inflation as shown in equation 3. In Table 4 positive values indicate higher CPI inflation (as a proxy for non-traded goods prices) in comparison to wholesale price inflation (as a proxy for traded goods prices). In most years for most countries consumer prices grew faster than wholesale prices as indicated by the large number of positive entries. In average for all Central and Eastern European countries consumer prices have increased considerably faster than in Germany. This trend is weaker for countries such as the Czech Republic and Poland which have (temporarily) allowed for considerable nominal appreciations of their currencies.

[Table 3 and Table 4 about here]

As shown in equation 5, real appreciation against the euro captures both higher inflation than in the Euro Area and nominal appreciation of the domestic currency against the euro. In Table 5 we use Germany as the reference country to compute real appreciation against the euro and the German mark back to 1994. Negative values indicate real appreciation against the German mark (representing the euro starting in 1999).

It is evident from Table 5 that in most years for most countries the currencies of the new member states were under real appreciation pressure, which is in line with the relative productivity gains vis-à-vis the Euro Area. Real appreciation is in average least for Cyprus, Malta and Slovenia which have reached the highest stage of economic development in terms of GDP per capita.

[Table 5 about here]

A lower degree of real appreciation and even real depreciation in some countries in 2002 to 2004 could be seen as an indication of a gradually fading real appreciation pressure as the new member states approach the productivity level of the EU15. Yet the catch-up process of the new member states and therefore the rise of price levels can be expected to continue for a considerable period of time. As shown in Figure 1 differences in terms of both GDP per capita and price level are still significant. In many countries both indicators are still less than half of the EU15. Given a robust relationship between the real GDP per capita and the price level which is suggested by the Balassa-Samuelson effect and empirically shown by Kravis and Lipsey (1988) we would expect that both the economic catch-up process and the increases in price levels will continue for a considerable period of time.

[Figure 1 about here]

To provide evidence on the time dimension of the economic catch-up process Figure 2 shows the gap between Japanese and US CPI inflation and (real) appreciation of the Japanese yen against the US dollar. Japan's economic catch-up, which was driven by high industrial productivity gains compared to the US, lasted from about 1960 up to the late 1980s—roughly 30 years. During the fixed rate period Japan moved from the fixed (Bretton Woods) exchange rate regime to flexible rates in the early 1970s.

Figure 2 shows how Japan's relative productivity gains were adjusted under fixed exchange rates by higher inflation (than the US) and later on by nominal appreciation. The left panel of Figure 2 plots inflation in comparison to the United States. During this period inflation remained consis-

tently higher than in the US. After Japan had moved to flexible rates in the early 1970s, relative productivity gains were reflected in nominal appreciation of the Japanese yen against the dollar (right panel of Figure 2) and inflation was lower than in the US. Under both exchange rate regimes Japanese productivity gains led to the real appreciation of the Japanese yen against the dollar as shown in the right panel of Figure 2.

Given Japan's experience, we would expect that the real appreciation pressure on the Central and Eastern European currencies would persist—at least for one or two decades. The inflationary pressure may even increase in the wake of EMU accession as observed for some of present EMU members such as Ireland due to accelerated capital inflows. Depending on the exchange rate regime these capital inflows will enhance nominal appreciation in the case of more flexible rates. If exchange rates are fixed, additional inflation will emerge via official foreign currency purchases which result in an increasing money supply.

All in all, as shown in Table 2, higher inflation will remain a considerable concern in the EMU accession candidate countries. In the past, most of them—with the exception of Lithuania—would not have fulfilled the Maastricht inflation criterion (Table 2). In Poland and the Czech Republic, where the Maastricht criterion was fulfilled in 2002 and 2003, the previous nominal appreciations of their currencies are likely to have contributed to lower inflation.

2.3. Fiscal Contraction versus Nominal Appreciation

Given that under higher productivity growth fixed exchange rates and convergence of inflation are difficult to achieve simultaneously as required by the Maastricht criteria, the EMU accession candidates have to consider macroeconomic measures to cope with the dilemma of real versus nominal convergence dilemma as shown in section 2.

Two solutions are possible. First, some countries will pursue tight exchange rate pegs to the euro. After having entered the ERM2 in July 2004, Estonia, Lithuania and Slovenia have remained committed to a narrow ERM2 bandwidth close to ±0% although the official ERM2 bandwidth has been set to ±15%. The hard peg to the euro is likely to lead to higher inflation than in the euro area. Fiscal contraction to meet the Maastricht inflation criterion will be necessary. Sufficient fiscal flexibility requires structural reforms, which may be implemented easier in smaller than in larger countries.

While fiscal consolidation will support the efforts to meet the fiscal Maastricht criteria for these countries, whose deficits are above the 3% limits, there will be considerable costs in terms of an economic downturn in the advent of EMU accession. Macroeconomic volatility will increase, as

the fiscal tightening will be relaxed after the EMU entry. Furthermore, there remains uncertainty about the adequate degree and timing of fiscal measures which may destabilize expectations on the EMU entry process.

[Figure 3 about here]

3. Case Studies of EMU Entry

Nominal appreciation within the ERM2 band may be a viable alternative for restrictive fiscal policies for two reasons: First, adjustment to higher inflation by nominal appreciation is "automatic". It does require any discretionary government action. Second, as adjustment is achieved by relative price changes between traded and non-traded goods and therefore through expenditure switching, losses in terms of real growth will be less.

The prerequisite of equal treatment would imply that the new member states will be able to pursue similar accession strategies as the present members. This applies for both the ERM2 band width, which was ±15% for the present members, as well as for the accession strategies, which were "more flexible" in the cases of Ireland and Greece. Therefore pre-EMU entry Ireland and pre-EMU entry Greece provide the possible blueprints for an EMU entry based on more exchange rate flexibility within ERM2.

3.1. The "Flexible" Irish Model

As shown in Figure 4, before its EMU entry the Irish pound experienced wide fluctuations around the central rate but within the ERM1 ±15% limits. In December 1997—one year before the planned EMU entry—the Irish currency was quoted at around 8% below the bilateral DM central rate, which was in line with the significant productivity growth relative to the EU core countries and inflation converging towards the EMU Maastricht benchmark. Because the central rate could be expected to correspond to the final conversion rate (fixed rate rule), this implied—given no further policy measures—an 8% depreciation of the Irish pound over the next twelve months (Figure 4).

[Figure 4 about here]

Given the prior appreciation of the pound, the Irish government had two options of setting the final entry rate. Leaving the bilateral central rates unchanged would have meant that the preva-

lent bilateral central rates would have corresponded to the final bilateral EMU entry rates. As exchange rates were likely to be more responsive to changes in market expectations than short-term interest rates, without revaluation of the central rate the final announcement of the conversion rate could be expected to trigger a move of the exchange rate towards the conversion rate.[5] Such sharp depreciation would have stimulated growth, but would also have caused additional inflationary pressure to the (post-)EMU entry Irish economy—possibly putting the Maastricht inflation criterion at risk and contributing to overheating.

The alternative was to revalue the bilateral central rates to avoid such sharp depreciations. If, for instance, the bilateral central rate had been revalued by 8% no upward pressure on prices and wages would have emerged, but at the cost of less growth. The Irish government opted for a 3% revaluation of the bilateral central rates in March 1998 which corresponded to a compromise between depreciation and "complete" revaluation (Honohan 1997).

3.2. The "Rigid" Greek Model

While the Irish model has the merit of flexibility, it suffers from sharp exchange rate movements prior to the final fixing of the entry rate. In specific, sharp exchange rate fluctuations of large countries such as Poland may disturb the macroeconomic stability in smaller neighboring EMU aspirant countries. Although the exchange rate of the Greek drachma did not appreciate in the wake of the EMU entry,[6] the Greek model might provide useful insights for the new member states, because it ruled out sharp exchange rate fluctuations by setting the ERM2 entry rate different from the ERM2 central rate.

The Greek EMU entry process is shown in Figure 5. On March 16 1998 the Greek drachma entered the ERM1 with a significant depreciation at a central rate equivalent to 353.109 drachmas per euro. In September 1998, the Greek government announced to participate in ERM2 with a bandwidth of ±15%. In January 1999 Greece entered ERM2 with a central rate of 353.109 drachmas per euro—about 7.5% above the then market rate of around 329 drachmas per euro on December 31 1998 (Garganas 2003).

[Figure 5 about here]

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5 Depreciation was also suggested by interest rate differentials. Despite the appreciation of the Irish pound Irish short-term and long-term interest rates had remained higher than in Germany.

6 Due to a small industrial and a large service sector (tourism) no Balassa-Samuelson effect could be observed in Greece.

Because the ERM2 central rate against the euro was expected to correspond to the final conversion rate (fixed rate rule), this implied a nominal depreciation of the drachma within the ERM2 band. The central rate provided the upper limit for the depreciation because any rise beyond the central rate would have caused doubts about Greece's ability to enter EMU. In effect the ERM2 bandwidth was reduced to 15% with the exchange rate moving upward (depreciation) within a 7% to 8% corridor towards the central rate.

When the depreciation proceeded slowly during the first year of ERM2 membership, the revaluation of the central rate to 340.75 drachma per euro in January 2000 helped in reaching the final conversion target more smoothly. Finally, on June 19 2000 the ECOFIN Council announced the Greek EMU membership starting from January 2001 together with the final conversion rate which corresponded to the prevailing ERM2 central rate of 340.75 drachmas per euro.

4. Entry Scenarios based on Nominal Appreciation

Applying the Irish model to the EMU entry of the new member states would provide flexibility to exchange rate movements prior to the final fixing. The (reversed) Greek model could reduce exchange rate volatility while allowing for adjustment to productivity driven real appreciation pressure.

4.1. Exchange Rate Flexibility within the 30% Band

As shown in section 2, given large differentials in productivity growth in the new member states, a nominal appreciation below the central rate is more probable when inflation rates converge towards the EMU level. Speculative capital inflows which anticipate EMU membership may enforce the real appreciation pressure. Once the conversion rate is announced, exchange rates will depreciate towards the central rate as shown by De Grauwe, Dewachter and Veestraeten (1999). The resulting inflationary pressure can be cushioned by a revaluation of the central rate.

The Irish entry scenario is simulated in Figure 6 under the restrictive assumption that exchange rates adjust gradually to the Balassa-Samuelson effect via nominal appreciation taking into account that inflation is (close to or) equal to the EMU level.[7] We simulate yearly nominal (and real) appreciations of 1% up to 5%.

[7] In practice the nominal exchange rates can be assumed to be more volatile, in particular as capital controls are removed.

[Figure 6 about here]

As shown in Figure 6, in most cases, nominal appreciation would be sufficient to accommodate the equilibrium appreciation pressure. (Intra-marginal) central bank intervention would remain necessary to control for sharp short-term exchange rate fluctuations which might surpass the ±15 limits.

Further, we assume that the assessment of compliance with the Maastricht criteria takes place after 24 months ERM2 membership (waiting room approach) and that at the same time the final EMU conversion rate[8] after—say—six months after assessment is announced. At this time the currencies of the new member states have probably appreciated considerably as shown in Figure 6. If the prevalent central rate would be announced to be the conversion rate, the respective currencies would gradually depreciate towards the conversion rate starting—or even prior—from the day of the announcement.

To dampen the resulting inflationary pressure the revaluation of the central rate has to be considered. Six months prior to EMU entry, the final conversion rate is easier to determine than at ERM2 entry. The degree of revaluation will be subject to negotiations between the EMU and the accession country. In Figure 6 we assume that a further appreciation is projected and relative productivity gains are fully incorporated in the determination of the final conversion rate. Nevertheless, a mixed strategy as pursued in Ireland which allows for some depreciation prior to the EMU entry is possible.

4.2. Exchange Rate Flexibility within the upper ±15% band

In contrast to the Irish model the Greek model suggests to set the ERM2 entry rate different from the ERM2 central rate to reduce exchange rate volatility. In Greece exchange rate volatility during ERM2 membership was much smaller than in Ireland because the entry rate and the central rate projected a clear exchange rate path towards EMU membership. The danger of sharp reversals of international capital flows will be less, as long as the entry strategy (including the fiscal criteria) remains credible.

In contrast to Greece, which allowed for a gradual depreciation within ERM2, the entry rate of the new member states would be above the central rate because a nominal appreciation is expected. Figure 7 simulates the EMU entry based on the Greek model (in reverse). Like in the Irish model we assume a probationary period of 24 months in ERM2 (waiting room approach) and an additional six month membership after successful compliance. We assume that different countries

[8] This corresponds to the central rate due to the fixed rate rule.

have different degrees of real appreciation. With inflation rates assumed to be (close or) equal to the EMU we simulate nominal appreciation.

In order to project the adequate ERM2 entry rate exact information is needed concerning the degree of expected appreciation and the duration of ERM2 membership. Here we assume appreciations from 1% up to 5% and a stay in ERM2 of 30 months—two years probationary period before assessment and six months preparation for EMU accession (waiting room approach). Based on these assumptions the ERM2 entry rates can be calculated recursively. As shown in Figure 7 a high expected nominal appreciation will project a higher ERM2 entry, while a low expected real appreciation will lead to an ERM2 entry closely above the central rate. As for Greece the de facto bandwidth will be considerably smaller than 30% (maximum < 15%) depending on the ERM2 entry rate.

[Figure 7 about here]

Setting the ERM2 central rate above the entry rate is based on the idea that the currencies will appreciate toward the projected EMU entry rate. This scenario implies a clear commitment in favour of the pre-announced EMU entry rate. If this commitment is credible, exchange rate volatility will be low to provide a safe EMU entry. Faster appreciation pressure than projected can be adjusted by a revaluation of the central rate. In contrast, less appreciation than expected will lead to additional appreciation pressure thereby putting an additional restrictive effect on the EMU accession candidate.

4.3. Heterogeneous EMU Entry Strategies and the Maastricht Criteria

As both hard pegs to the euro and gradual appreciation within ERM2 constitute possible EMU entry strategies the new member states are likely to choose different entry options. This may—given that the Maastricht criteria for EMU entry remain unchanged—make the EMU entry for the group of countries with hard pegs even more difficult.

According to the Maastricht Treaty and the respective protocols inflation should "*not exceed by more than one percentage points that of, at most, the three best performing Member States in terms of price stability.*" As the best performing members in terms of inflation will be chosen among all EU25 member states, these new member states which allow for gradual appreciation of their currencies are more likely to be the best performing members in terms of inflation.

For instance in 2003, Poland (0.7) and the Czech Republic (-0.1) which had previously allowed considerable appreciations of their currencies were among the three best performing mem-

bers. Together with Lithuania (-1.1) the average inflation was -0.16 which is significantly below the 2.1 HICP inflation of the Euro Area as a whole—and also significantly below the 1.2 average of the three best performing EMU members Germany (1.0), Austria (1.3), and Finland (1.3).

This implies that heterogeneous entry strategies might constitute an additional entry barrier for countries pursuing hard pegs in contrast to countries which allow for nominal appreciation. In fact the countries which opt for nominal appreciation will elevate the hurdle for countries with fixed exchange rate strategies. This may suggest a coordination of entry strategies.

5. Outlook

Eight Central and Eastern European economies have joined the European Union. As the new member states have explicitly indicated their strong intention to join the EMU as soon as possible they face the Maastricht dilemma of real versus nominal convergence. There is no indication that the nominal criteria will be redesigned for the new member states.

This paper focused on nominal appreciation as the main option to achieve a smooth EMU membership. We have shown in section 2 that there exists a substantial systemic upward pressure on inflation that may put their EMU membership at risk. A number of countries will need to follow a policy of fiscal consolidation. In other countries, restrictive budgetary policies are not necessary. Whatever the budgetary policies these countries follow, it appears that the best they can do to take care of real appreciation pressure consists in allowing for a gradual nominal appreciation of their currencies.

Having once opted for gradual appreciation the Irish or the reversed Greek models could be the blueprint for ERM2 membership. Defining the ERM2 entry rate as the ERM2 central rate provides a high degree of flexibility during the probationary period, but it allows for sharp exchange rate fluctuations and opens the door to strategic behaviour with respect to the EMU entry rate. Choosing the ERM2 entry rate above the ERM2 central rate helps to reduce exchange rate volatility and thereby to achieve a safe EMU entry. It necessitates clear information about expected appreciation and the duration of ERM2 membership.

Although nominal appreciation within the ERM2 corridor seems the better choice to reconcile nominal and real convergence, there are countries that have decided to adopt hard pegs to the euro (Estonia, Lithuania, Slovenia and potentially Latvia). Given the considerable investment these countries have made in the credibility of these arrangements, it does not seem desirable to change these arrangements.

There are countries which will have to go through a process of fiscal consolidation prior to their entry into the euro zone. Our main conclusion also holds for these countries. A gradual appreciation of the currencies of these countries is desirable. In the absence of such appreciation, these countries will have to follow policies of fiscal restriction that are tighter than is necessary to satisfy the Maastricht fiscal criteria.

Finally, given irrevocably fixed exchange rates, higher inflation is a very likely outcome at the new Eastern periphery of the enlarged EMU. Once a new member state has achieved EMU entry, higher inflation is in line with the Maastricht Treaty. As we regard this higher inflation as the outcome of the catch of productivity, real GDP per capita and price levels, i.e., an equilibrium phenomenon, is it not problematic from this perspective. But the challenge of a one size fits all monetary policy, i.e., the dangers of highly heterogeneous real interest rates within the Euro Area will persist.

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Table 1: Productivity Changes in the Industrial and Service Sectors (Percent)

	Czech Republic		Hungary		Poland		Slovak Republic	
	industry	**services**	**industry**	**services**	**industry**	**services**	**industry**	**services**
1994	11.90	3.33	6.74	3.94	11.27	4.44	10.91	0.44
1995	11.93	2.61	8.52	-0.93	13.64	4.34	35.65	5.23
1996	13.75	0.44	3.98	2.08	8.81	4.16	2.23	2.00
1997	6.22	0.83	13.40	1.92	14.39	3.27	-2.49	13.14
1998	-8.49	5.24	10.30	3.50	7.48	4.01	5.24	4.59
1999	-2.07	1.51	8.33	2.70	4.01	4.34	2.94	1.24
2000	8.02	0.83	6.93	4.48	7.27	3.31	-1.96	7.64
2001	2.59	6.43	2.51	4.10	-0.79	2.36	10.23	4.60
2002			2.83	4.02	1.52	2.90		
Average	**5.48**	**2.65**	**7.06**	**2.87**	**7.51**	**3.68**	**7.84**	**4.86**

Source: OECD. Productivity calculated on the basis of value added (volumes).

Table 2: HICP Inflation in the New Member States (Percent)

	CZ	CY	EE	HU	LV	LT	MT	PL	SK	SI	MIB
1999	1.8	1.1	3.1	10.0	2.1	0.7	2.3	7.2	10.5	6.1	**2.1**
2000	3.9	4.9	3.9	10.0	2.6	0.9	3.0	11.0	8.2	8.2	**2.5**
2001	4.5	2.0	5.6	9.1	2.5	1.3	2.5	5.3	7.2	8.6	**2.9**
2002	1.4	2.8	3.6	5.2	2.0	0.4	2.6	1.9	3.5	7.5	**2.5**
2003	-0.1	4.0	1.4	4.7	2.9	-1.1	1.9	0.7	8.5	5.7	**1.3**
2004*	2.8	1.8	3.8	6.7	7.7	3.0	3.2	4.7	7.0	3.4	**3.7**
Mean	**2.5**	**3.1**	**3.7**	**7.1**	**3.5**	**0.9**	**2.6**	**4.7**	**6.9**	**6.7**	**2.6**

Source: ECB. CZ = Czech Republic; CY = Cyprus, EE = Estonia, HU = Hungary, MT = Malta, LV = Latvia, LT = Lithuania, PL = Poland, SK = Slovak Republic, SI = Slovenia, MIB = Maastricht inflation benchmark. HICP = Harmonized Index of Consumer Prices. * Values up to October 2004. The Maastricht inflation benchmark (MIB) is calculated for every year as an average of the three best performing **EU25** members in terms of price stability. Shaded areas indicate that the hypothetic Maastricht inflation criterion has been met.

Table 3: Productivity Changes in the Whole Economy (Percent)

	CY	CZ	EE	HU	LV	LT	MT	PL	SI	SK	DE
1994	n.a.	n.a.	1.79	n.a.	4.89	13.70	-4.21	n.a.	n.a.	n.a.	n.a.
1995	n.a.	5.15	11.43	n.a.	3.01	10.62	5.26	n.a.	n.a.	5.65	1.52
1996	22.47	4.12	7.01	1.83	2.44	5.79	3.70	3.99	5.24	3.74	1.06
1997	2.58	-0.03	10.51	4.41	4.86	3.75	6.35	3.90	5.49	5.94	1.57
1998	3.75	0.36	7.23	3.02	3.42	5.04	8.13	2.40	3.48	4.66	0.88
1999	3.37	2.62	4.55	0.95	3.29	5.17	-1.18	6.99	4.46	4.26	0.79
2000	2.13	3.99	9.42	4.17	-1.60	10.12	7.94	6.42	0.67	3.95	1.08
2001	2.06	3.16	5.51	2.80	-4.12	5.70	10.86	1.65	2.21	3.17	0.39
2002	0.62	0.94	5.87	3.43	2.48	4.77	15.15	3.69	3.75	5.52	0.66
2003	1.50	3.75	3.63	1.70	1.66	5.63	6.53	4.92	2.82	1.87	0.87
2004	2.69	n.a.	4.73	2.60	1.67	5.70	5.49	4.16	3.10	3.39	1.32
2005	3.18	n.a.	5.48	2.75	0.83	5.63	5.32	3.61	3.13	3.51	n.a.
Mean	**4.43**	**2.67**	**6.43**	**2.77**	**1.90**	**6.80**	**5.78**	**4.17**	**3.44**	**4.15**	**1.01**

Source: ECB. CY = Cyprus, CZ = Czech Republic, EE = Estonia, HU = Hungary, MT = Malta, LV = Latvia, LT = Lithuania, PL = Poland, SI = Slovenia, SK = Slovak Republic.

Table 4: Changes of Consumer Prices Relative to Wholesale Prices (Percent)

	CY	CZ	EE	HU	LV	LT	MT	PL	SI	SK	DE
1994	1.33	4.41	n.a.	5.89	16.33	18.94	n.a.	2.44	2.81	3.12	2.13
1995	-0.97	1.53	2.54	-0.17	11.69	8.84	n.a.	2.01	0.59	0.80	-0.01
1996	0.82	3.82	7.19	1.47	3.46	6.27	n.a.	5.85	2.86	1.62	2.70
1997	0.79	3.51	2.03	-1.71	4.14	7.43	n.a.	2.58	2.15	1.55	0.70
1998	1.71	5.45	3.81	2.61	2.73	10.40	n.a.	4.18	1.89	3.34	1.34
1999	0.42	1.09	4.58	4.68	6.64	-0.73	n.a.	1.68	3.91	6.51	1.60
2000	-2.85	-0.94	-0.80	-1.72	2.02	-14.06	n.a.	2.25	1.10	2.04	-1.76
2001	0.38	1.84	1.29	4.22	0.76	5.16	n.a.	3.78	-0.48	0.68	-1.02
2002	1.43	2.34	3.14	6.75	1.01	4.10	n.a.	0.71	2.24	1.22	1.77
2003	1.20	0.39	1.13	2.16	-0.26	-0.78	n.a.	-1.90	2.96	0.23	-0.65
2004*	0.37	-1.62	0.26	4.03	-1.14	-4.64	n.a.	-2.77	-0.45	4.16	0.35
Mean	**0.42**	**1.98**	**2.52**	**2.56**	**4.31**	**3.72**	**n.a.**	**1.89**	**1.78**	**2.30**	**0.65**

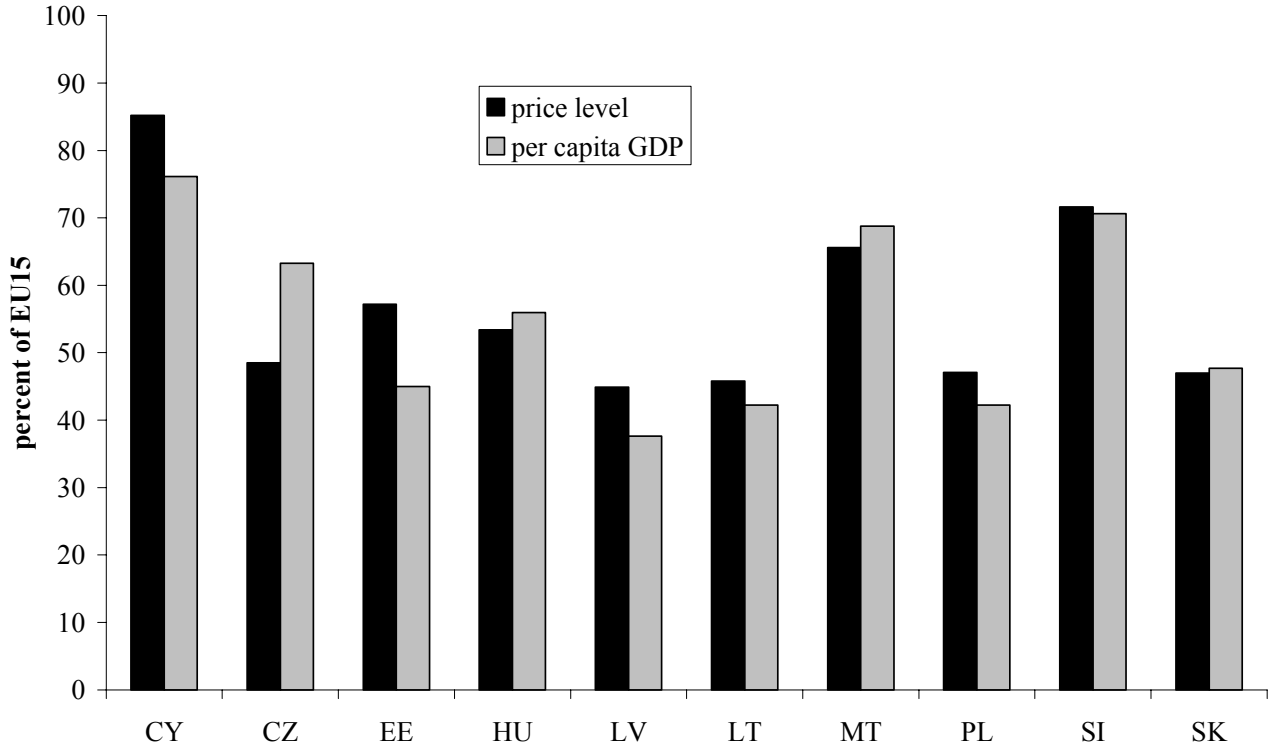
Source: IMF: IFS. CY = Cyprus, CZ = Czech Republic, EE = Estonia, HU = Hungary, MT = Malta, LV = Latvia, LT = Lithuania, PL = Poland, SI = Slovenia, SK = Slovak Republic. * January – October.

Table 5: CPI Based Real Appreciation against the Euro (German Mark) (Percent)

	CY	CZ	EE	HU	LV	LT	MT	PL	SI	SK
1994	-1.07	-6.01	-30.35	0.73	-36.17	-44.32	-0.62	-1.46	-1.59	-3.87
1995	3.18	-2.72	-21.06	7.30	-13.13	-17.06	3.05	-4.02	-6.59	-2.80
1996	-3.30	-9.18	-17.56	-5.06	-14.24	-22.47	-3.34	-10.35	0.51	-5.80
1997	-5.96	-4.89	-7.81	-8.54	-14.00	-18.80	-8.19	-6.56	-3.77	-8.63
1998	-1.96	-8.43	-6.80	-0.05	-3.50	-5.34	-2.22	-5.65	-4.17	-2.29
1999	-0.54	1.07	-2.68	-3.07	-6.57	-4.32	-3.08	2.55	-0.60	2.35
2000	-3.41	-5.70	-2.48	-4.90	-11.40	-13.08	-5.83	-12.71	-1.27	-12.83
2001	0.35	-6.79	-3.52	-7.93	0.05	-2.25	-1.18	-11.57	-0.40	-3.07
2002	-1.52	-9.84	-2.16	-8.83	2.96	-2.28	0.52	4.29	-1.83	-3.27
2003	-1.35	4.36	-0.20	0.70	8.90	2.14	4.91	14.68	-1.06	-9.44
2004*	4.69	0.12	-1.20	-4.27	-0.86	0.52	-0.58	3.95	0.17	-7.62
Mean	**-0.99**	**-4.36**	**-8.71**	**-3.08**	**-8.00**	**-11.57**	**-1.51**	**-2.44**	**-1.87**	**-5.21**

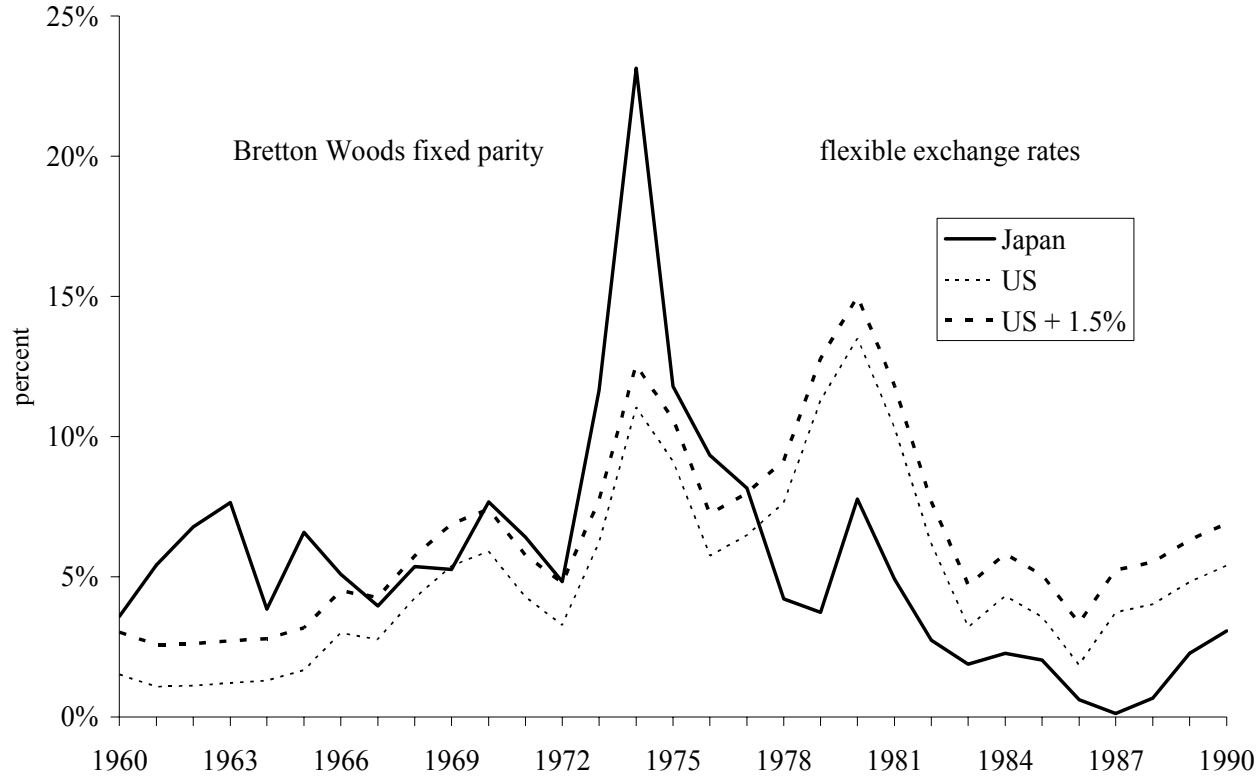
Source: IMF: IFS. CY = Cyprus, CZ = Czech Republic, EE = Estonia, HU = Hungary, MT = Malta, LV = Latvia, LT = Lithuania, PL = Poland, SI = Slovenia, SK = Slovak Republic. * January – October.

Figure 1: Differences in Price Levels and GDP per Capita (as Percent of EU15)

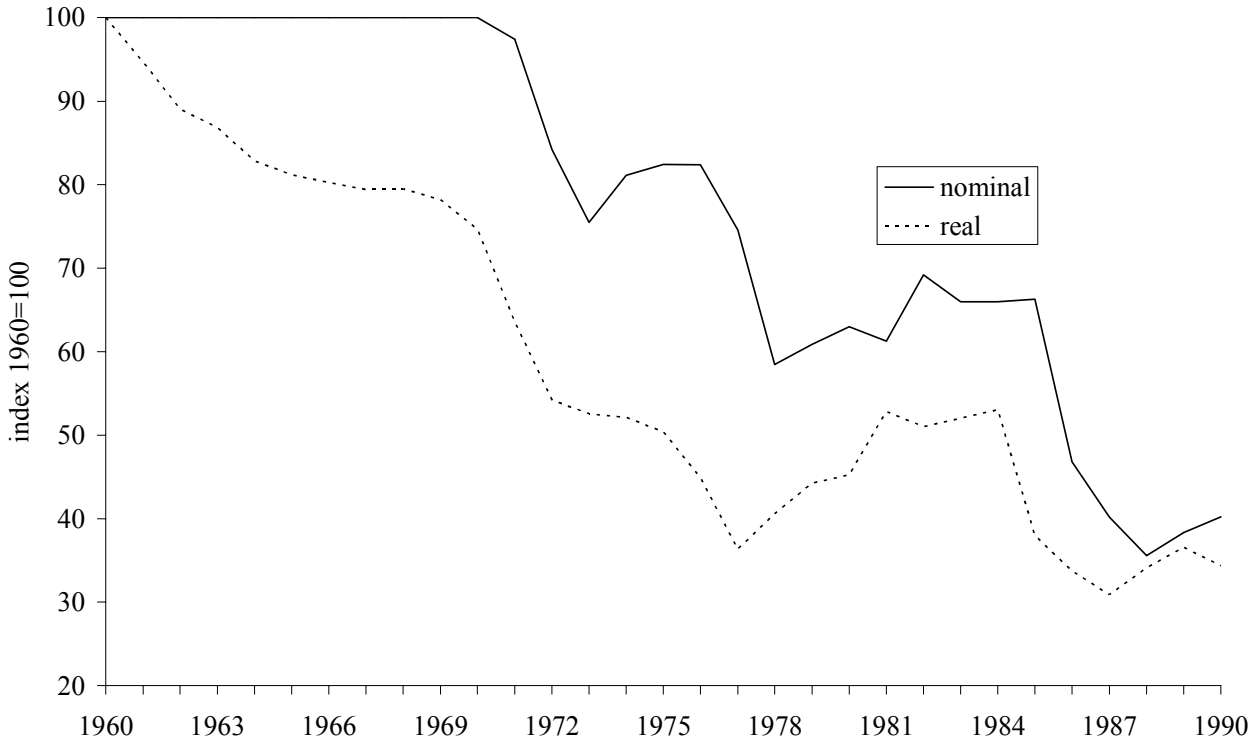


Source: Eurostat. Relative price level indices.

Figure 2: Exchange Rate Regime and Inflation in Japan and the US (1960–1990)



CPI inflation

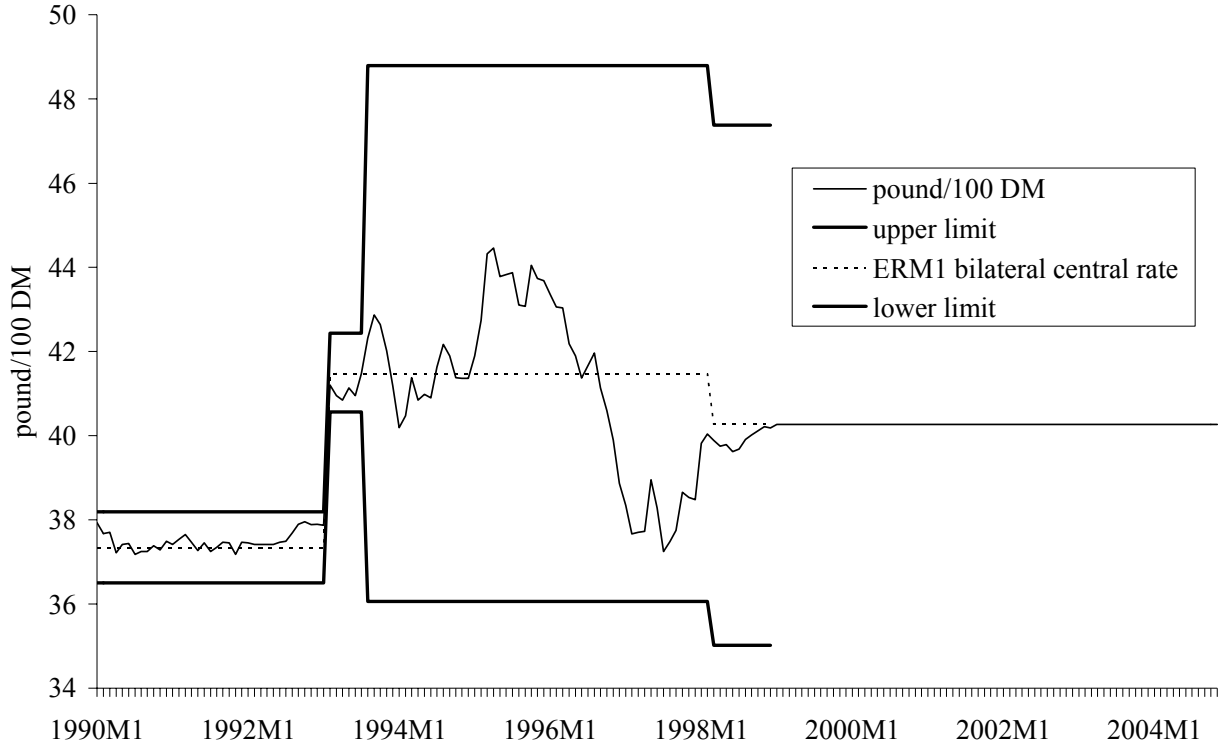


real and nominal yen/dollar exchange rate

Source: IMF: IFS. Real exchange rate calculated based on consumer prices.

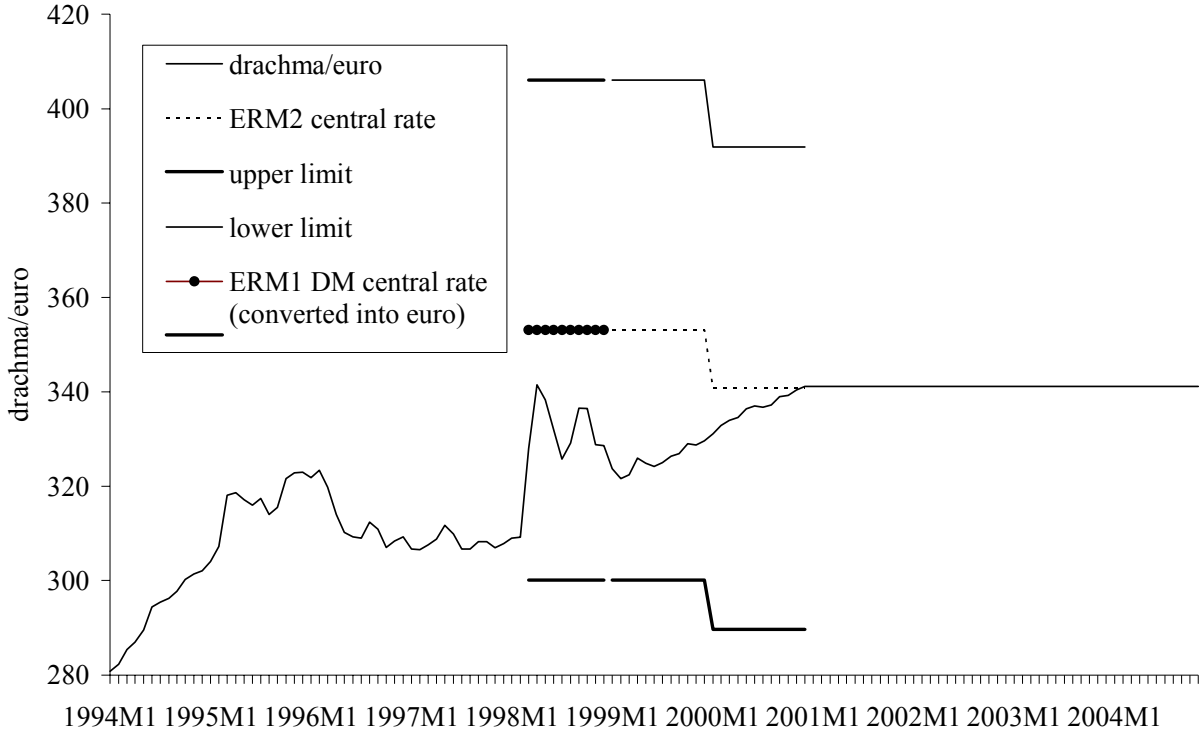
Figure 3: Simulation of EMU Entry Based on Hard Pegs to the Euro

Figure 4: ERM1 and EMU Membership of Ireland



Source: IMF: IFS.

Figure 5: Pre-ERM2, ERM2 and EMU Membership of Greece



Source: IMF: IFS. Before January 1999 the DM represents the euro.

Figure 6: Simulation of EMU Entry Based on the Irish Model

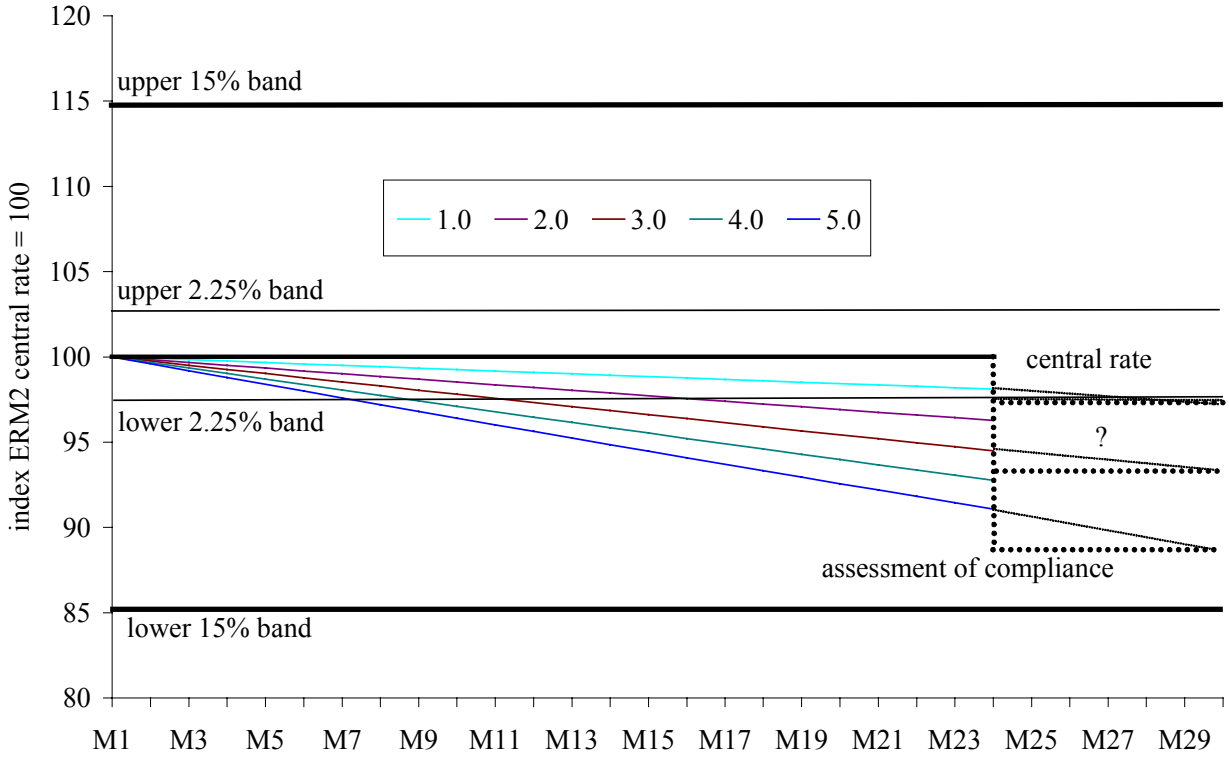


Figure 7: Simulation of EMU Entry Based on the Greek Model