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STABILIZATION INSIDE AND OUTSIDE EMU*

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ABSTRACT: One central issue in the creation of EMU was whether the common central bank could provide enough stability to the member countries abandoning their domestic monetary policies. In this paper, we analyze the stabilization policies of an EMU candidate country, outside and inside the monetary union, and combine the effects of short-run stabilization policies with these policies' potential long-run repercussion on the natural rate of output. Such repercussions can emerge if the option to stabilize using domestic monetary policies leads to a permanent rise in the expected real interest rate through the anticipation by the private sector of devaluation-prone policies. We show under which conditions this argument will make it worth while to delegate monetary policy to the common central bank. Inflation targeting policies, when the target is as tight as that of the ECB, do not, in general, lead to this outcome. Instead, in contrast to the popular view, policies with the aim of targeting output, under mild conditions, lead to this conclusion. Finally, an empirical model of the real rate of interest in Sweden is estimated based on the theoretical results of the paper.

Key Words: EMU, stabilization policies, interest rate differential

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TIIVISTELMÄ: Yksi keskeinen tekijä EMUn luomisen yhteydessä koski sitä, voiko yhteinen rahapolitiikka tuottaa riittävästi stabilisaatiota maille, jotka luopuvat kansallisesta rahapolitiikasta. Tässä tutkimuksessa analysoidaan stabilisaatiopolitiikkaa EMU-kandidaattimaassa rahaliiton ulkopuolella ja sisäpuolella yhdistäen lyhyen ajan stabilisaatioon tämän politiikan mahdollinen pitkän ajan vaikutus potentiaaliseen tuotantoon. Tämä vaikutus voi syntyä siitä, jos mahdollisuus stabilisoida johtaa pysyvään nousuun odotetussa reaalikorossa sitä kautta, että yksityinen sektori odottaa devalvaatiohakuista politiikkaa. Osoitamme, millä ehdoilla kokonaisarvio stabilisaatiosta ja kasvusta puoltaa liittymistä rahaliittoon. Ns. inflaatiotavoitteen noudattaminen, jos tavoite on sama kuin EKP:llä, ei yleisesti johda tähän tulokseen. Sen sijaan vastoin yleistä käsitystä politiikka, joka pyrkii vain tuotannon vakauttamiseen, johtaa heikoilla ehdoilla tähän tulokseen. Lopuksi estimoidaan malli, jolla selitetään tutkimuksen teoreettisiin tuloksiin perustuen reaalikoron määräytymistä Ruotsissa.

Asiasanat. EMU, stabilisaatiopolitiikka, korkoero

1. INTRODUCTION

Much of the economic analysis during the preparations in the EU to introduce a single currency was conducted along the lines of the seminal optimal currency theory. The basic message of this theory is that if countries' business cycles are synchronized enough through trade and factor movements, then a single monetary policy can provide them enough of the needed stabilization. As a result, these countries can, with limited risk, start to reap a permanent welfare benefit through the efficiency gains, i.e., reduced transaction costs and exchange rate risk, related to a common currency.

More recent versions of this theory have, instead, suggested an endogenous synchronization of the business cycles in a currency union, because more intensified trade links will lead to a similarity in the business fluctuations, as suggested by Frankel and Rose (1998). Anyway, it would be too far-reaching to claim that the stabilization issue has become an irrelevant topic in a monetary union like EMU, as witnessed by the large body of theoretical and empirical research on it. In this respect, the cases of Sweden and Finland are of special interest and worth considering also from a broader perspective. Concerns of stabilization in these countries have been, and still are, reflected in the policy preparations for and debate on joining, or living in, EMU.

The deep economic depressions experienced in Finland and Sweden in the early 1990s form the economic background to their integration policies towards EU and EMU membership. During these turbulent times, both countries had to give up a fixed parity to the ECU and let their currencies float in 1992. The consequent large devaluation and flotation led to a permanent real depreciation of the currencies, i.e., a rise in competitiveness with no marked rise in inflation, in contrast to what was suggested by those policy makers wanting to stick to the parities adopted in the 1980s. The crises were reinforced by temporary sharp rises in foreign and, in particular, domestic interest rates. However, the flotation of the currencies managed to drive the interest rates down to a level conducive to both price stability and reflation of the economy. In other words, it helped restore the lost credibility of the central bank, although only after a painful stage, and attracted foreign currencies back home. So, the experiences of both Finland and Sweden were quite negative as to the fixed exchange rate policies of the late 1980s and quite positive towards the free floating around the mid-1990s. Nevertheless, the two countries chose different positions towards EMU and thus also irrevocably fixing their exchange rates vis-à-vis that of the Euro Area. Why?

Clearly, there are wide differences in politics and economics between Finland and Sweden. On the political side, it is apparent that Finland desired to be in the inner core of the EU after being in its shadow, viewed at least from a European perspective, during the Cold War. Sweden has for long pursued a "splendid isolation" with neutrality and a "superior social model"; so its threshold for giving up a part of its sovereignty, also with respect to monetary policy, could be imagined to be quite high.

On the economic side, the efficiency gains of a single currency were probably evaluated somewhat differently in Finland and Sweden, and the need and effectiveness of stabilization

policies were assessed differently, too. In Sweden, it was also felt that it would be risky for a country to adopt an irrevocably fixed exchange rate, because there was previously, although no longer in the 1990s, a clear downward trend (real depreciation) in the real exchange rate of the krona against the D-mark, reflecting the need for recurrent nominal devaluations. Recently, Sweden has started to rethink its position outside the monetary union. Conditions of entry defined in the so-called Calmfors Committee[1] of 1998 have been more or less met, as the economic performance of the country has been quite favourable during the recent years, unemployment has declined to a low level and government finances have turned from a position of deficit to a sizeable surplus. The gains of a single currency have become more visible as the changeover to the euro proceeded smoothly in 2002 and also the handicap in EU politics of staying outside the monetary union, the spearhead of EU integration, has been felt during the period.

In Finland, on the other hand, two basic arguments were raised with respect to stabilization and EMU. First, there is a reduced need for activism in policies as the disappearance of the balance of payment constraint in EMU no longer reinforces, through accommodative economic policies, a recession which starts from a slowdown in exports.[2] The second argument is a general negative attitude towards stabilization using monetary policy. It suggests that the option of devaluation is (easily) reflected as a premium in the domestic interest rate, eliminating much of the benefits of floating, even permanently so, especially in a country with foreign indebtedness. The Swedish view, on the other hand, held that it is possible to float successfully without much cost. If a recession leads to a devaluation, attendant deflation in the economy keeps the domestic interest rate from rising.

The stabilization issue has again been recently thoroughly analysed by a new Swedish committee, see the report published in SOU (2002). It concerns and gives recommendations on fiscal policy making in a monetary union. This is not a central issue here, however, for the focus of the paper is basically on the choice of the proper monetary regime. It is, of course, true that a monetary union also gives more leverage to fiscal policy, as the interest rate does not react, neutralizing some of the effects of fiscal expansion in a single (small) country. Monetary union may also have an impact on the wage setting behaviour of unions, see e.g. Coricelli et al. (2001) and Alho and Erkkilä (1996), but we also omit explicit consideration of this issue here.

The aim of this paper is to evaluate the stabilization policy argument of joining or not joining EMU. Although this theme has received much attention throughout the EMU preparation, we hope to shed some new light on the issue by, i.a., linking short-run stabilization policy with its long-run repercussion as to the potential growth of the economy. Recent research, see e.g. Cooley and Quadrini (2002), has emphasized the cooperation vs. conflict situation in international monetary policies and the inefficiency in this sense related to preserving national monetary policies. This consideration is not examined at all in our paper.

The problems of monetary policies are normally taken to be related to the issue of commitment vs. discretion, the latter producing unnecessarily high inflation without a gain in output, which stays at the level consistent with the natural rate level. Giving up the desire to

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1 See the report of the committee in SOU (1998).

2 See the announcement by the Government to the Parliament (1998).

raise output higher than its natural rate alleviates the credibility problem, but does not eliminate it. A monetary policy commitment would still be preferable, as shown by Clarida et al. (1999). The gains of EMU are normally taken to be related to increased credibility, which means that the common central bank has acquired, due to its constitution, the credibility of that member central bank, i.e., the Bundesbank, with the highest credibility among the member countries forming the monetary union. This would lead to a more favourable trade-off between the variability of inflation and output in a weak member country than before joining EMU. This is not the key issue here, as we assume that the central bank already pursues its stabilization in a situation after a reform that has enhanced its independence. Thus, the central bank will no longer outside of EMU try to stabilize output at a higher level than that consistent with the natural rate of unemployment. However, in spite of this formulation, we show that it may be beneficial to delegate monetary policy to a common central bank. This is due to the fact that the option of stabilization may lead to such a high domestic real interest rate that it lowers, through weak capital accumulation, the natural rate of output over time.

The intuition behind this basic result of the paper is as follows. Output is positively affected by the real depreciation of the domestic currency, but the real interest rate is, in the manner just explained, also likely to be positively affected by it. Higher real interest rates, in turn, reduce potential output. If the exchange rate, and the monetary policy, is a very effective policy tool in stabilizing the real economy, so that small adjustments to the exchange rate stabilize the real economy, then expectations of a devaluation do not arise, and the domestic interest rate does not rise in a markedly harmful way. Then there is a case for sticking to monetary autonomy. If this situation does not hold, then preserving monetary autonomy may create a long-run burden to the economy. Giving up this autonomy should be preferable, even though there is a loss related to the fact that the task of stabilization is shifted on the common central bank, which in turn pays only limited attention to developments in each individual member country. If, on the contrary, the country targets only inflation, these policies will not lead to a higher real interest rate than abroad, provided that the inflation target is the same as that of the ECB.

The organisation of the paper is as follows. In Section 2 we present our model and solve for the expected values of the change in the exchange rate and inflation, allowing us to derive the key expression for the expected domestic real interest rate. Section 3 solves for the optimum exchange rate policy. Section 4 considers the situation under EMU and takes into account the spillovers of the policies of the common central bank in an enlarged monetary union to which the new member country joins. In Section 5, we compare the monetary regimes, and present some numerical calculations and in Section 6 some empirical evidence on this issue. Section 7 concludes.

2. THE MODEL

We specify the following quite straightforward aggregative model for an open economy. The framework used here is along the lines of the seminal model by Dornbusch (1976), with some modifications to allow for short-run analysis, taken to be relevant for monetary policy stabilization purposes. It is true that the standard models used in the current international macroeconomic literature are now based on solid microeconomic foundations, building on the work particularly of Obstfeld and Rogoff; see, for example, their (2000) paper. These models, however, come at the cost of more complexity, and building them requires making a lot more assumptions. Nevertheless, as shown recently by Clarida et al. (2002), when linearised around a steady state, these optimisation-based models quite closely resemble a traditional non-optimising macroeconomic model. The classic Dornbusch model is just suitable for our purposes, in being analytically tractable, and in allowing us to link our analysis to, and utilise some important results produced in, the recent strand of New Keynesian literature on monetary policies in the closed economy; see, e.g., Clarida et al. (1999).

We start with the case of a single country, which is not a member of EMU and which floats its currency. The deviation of output from trend, Q, (or, equivalently, the rate of growth of output) obeys the following behaviour

$$(1) \qquad Q = \alpha c - \beta(i - E(p)) + \theta + \phi Q^*,$$

where c is the log change in competitiveness C, i is the domestic interest rate and E(p) is the expected rate of inflation p, θ is the domestic demand shock and Q* is the deviation of foreign (Euro Area) output from its trend, the parameter ϕ measuring the size of this spillover to the domestic economy. The parameters α, β, ϕ are positive. For competitiveness we have

$$(2) \qquad C = SP^*/P \text{ and so } c = s + p^* - \varepsilon(P,S)s ,$$

where S is the (effective) exchange rate (units of domestic currency per unit of foreign currency), s is the log change in S, p* is foreign inflation and $\varepsilon(P,S)$, to be denoted below by χ, is the elasticity of the price of domestic output with respect to the exchange rate, reflecting the share of foreign raw materials and intermediate goods in domestic production. So, we have in (2) $c = (1-\chi)s + p^*$. We specify the supply equation, the domestic rate of inflation, in the following way, differing somewhat from that in the Dornbusch (1976) model,

$$(3) \qquad p = p^* + \chi s + \xi Q + \upsilon,$$

where the Phillips-curve parameter ξ is positive (or zero) and υ is the domestic supply shock. An essential feature in the analysis below is that in the equilibrium, where output is at its trend, purchasing power parity does not hold because in the short run χ is assumed to be smaller than unity (see empirical evidence by Burstein et al., 2002). This allows for some leverage from monetary policy to domestic output. So, we assume that domestic wage costs

do not react to the change in the exchange rate, which is sufficient to satisfy this assumption; see Alho (1997).

Let us turn to equilibrium in the financial markets. Open interest parity is assumed to hold:

(4) $$i = i^* + E(s) ,$$

where i* is the international nominal interest rate, i.e., that in the Euro Area, and E(s) denotes the expected logarithmic change in the exchange rate. The money market equilibrium is

(5) $$M - (P_0 + p) = m_1(Q_0 + Q) - m_2 i \ ,$$

where M is the log of the money stock in nominal terms and the parameters m_i, i =1,2, are positive, and the subscript 0 denotes the initial situation. A rise in M leads to a rise in the exchange rate and competitiveness as long as χ is less than unity; see the analysis of the Dornbusch model by Heijdra and van der Ploeg (2002), Chapter 11.3. Note that the exchange rate acts via two channels, both through demand to output and through supply to inflation, which means that the situation is not identical to the standard closed economy case of monetary policy making. We shall return to this issue in Section 4. The demand impulse has an effect here on the domestic economy, in contrast to the result in standard open economy macroeconomics under floating exchange rates, as the ensuing devaluation caused by a recession, has an impact on the price level, thereby cutting the real money stock in (5).

The private sector sets its price and forms financial (exchange rate and consequent interest rate) and inflation expectations prior to the shocks hitting the economy. The policy maker, however, sets his policy choice of s (using M) only when the shocks have been realised and the foreign output Q* and inflation rate p* have been realised, too. The private sector has full knowledge of the average shocks and the policy rule, but the policy maker cannot credibly commit to it.

Let us assume that the domestic policy maker, in aspiring to stabilise the economy, minimises the standard loss function

(6a) $$L = E[(p-\Omega)^2 + \lambda Q^2], \ \lambda \geq 0,$$

where Ω is the domestic inflation target and λ is the weight given to output stabilization in relation to inflation stabilization. As mentioned earlier, we assume that the policy maker does not strive to achieve a level of output higher than the natural level.

Expanding on the standard treatment of stabilization policies, we also consider the long-run consequences of policies. Even though in the short run the policy maker would be able to reach his optimum, i.e., minimum of L, this may be done at the cost of hampering the long-run performance of the economy. So, we assume that the policy maker thinks about long-run considerations, too, and puts a positive weight on k, where k is the change in the natural rate of output from the short run to the long run. We specify it to depend in an inverse way

on the domestic real interest rate so that $k = f(i - E(p))$, $f' < 0$, and present this in Section 5 in more detail.

If λ is zero in (6a), the short-run goal is simply to reach the inflation target[3]

(6b) $\quad p = \Omega$,

and if λ rises to infinity, the goal in the short run is to eliminate all the deviations of output from trend,

(6c) $\quad Q = 0$.

We now turn to solving the model. Inserting (2)-(5) into (1), we first solve for the reduced form equations for output and inflation, given the expected values of the shocks and the expectations of inflation and the change in the exchange rate, i.e., policy, by the private sector. We then use condition (6) to solve for the optimal exchange rate policy, insert the expected inflation as a function of the expected change in the exchange rate and use the law of iterated expectations to solve for the model-consistent expectations of the latter. This gives the general outcome that the expected exchange rate change is a linear function of the foreign interest rate i*, foreign inflation rate p* and the combined expected shock $E(H) = \phi Q^* + E(\theta) - \alpha E(\nu)$. In the special case of pure inflation targeting (6b), the solution for E(s) is as follows

$$\text{(7a)} \qquad E(s) = \frac{\xi\tilde{\beta}\, i^* - p^* - \xi E(H) - E(\upsilon) + \Omega(1 - \xi\tilde{\beta})}{-\xi\tilde{\beta} + \chi + \xi\tilde{\alpha}(1-\chi)} \ ,$$

where we denote by a tilde the original parameter or variable divided by $1 + \xi\alpha$, which is positive and bigger than unity. In the special case of no emphasis given to inflation, i.e., the case (6c) of output targeting, and if the Phillips curve parameter ξ is set to zero,[4] this expression becomes,

$$\text{(7b)} \qquad E(s) = \frac{\beta(i^* - p^*) - E(H) + E(\upsilon)}{(1-\chi)(\alpha - \beta)} \ .$$

In the general case where ξ is positive, this expression becomes much more complicated, although the basic insight is not altered. However, the expected change in the exchange rate is always located between (7a) and (the general expression corresponding to) (7b), as the derivative of the general solution with respect to the weight λ does not, in a linear model with quadratic preferences, change in sign as λ varies over the positive axis.

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[3] Note that as the policy maker only reacts after the shocks have been realised, there is no post-shock uncertainty related to reaching this target. This also applies to the more general case (6a).

[4] This may be identified as the small open economy case, where the domestic price level is fully determined by the foreign counterpart and the exchange rate.

The standard case is when α is "big" and β is "small", at least in a small open economy, which means that competitiveness has a more vigorous effect on output than the real interest rate, so that the denominator in (7b) is positive. We see that, in this case, there is leaning-against-the-wind intervention, anticipated by the private sector, so that the expected international and domestic boom or recession ($E(\theta) \neq 0$) leads to an anticipation by the private sector of an offsetting move by the central bank so that the interest rate differential and thus the domestic interest rate behave in a procyclical way. It declines in a boom, which is expected beforehand by the private sector ($E(\theta) > 0$), and rises when a recession is expected ($E(\theta) < 0$) and the private sector starts to channel its funds abroad. Note that under pure inflation targeting this effect will only exist if there is a link from output to inflation ($\xi > 0$). If the reverse case holds, so that $\alpha < \beta$, the private sector would expect a revaluation in a recession, which is not very plausible in practice.

Let us then turn to the (expected) domestic real interest rate, which is $i^* + E(s) - E(p)$. We have first, in general,

$$(8) \qquad i - E(p) = i^* + \frac{1-\chi}{1+\xi(\alpha-\beta)} E(s) + \frac{-p^* + \xi\tilde{\beta} i^* - \xi E(H) - E(\upsilon)}{1-\xi\tilde{\beta}}.$$

A rise in the expected devaluation E(s) unambiguously leads to a rise in the expected real rate of interest, if α is bigger than β and χ is less than unity, as we assume here. If ξ is zero, this situation will hold with certainty so long as χ remains less than unity. This condition may still hold, in the general case, even if α is smaller than β. Domestic stabilization policies implemented to fight deflationary demand shocks may entail a cost to the long-run welfare of the country. The magnitude of this effect depends on the size and frequency of deflationary shocks in relation to booms, i.e., the sign and size of $E(\theta)$ on average, and the key parameters characterising the economy, especially the importance of the competitiveness channel in relation to the interest rate channel. If χ approaches unity, the monetary policy loses its effectiveness and the expected real interest rate does not react to the expected devaluation.

Let us concentrate solely on the more straightforward case where $\xi = 0$, which can be called the basic small open economy case. Now, we get from (8) and (7a and b) that the expected real interest rate is, in the case of pure inflation targeting (6b), as follows:

$$(9a) \qquad i - E(p) = i^* - p^* + \frac{1-\chi}{\chi}(\Omega - p^*) - \frac{1}{\chi} E(\nu) \text{ and}$$

$$(9b) \qquad i - E(p) = \frac{\alpha}{\alpha-\beta}(i^* - p^*) - \frac{1}{\alpha-\beta}(E(\theta) + \phi Q^* - \beta E(\nu))$$

in the case of pure output stabilization (6c).

Thus we have

Proposition 1. In the basic long-run case, where E(ν) = 0, we see that under inflation targeting (i.e. (9a)), the domestic real rate of interest is higher than the foreign real rate, if the country concerned pursues a looser inflation target than the foreign country (ECB), i.e., if the domestic target Ω exceeds the foreign inflation rate p. The standard case of real interest rate parity only holds under purchasing power parity in the long run, when χ is unity.*

The result in (9a) is due to the fact that the domestic central bank, while pursuing only inflation targeting, reacts in a symmetric way by a revaluation or a devaluation of the domestic currency, if the inflation target is the same as that abroad. But if the target exceeds that of the ECB, there will be an expectation of a permanent devaluation.

We get from (9b),

Proposition 2. Under output stabilization the real interest rate is higher than the foreign real rate (which is assumed throughout to be positive) as the coefficient of the foreign real rate of interest is higher than unity, if α > β, and even if there are no expected shocks.

This cost of monetary autonomy is smaller, the more dominating is the role of the competitiveness channel in contrast to the real interest rate channel, in accordance with the intuition given in the Introduction related to the benefit and cost of the exchange rate policy in stabilising output. Output stabilization leads the public to expect devaluation-prone policies, if $\alpha > \beta$, and this will cost in terms of a premium in the domestic real interest rate. This is due to the fact that a rise in the foreign real rate of interest also cuts the domestic output, which the policy makers want to eliminate by a devaluation, anticipated by the private sector.

Let us make a distinction between normal times, when the expectation of a domestic supply and demand shock is zero, $E(\theta) = E(\upsilon) = 0$, and times marked by recessionary fears, when there is a deflationary bias in the economy so that $E(\theta) < 0$.[5] The persistent fear of a recession, i.e., $E(\theta) < 0$, which may also be a relevant situation in a medium-run policy evaluation, leads to real interest rates which are higher than those given in (9b) with the standard assumption $E(\theta) = 0$. Under inflation targeting, on the other hand, the real rate does not respond to the fear of recession; see (9a). The former situation exacerbates the long-run cost to the economy in the sense that the real interest rate is raised above that prevailing abroad, due to the consequent rise in the expectations of a devaluation. In the sequel the natural rate of output will be cut, see Section 5. But, on the other hand, the need for domestic stabilization is also higher under such a condition. Both these effects, success in short-run stabilization outside EMU and its consequent effects on long-run growth, have to be taken into account while considering the monetary regime suitable for the country concerned, and will be combined in Section 5.

[5] This could arise if the shock θ is autocorrelated in time so that, e.g., an ongoing recession is expected to be of a longer duration.

3. OPTIMAL SHORT-RUN POLICIES

We next solve the model for the optimal value of the exchange rate. If desired, the corresponding optimal change in the money supply can be traced from (5). The optimal solution to the general loss function (6a) can be derived to lie between the optimal solutions to the two special cases (6b) and (6c). Hence, we can concentrate on these polar cases, which also makes for an easier exposition.

The optimal solution for the exchange rate in the case (6b) is simply, if again the parameter ξ is set to zero,

$$(10a) \quad s_{opt} = \frac{(\Omega - p^*) - \upsilon}{\chi} \ .$$

The optimal solution in the case (6c) is, if there are no expected shocks so that E(H) = E(ν) = 0,

$$(10b) \quad s_{opt} = \frac{1}{(1-\chi)(\alpha-\beta)}(i^* - p^*) - \frac{1}{\alpha(1-\chi)}(\phi Q^* + \theta - \alpha\upsilon) \, .$$

Both these cases work in an intuitive way so that there is a devaluation in a recession and a revaluation in a boom. Reaction to the real interest rate shock abroad in (10b) again depends on the sign of the key difference $\alpha-\beta$. Once more, we see that the more powerful is the competitiveness channel (α compared to β), the smaller the reaction needed from exchange rate policy to stabilise the economy. Eq. (10a) works meaningfully for all values of the parameter χ, so that it basically eliminates the foreign and domestic inflationary shocks by revaluing the currency, while (10b) runs into mounting problems if the parameter χ rises towards unity.

In the case of a closed economy, a standard result of the New Keynesian analysis of monetary policy making is that the central bank fully neutralises the effect of the demand shocks, here θ and Q*, irrespective of the weight λ given to output deviations; see Clarida et al. (1999). The reason for this is that the demand shocks do not lead to a change in the trade-off between output and inflation. Here in our model of the open economy, this result does not hold in general. The reason is that a devaluation, which would eliminate the effects of a recessionary demand shock θ, would at the same time lead to higher inflation, as χ is positive. However, in the next section, when specifying a model for the Euro Area, we are able to use the just stated standard result.

4. JOINING EMU

If the country joins EMU, the exchange rate and its expected value is fixed, s = E(s) = 0, throughout, and equation (4) is replaced by the fixed interest rate condition, i = i*. The money market equilibrium, condition (5), only determines the money stock to be demanded by the country concerned, and supplied to it by the ECB while financing the deficit in the balance of payments of its member country with perfect elasticity. In this case we only have the domestic inflation rate as an expected variable. The parameters of the model under EMU are taken to be the same as those for a country outside of the Union, as are the distributions of the shocks. These are, admittedly, quite drastic assumptions. We nevertheless adopt them here since the research in this area has yet to offer a robust alternative that we could rely on.

Solving for the expected inflation now yields the outcome

$$(11) \qquad E(p) = \frac{1}{1-\xi\tilde{\beta}}\left[p^* + \xi(-\tilde{\beta} i^* + \tilde{\phi} Q^* + E(\tilde{\theta})) + E(\upsilon)\right],$$

where, again, a tilde denotes the original parameter or variable divided by $1+\xi\alpha$. The domestic expected real interest rate is now $i^*-E(p)$ and is procyclical; it rises in a recession and declines in a boom, if ξ is positive. If ξ is zero, the expected domestic real interest rate is the same as the foreign rate less the effect coming from the domestic supply shock. So, we see again that the same problem of procyclical real interest rates exists in EMU as outside it, but only if ξ is positive. Imagine now that ξ is zero, corresponding to the prototype small open economy case. If there is no expected domestic supply shock, the domestic real interest rate in EMU is the same as the foreign rate, i^*-p^*. The comparison made in connection with (9a and b) between the domestic and foreign real rate of interest can now be applied with respect to joining or staying outside of EMU, if the foreign real rate of interest does not react to the fact that the country concerned joins EMU.

In EMU, responsibility for monetary policy affecting the domestic economy is transferred to the common central bank. Let us therefore incorporate the monetary policy of the ECB into the analysis because such policy may deliver some of the stabilization services demanded by the domestic economy, although it could also hurt EMU member countries on average. The ECB determines the outcome for Q* and p* by minimising

$$(12a) \qquad L_{ECB,\,I} = E[(p^* - \Omega^*)^2 + \mu(Q^*)^2] \,,\ \mu > 0,$$

if the country concerned is not a member of EMU, and

$$(12b) \qquad L_{ECB,\,II} = E[((1-\eta)p^* + \eta p - \Omega^*)^2 + \mu((1-\eta)Q^* + \eta Q)^2],\ \mu > 0,$$

if the country joins EMU, where η is the weight of the country concerned in the Euro Area aggregate (typically the relative GDP weight). In part, the ECB takes into account the shocks facing also the candidate country both outside and inside of EMU, but not identi-

cally, as we shall see. In (12b) we assume that if the country concerned joins EMU, the ECB does not change its preference function.

The Euro Area, less the potential new member country considered above, obeys the following model when this country is an outsider of the monetary union.

(13) $Q^* = -\alpha^* c - \beta^*(i^* - E(p^*)) + \theta^* + \phi^* Q$, and

(14) $p^* = E(p^*) - \chi^* s + \xi^* Q^* + \upsilon^*$,

where the variables and parameters are analogous as in (1) and (3). Assume that the spillover to inflation is non-existent so that the parameter $\chi^* = 0$ as, in practice, this spillover is likely to be very small indeed. Namely, if Sweden changes its monetary policy, this has so negligible an effect on the inflation rate in the Euro Area that it can be omitted with good grounds.[6]

Let us now *concentrate solely on demand shocks θ in the small country considering joining the EMU and θ^* in the incumbent Euro Area* and leave analysis of the supply shocks to a subsequent stage. This can be justified by the notion that this is by far the most dominating case in the minds of policy makers thinking about their position towards EMU.

Optimal policies by the ECB can now be inferred to be such that the demand shock, i.e., $-\alpha^* c + \theta^* + \phi^* Q$, will be fully neutralised from having an effect on Q*, irrespective of the weight given to output stabilization, analogously as in the case of optimal monetary policy in the closed economy; see Clarida et al. (1999, p. 1674). The old optimal situation with respect to Q* and p* can be reached by fully eliminating the additional effect caused by the demand shock on the output gap. This reaction does not have an impact on the inflation rate, either, which only depends on the supply shocks ν, see Clarida et al. (1999).

If the country concerned joins EMU, its model is then

(15) $Q = \alpha(p^* - p) - \beta(i^* - p^*) + \theta + \phi Q^*$

(16) $p = p^* + \xi Q + \nu$.

Now the principle just stated means that the ECB reacts so that the real interest rate is solved from the condition

(17) $(1-\eta)Q^* + \eta Q = 0$.

The simultaneous solution of the model, consisting of (12)-(17), leads to the following result if, for simplicity, ξ is again set to be zero,

(18) $i^* - p^* = A\theta + B\theta^*$, where

[6] The exchange rate may be only slightly reflected in the foreign currency prices of the economy concerned and so in the foreign rate of inflation, too.

$$A = \frac{C}{E} \text{ and } B = \frac{D}{E}, \text{ and where}$$

$$C = \eta + \frac{1+\eta(\phi-\phi^*)}{1+\beta\phi^*-\phi\phi^*}\phi^*, \; E = \eta\beta + \frac{1+\phi^*}{1+\beta\phi^*-\phi\phi^*}\beta^* \text{ and}$$

$$D = \frac{1-\eta(1-\phi^*)}{1+\beta\phi^*-\phi\phi^*} \; .$$

A and B in (18) are definitely positive as C, D, and E are positive in the plausible case where the positive spillover parameters ϕ and ϕ^* are smaller than unity. We may now solve for output and inflation in the new member country to be the following function of the domestic and foreign demand shocks,

(19) $Q = (1 - A(\beta+\phi\beta^*))\theta + \phi(1-\beta B)\theta^*$ and
$p = p^* + \nu$.

This means that the policies of the ECB definitely counteract the effect of the domestic and foreign shocks, thereby preventing them from being fully reflected on the new member country. In the extreme case where the size of the country, i.e., the parameter η goes to zero, and similarly the spillover to the rest of the Euro Area, i.e., the parameter ϕ^*, approaches zero, we get the intuitively plausible case where, simply,

(20) $Q = \theta$.

The ECB only neutralises the demand shock hitting the incumbent Euro Area and does not pay any attention to the extremely small new member country. In the general case, Q also depends on the covariance between the domestic and foreign shocks, see Section 5.

If the country stays outside of EMU, the effect of a demand shock arising in the candidate country on the interest rate policy of the ECB, as it neutralises the effect of θ and θ^* on Q^*, will be

(21) $$\frac{d(i^*-p^*)}{d\theta} = \frac{1}{\beta^*}(\phi^*-\alpha^*\frac{ds}{d\theta}) \; .$$

Insert then (10a) and (10b) into (21) to get the final reaction by the ECB under floating exchange rates. We see that there exists a value for the pass-through coefficient χ, which is so high that the reaction under floating exchange rates by the ECB will be bigger to the events occurring in the candidate country than in EMU. Under inflation targeting, case (9a), all hinges on the parameter ξ. If this is zero, then there is no reaction by the national central bank, see (10a), and the reaction by the ECB under EMU membership of the country concerned is unambiguously more vigorous than under floating. We omit this complication in the numerical calculations below and *assume that in the Euro Area the real interest rate behaves in a similar way, irrespective of whether the new candidate country joins or not.*
We now have available the tools necessary to evaluate the key decision by the outsider country, namely whether or not to join EMU.

5. EVALUATION OF MONETARY REGIMES

Let us now first evaluate in more detail long-run consequences of the stabilization policies. In order to do that we have to enlarge the short-run framework used above. Let F(K,L), where K is the capital stock and L the labour input, be the aggregate production function for the candidate country, and define the natural rate of output so that there is full employment, $L = \bar{L}$. In their investment decisions, firms set $F_K = i^* + E(s) - E(p)$. The permanent differential reaction of output between EMU and the outsider situation is, using ρ to denote the elasticity of output with respect to the capital stock,

$$(22) \qquad dk = \rho d\log(K) = \frac{\rho}{\rho - 1} \frac{-E(p)_{EMU} - E(s_O) + E(p_O)}{i^* - E(p)_{EMU}} \ .$$

Here, the subscript EMU denotes the situation in EMU and O the outsider situation. Under the two cases in (9a) and (9b), expression (21) is as follows. We have under inflation targeting,

$$(23a) \qquad dk = -\frac{\rho}{\rho - 1} \frac{1 - \chi}{\chi} (\Omega - p^*)$$

and in the case of pure output stabilization

$$(23b) \qquad dk = -\frac{\rho}{\rho - 1} \frac{\beta}{\alpha - \beta} \ .$$

In general, the sign of (23a), again, depends on the domestic inflation target vis-à-vis that of the ECB and is zero if the country concerned has as tight an inflation target as that of the ECB. Eq. (23b) entails a permanent gain from joining (if again, as above, $\alpha > \beta$).

We then combine the short-run effects from stabilization with the long-run analysis in (22) and (23 a and b), and, as mentioned above, only consider the case of demand shocks in the EMU candidate country. Under floating exchange rates, the policy maker in the country concerned is able to reach his short-run goal, i.e. minimise L, in the way desired. If the policy goal is output stabilization or pure inflation targeting, the short-term loss L reaches its lowest value of zero outside the monetary union, but at a long-run cost in the former case. Let us then evaluate the short-run loss of giving up domestic monetary policy in EMU. The reaction by the ECB means, see (19) above, that this loss to the new member country will be mitigated.

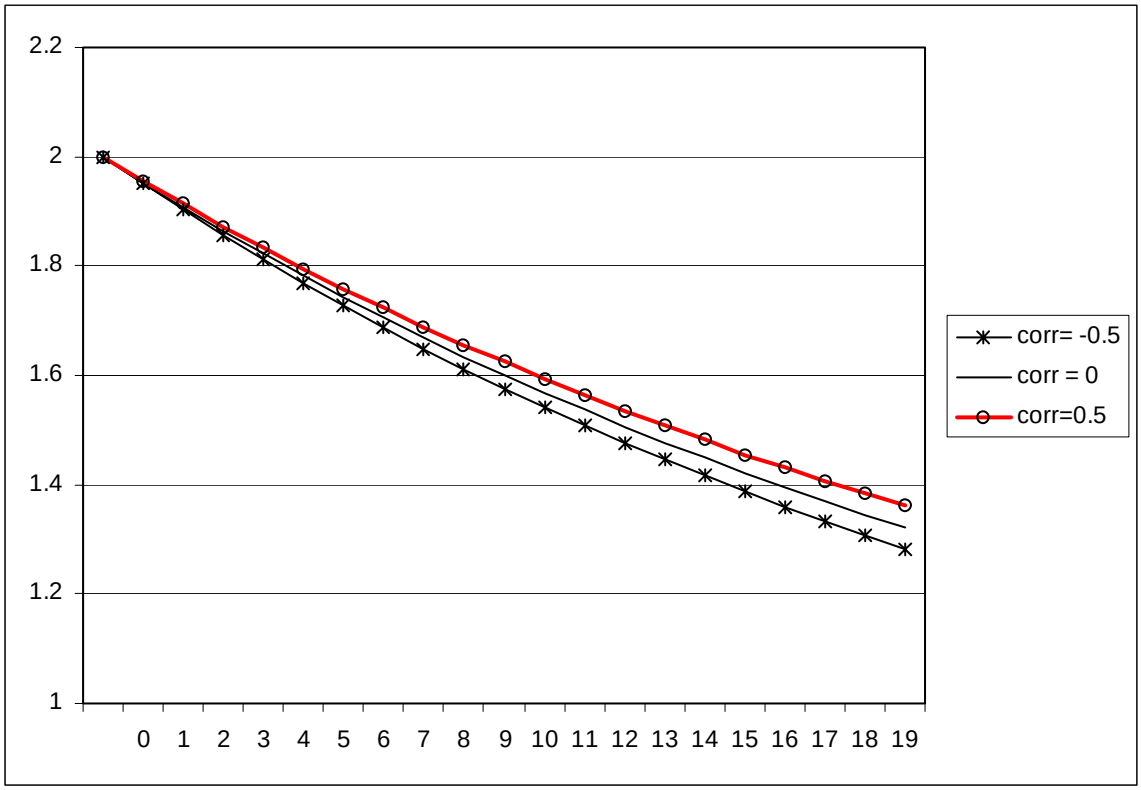
In practice, politicians – when deciding whether or not to join EMU - are usually interested in output stabilization. We have made some basic calculations on the basis of the result in (19) as to the variability of the output deviation from its mean. An illustration of this is displayed in Figure 1. We see that there are, in a way, increasing returns to scale in joining EMU with respect to the size of the new member country. The variability of output declines

as the size of the country (the parameter η) rises, so that the case of an extremely small member country, see (20) above, represents the highest variability of output. The intuition is that as the size of the country concerned rises, the ECB starts to increasingly neutralise the effects of the idiosyncratic demand shocks. As to the correlation of the shocks, we get

Proposition 3. The correlation between the domestic and foreign shocks matters very little as to the variability of output in EMU.

This result challenges the conventional wisdom behind the theory of the optimal currency area concerning the key role of the similarity of the shocks behind the decision to join a monetary union. Here this result is based on the fact that the coefficient of θ^* in determining output Q in (19) is very small as the ECB neutralises most of the demand shock in the incumbent Euro Area. This leads to a situation where the correlation between the shocks has only a marginal impact on the outcome.

Figure 1. The variability of output (coefficient of variation, per cent) in a new member country of EMU as a function of the size of this country in the Euro Area, per cent, as the correlation between the domestic and Euro Area demand shocks varies*



* The parameters used were the following: $\eta = \phi^*$, $\phi = 0.2$, $\beta = \beta^* = 0.1$, $\sigma(\theta) = 2$ per cent, $\sigma(\theta^*) = 1$ per cent.

Turn then to consider expectations of a deflationary (or a booming economy), $E(\theta) \neq 0$. Normally, policy makers have fears of recessions more on their minds, $E(\theta) < 0$. In this

case, the cost of joining may be higher, analysed from the stabilization point of view (function L). There are states of the world where the negative shock θ is so large that it would be better to have an own currency; the lower stabilization cost L outside EMU, given the shock, compensates for the loss in potential growth through k (which depends on E(θ), not the actual θ). (See Section 3 on the suitable policies outside of EMU). Thus, we establish the following proposition.

Proposition 4. There is no uniformly best monetary regime for each state of the world θ.

But, in practice, we have to base the decision on joining or staying outside EMU on an evaluation of average conditions over the whole distribution of shocks and not on the incidence of individual shocks. Imagine that the country only puts weight on output stabilization or inflation targeting, cases (6b) and (6c). Under floating exchange rates, we now have L = 0. Take again the case of output stabilization. The overall net gain from joining EMU is

$$(24) \qquad G = -\sqrt{L} + k = -\sqrt{\sigma^2_{Q,EMU} + E(Q)^2_{EMU}} + k\,,$$

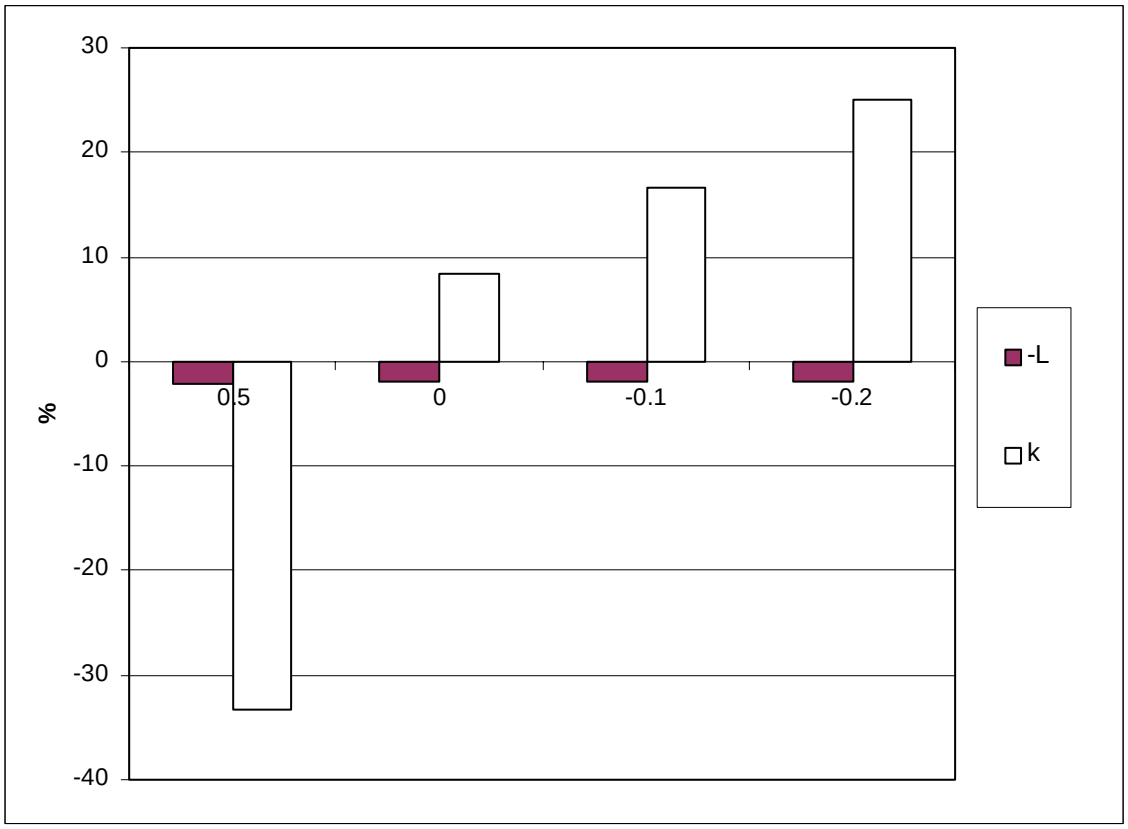
where σ^2 denotes the variance of output, and output obeys expression (19). The long-run gain from joining EMU is given by k, which was derived above in (23b).

Let us now make a rough comparison of these components. The standard deviation of the output gap is typically around 2 per cent in relation to GDP. The growth component k can be calibrated from the long-run differential in the real interest rate, see (9a) and (9b) (assuming that we know the policy rule). Assume, for instance, that the real interest rate differential given by (9b) is such that under floating exchange rates the real interest rate is 3.5 per cent while in the Euro Area it is 3 per cent. Inserting this into (23b), and using a typical elasticity ρ of output with respect to capital of one-third, implies that the loss in terms of the potential level of output, related to sovereign monetary policy, is 8 per cent of output. This is a huge estimate for the loss from staying outside EMU.[7]

Let us now also incorporate the effect of an expected recession into the analysis and include this component in (24) by assuming that the foreign expected shock E(θ*) = 0 in (19). Using the result (9b), however, we see that the real interest rate premium clearly outweighs the gain from preserving monetary autonomy, as the magnitude of the relative interest differential grows very steeply as a function of the size of the expected shock –E(θ), even with very small negative values of E(θ). The situation is illustrated in Figure 2. We also see that booming countries with E(θ) > 0 may do better by remaining outside the monetary union, see (9b).

[7] Usually, the empirical investment equations indicate a smaller impact than this from an interest differential, derived directly from the optimal condition for the demand for capital in production by the firms.

Figure 2. The benefits of joining EMU and its components, the short-run loss (-L) and the long-run gain (k), under output targeting, as a function of E(θ), percentage deviation from baseline (remaining outside EMU)



Under inflation targeting, if the country concerned pursues a similar inflation target as abroad, i.e., the ECB, so that $\Omega = p^*$, there is no long-term loss as the real interest rate is the same as the foreign rate, see (22a). The overall loss from joining EMU would then be that produced by the larger variability of inflation under EMU.

So, somewhat surprisingly, and in contrast to the popular view, we reach

Proposition 5. A country with high ambitions with respect to output stabilization should consider joining EMU, while a country preferring price stability can do better outside. Also, in contrast to the common intuition, booming countries may do better outside, but depression-prone countries should join the monetary union.

6. SOME EMPIRICAL EVIDENCE

Let us close this analysis of the gains of joining EMU by having a look at Finnish and Swedish data on (ex post) real interest rates in the post-devaluation period, in comparison to Germany; see Figure 3.

Figure 3. Annual real long-term interest rates (on 10-yr. govt. bonds) in Finland, Sweden and Germany, per cent

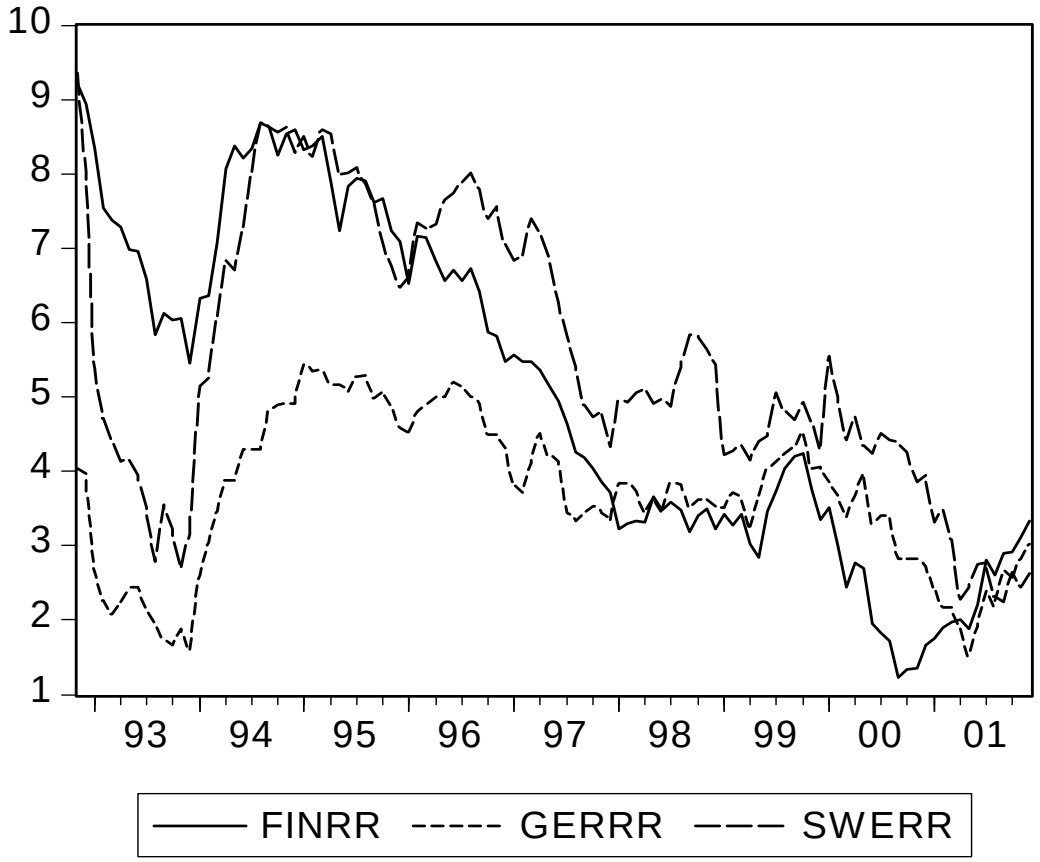


Table 1 presents some key statistics on these real rates of interest.

Table 1. Summary statistics for the real long-term interest rate in Finland, Sweden and Germany, per cent *

Statistic	Finland	Sweden	Germany
Average 1992/11-2001	5.10	5.54	3.68
Standard deviation, 1992/11-2001	2.28	1.87	1.03
Average 1996/10-2001	3.36	4.71	3.44
Standard deviation, 1996/10-2001	1.17	1.35	0.70

* The price index used is the CPI

We have split the post-flotation period into two parts, the separating point of time being Finland's membership in ERM in October 1996. We see that there has been a marked reduction in the Finnish real interest rate to the level prevailing in Germany. In Sweden, however, only a small reduction has taken place and, on average, the rate has been clearly higher than in Germany. The variability of the real interest rate has declined in all these countries, mostly so in Finland. However, as Figure 3 shows, there has been no marked deviation in real interest rates between these countries recently. Whether this is a sign of a permanent change, and due to the more likely entrance of Sweden in EMU, remains to be seen.

We then estimated straightforwardly a model for the real interest rate in Sweden on the basis of combining the results derived above in (9a) and (9b).

We get the following long-term equation, using the Engle-Granger procedure on the above data (t-values in parentheses):

$$\text{(25a)} \quad \underset{}{\text{Swerr}} = \underset{(3.44)}{-0.799} + \underset{(28.23)}{1.742}\text{Gerrr} + \underset{(8.76)}{0.507}(\text{Swep}-\text{Gerp}),\ R_C^2 = 0.822\ ,$$

where Swep (Gerp) is the moving average of the inflation rate during the past 3 years in Sweden (Germany). The corresponding short-term adjustment equation is

$$\text{(25b)} \quad \text{Swerr}-\text{Swerr}_{-1} = \underset{(4.91)}{1.005}(\text{Gerrr}-\text{Gerrr}_{-1}) - \underset{(2.03)}{0.166}\text{res}_{-1},\ R_C^2 = 0.302\ ,$$

where res is the residual of (25a). The long-run relation fits very well and is in accordance with the model presented above. The long-run coefficient of the German real interest rate is clearly higher than unity, in accordance with (9b) and the inflation rate differential also works as postulated in (9a). The negative constant in (25a) would indicate the existence of booming shocks in Sweden. A similar model estimated for Finland did not work in a meaningful way, for instance the coefficient on the German real interest rate is less than unity (in the pre-ERM period). Thus we skip it at this stage, where the main point has only been to present some preliminary empirical evidence. It should also be noted that the Swedish model does not appear to have been completely robust during the whole period.

7. CONCLUDING REMARKS

Above we have considered stabilization and its linkage to output growth in a country operating under floating exchange rates and as a member in EMU, as both these alternatives are important from the point of view of choice of a proper monetary regime. Our result on the relation between stabilization and growth resembles to some extent the property stated by Lucas (1987), who argues that eliminating short-run fluctuations in consumption yields negligible welfare gains in relation to the favourable change in the trend growth rate of consumption.

Above we have deliberately omitted fiscal policy, as we have wanted to focus our attention on the basic question of the choice of the monetary regime from the stabilization point of view as such. In practice, of course, fiscal policies can also be used in stabilising the economy of a member country in EMU. The leverage of fiscal policies will be enhanced in EMU, as the domestic interest rate will not react to a fiscal expansion and appreciation of the domestic currency in a recession, and the effectiveness of fiscal policies with respect to stabilization will reach its highest possible value. This will cause membership in EMU to emerge as more favourable than could be traced from the above considerations. We leave a more detailed analysis of this point to a later stage.

We have also omitted the microeconomic efficiency gains, i.e., reduced transaction costs and exchange rate risk, related to a common currency, which should be added to the above considerations focusing on the macroeconomic side of the monetary union.

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