HOW WILL THE EURO BEHAVE ?

by
Daniel COHEN[1]
(Ecole normale superieure, Cepremap and Cepr)
No 9704

[1] *Daniel Cohen: Cepremap, 140 rue du chevaleret 75013 Paris; tel: 331 40778441;*

The paper was prepared for the IMF conference on "The Euro and the Future of the International Monetary System" held in Washington, DC, March 17-18, 1997.
I thank Helene Poirson and Delfim Neto for their brilliant research assistance.

HOW WILL THE EURO BEHAVE ?
Abstract

The paper investigates theoretically and empirically the effect on exchange rates of integrating monetary policy in Europe. It shows that the likely effect will be to generate a tighter European monetary policy (nonwithstanding crediblity aspects which are not discussed in the paper). The argument is that European monetary policy will fear less trade disequilibria than it currrently does. This could lead, under certain circumstances which are explored in the text, to an euro that will be more volatile than it is now (as a basket of currencies).

JEL F3, F4

keywords: Euro, European Monetary Integration, exchange rate fluctuations;

QUELLE SERA LA VALEUR DE L'EURO?
Résumé

L'article examine d'un point de vue théorique et d'un point de vue empirique l'effet de l'integration monétaire européenne sur les taux de change. L'article démontre que l'intégration monétaire européenne pourrait donner lieu à une poltique monétaire moins accommodante. L'argument ne repose pas sur l'analyse de la crédibilité des politiques (la question n'est pas analysée dans l'article), mais sur l'observation suivante: en l'absence de risque de change intra-européen, la conduite de la politique monétaire ne sera pas inquiétée par les effets néfastes qu'elle pourrait avoir sur le commerce intra-européen lui-même. De ce fait, sous certaines conditions qui sont analysées dans le texte, l'euro pourrait être plus volatile qu'il n'est aujourd'hui (comme panier de monnaies).

JEL F3,F4

Mots clés : Euro, Intégration monétaire européenne, Fluctuations du taux de change.

1 Introduction

There is little doubt that the making of monetary integration in Europe will have major effects on the exchange markets. Quoting one European currency rather than six or twelve should matter. But how? In which direction should we expect the euro to go? The conventional wisdom is that the Euro will be a "strong currency". For one thing, it should mimick the DM, typically a strong currency in its own right; second it should attract new portofolio investors, bidding up its demand and raising its price; thirdly, it might have to go through a period during which the new monetary authorities will have to demonstrate their willingness to be "tough", hence appreciating the currency at least for a while.

All these points are well known, and fairly extensively discussed in daily appraisal of the euro. The feature that I want to stress here is of a different nature: I want to emphasize the effect of the new conduct of monetary and fiscal policy upon the euro. Not only will it be that monetary policy will behave differently, by definition. Fiscal policy itself will change its course, and the new design of economic policy will have major influences on the value of the euro.

Building upon previous work with Charles Wyplosz (Cohen and Wyplosz, 1995). I will attempt to understand the likely implications of these policy regimes shift upon the value of the Euro. As I will show, there are few reasons to believe that the euro will be less volatile than European currencies to-day. This will first be demonstrated theoretically. The core of the argument comes as follows: since Europe as a whole is less open than the representative European country, monetary policy will be less constrained than it is now by trade disequilibria. This will make it less accomodative, hence making the euro potentially more volatile. The argument is sometimes known as the effect of a new "benign neglect" of Europe towards the euro, as it will become a "closer" economy (see Bergsten, 1997). The paper will qualify this view. First openness needs to be defined by the degree of subsituability of European goods with the "Rest of the World" products rather than through the mere average of imports or exports to GDP. Second, I will also show that being less open will imply a more volatile exchange in response to one kind of shocks: those regarding price determinations (Phillips curve shocks) rather than those affecting aggregate demand. In the last part of the paper I will offer some empirical simulations regarding the value of the euro. I will first demonstrate that its current value is fairly well explained by the macroeconomics "fundamentals" of Europe, and I will then move to simulate the effects of a less accomodative monetary policy towards these shocks. Although these simulations are simply illustrative, they are suggestive of the fact that the Euro might become more volatile than European currencies to-day.

2 A theoretical framework

I elaborate here upon a model of exchange rate behavior and policy design which is developped in Cohen and Wyplosz (1995).

Assume that the world is composed of three countries: Germany and France which are assumed to be two identical countries and the Rest of the World (Row) whose currency is called the "dollar". Let e be the (log) of the nominal exchange rate of the franc with respect to the mark, let e_1(e_2) be the log of the nominal exchange rate of the franc (DM) with the dollar. We then have:

$$e = e_1 - e_2.$$

We assume that each country produces a representative product whose price is p_1 in France, p_2 in Germany and p_0 in the Row. Competitiveness is defined as:

$$\begin{aligned} z\ (t)\ &= p_2(t) + e(t) - p_1(t) \\ z_1(t) &= p_0(t) + e_1(t) - p_1(t) \\ z_2(t) &= p_0(t) + e_2(t) - p_2(t) \end{aligned}$$

$z(t)$ is the competitiveness of France with respect to Germany, $z_1(t)$ is that of France with respect to the Row and $z_2(t)$ is that of Germany with respect to the Row. We clearly have:

$$z(t) = z_1(t) - z_2(t).$$

I shall describe the economy through two equations, which I will refer to as a price and a demand curve. The price curve is a Phillips-curve which is written in each of the two countries as:

$$\begin{aligned} \pi_1(t) &= \pi_1^e + a_1 z_1 + az + bQ_1(t) + \varepsilon_1(t) \\ \pi_2(t) &= \pi_2^e + a_1 z_2 - az + bQ_2(t) + \varepsilon_2(t) \end{aligned}$$

in which π_i is inflation in country i and Q_i is the log of the level of output in that country. $\varepsilon_i(t)$ are two white noises.

As a simple way to understand this equation, assume that output is produced by mixing foreign and domestic (intermediate) goods. Call x_1 the (log of the) nominal price of the intermediate good in France and $e_1 + p_0$ and $e + p_2$ the (log of the) price of the two imported good. If domestic prices are written as a flexible mark-up above cost and a random disturbance, one can then write:

$$p_1 = \alpha x_1 + \beta(e_1 + p_0) + \gamma(e + p_2) + \delta Q_1 + v$$

in which $\alpha + \beta + \gamma = 1$. One can then write:

$$(1 - \beta - \gamma)p_1 = \alpha x_1 + \beta(e_1 + p_0 - p_1) + \gamma(e + p_2 - p_1) + \delta Q + v$$

i.e:

$$p_1 = x_1 + \frac{\beta}{\alpha} z_1 + \frac{\gamma}{\alpha} z + \frac{\delta}{\alpha} Q + \frac{1}{\alpha} v.$$

Now assume that the price of the intermediate good is contracted at the beginning of the period and set by producers so as to guess the coming period's price. One then write:

$$x = p_{-1} + \pi^e$$

One then obtains, with obvious changes of notations, the Phillips curve equation that we postulated above.

In the sequel, we shall make the assumption that $\pi^e = 0$. We shall justify this asusmption in section 3 below. Otherwise the model can be taken as a model where inflation is simply "surprise" inflation.

The second equation that we are dealing with is a demand-curve that writes output as a function of competitiveness and fiscal stimuli :

$$\begin{aligned} Q_1(t) &= h_1 z_1 + hz + gA_1(t) + \eta_1(t) \\ Q_2(t) &= h_1 z_2 - hz + gA_2(t) + \eta_2(t). \end{aligned}$$

in which $A_i(t)$ measures the fiscal stimulus that country i implements.

I will stick here to a static version of the model, and all disturbances are assumed to be white noise disturbances. The full-fledged dynamic model presented in Cohen and Wyplosz would have the same implications.

For simplicity, I will assume that the authorities can act directly upon two instruments: inflation π and fiscal stimulus A.

As a simple way to see how the model is solved, let us take for the time being the case of Europe as a whole, in those circumstances where the economies are perfectly symmetric, leading to an equilibrium value $z = 0$. With zero expected inflation, the European economy boils down to :

$$\begin{aligned} \pi_1 &= a_1 z_1 + bQ_1 + \varepsilon_1 \\ Q_1 &= h_1 z_1 + gA_1 + \eta_1 \end{aligned}$$

For a given value of π and A, output and competitiveness are determined simultaneously. Diagrammatically this can be solved as follows:

[Here DIAGRAM 1]

Any positive price shock $\varepsilon > 0$, if unaccommodated, brings the economy from a point A to a point B: output shrinks and competitiveness is reduced. Any negative demand shock $\eta < 0$ instead, if unaccommodated, brings the economy from a point A to a point C: output shrinks, but competitiveness rises. The economics of these shifts are fairly straightforward. A negative domestic demand shocks is partially accommodated by a reallocation of domestic output towards foreign markets, hence by an increased competitiveness. Instead, a negative price shocks brings in foreign products, hence tends to lower competitiveness.

One can immediately see the impact of accommodating the shocks through monetary and fiscal policy.

First consider a price-shock $\varepsilon > 0$. If it is accommodated by monetary policy, the economy might be brought back to its initial level. So, in response to a price shock, an accommodating monetary policy reduces the volatility of the exchange rate and of output. If instead the price shock is accommodated by fiscal policy (in order to limit output decline) then clearly this will *raise* the volatility of exchange rate: the initial decline in competitiveness brought by the price shock will be exacerbated by an expansionary fiscal policy. Clearly, the opposite will happen when dealing with a demand shock: if accommodated by fiscal policy, one will reduce the volatility of the economy, (output and exchange rate) while the volatility of the exchange rate will be raised if the demand shock is accommodated by monetary policy.

Let us now analyze in detail what are the optimal responses of monetary and fiscal policies to these shocks, and how Monetary Integration will change them.

3 Exchange rate volatility and the design of economic policy

Let us focus for the time being on the response of French and German policies to a symmetric shock : $\varepsilon_1 = \varepsilon_2 = \varepsilon$; $\eta_1 = \eta_2 = \eta$. I assume that the Row is purely passive.

Let us assume that monetary and fiscal policies are designed in such a way as to:

$$Minimize\ \frac{1}{2}\left\{Q^2 + \phi_0 A^2 + \phi_1 \pi^2\right\}$$

subject to the price and demand equations.

Let us briefly explain such optimization problem. In the standard monetary policy game, such as developped in Barro and Gordon (1983), the monetary authorities would typically solve:

$$Minimize \ \frac{1}{2}\left\{(Q-Q^{*})^{2}+\phi_{1}\pi^{2}\right\}$$

in which Q^* is (the log of) a full-employment (full-capacity) target level of output. Such objective would typically imply a systematic inflation bias that is expected by the private agents and has no effect on the equilibrium level of output.From an *ex-ante* point of view, the optimum way of achieving the objective that is stated above is to scale down the target level Q^* to a lower level Q_0 that is consistent *ex-ante* with zero inflation. The value Q_0 is simply the output equivalent of the "natural rate of unemployment". From the policymaker perspective, this implies an *expansionary* policy when output is below Q_0 and a *restrictive* policy when output is above Q_0. Such will then be our hypothesis: that policymakers are commited to implement their ex-ante best policy response to unexpected shocks. We shall then simply normalize Q_0 to be zero (all values are in logarithm) and therefore interpret Q as deviation (in log terms) from the "natural rate of output". Correspondingly, we assume that the Phillips curve that we deal with is associated to zero expected inflation. Our analysis consequently does not tackle the role of "credibility" that the implementation of the new European Central Bank would have to tackle. Clearly, within our formulation, such issue would involve analyzing the credibility issue through the additive term encompassed in the *expected* rate of inflation, but would not change the implication that we are dealing with, so far as the response to *unexpected* shocks is concerned.

Another difference between the standard Barro-Gordon model and our analysis involves the role of the fiscal stimulus A. The weight ϕ_0 that is attached to its implementation may be interpreted as the effect of distortionary taxation on the welfare of the economy. In the full fledged dynamic model that is analyzed in Cohen and Wyplosz (1995), it also embodies the weight of the intertemporal budget constraint.

As a starter to the analysis, let us now first compute the outcome of a fully cooperative policy making.

Recognizing their symmetry, French and German policymakers adopt the same decisions $\pi_1 = \pi_2 = \pi$ and $A_1 = A_2 = A$ and internalize the fact that their equilibrium real exchange rate will not vary, ie: they design their policy under the assumption that $z = 0$.

The problem can then be written as[2]:

[2]Here, the first order optimality condition is set simultaneously by "the" policymaker. But

$$Min\frac{1}{2}\left\{Q_1^2+\phi_0 A_1^2+\phi_1\pi_1^2\right\}+\lambda\left[-\pi_1+a_1 z_1+bQ_1+\varepsilon_1\right]$$
$$-\mu\left[-Q_1+h_1 z_1+gA_1+\eta_1\right]$$

The first order conditions are then written:

$$(1)\begin{cases}\phi_0 A = g\mu \\ \phi_1\pi = \lambda \\ Q+\lambda b+\mu=0 \\ \lambda a_1-\mu h_1=0\end{cases}$$

Eliminating λ and μ, this yields two equations:

$$(2)\begin{cases}Q+b\phi_1\pi+\frac{1}{g}\phi_0 A=0 \\ A=\frac{a_1}{h_1}.\frac{\phi_1}{\phi_0}g.\pi\end{cases}$$

The first equation simply reflects the set of preferences of the policy makers. In response to any shock (ε,η), monetary and fiscal policy will partially absorb the shock to the best of their willingness to do so which is measured by (ϕ_1,ϕ_0), and to the best of the efficiency of their instrument: (b,g).

The second equation specifies how monetary and fiscal policy share the burden of the adjustment. Putting these two equations together we can simply rewrite:

$$(3)\begin{cases}\pi=-\frac{1}{\phi_1}\frac{1}{b+a_1/h_1}Q \\ A=-\frac{1}{\phi_0}g\frac{a_1/h_1}{b+a_1/h_1}Q.\end{cases}$$

Clearly when either $1/\phi_1$ or $1/\phi_0$ is nil, the policy maker will not respond through the corresponding instrument: it is simply too costly in terms of welfare. Similarly, the bigger g the more efficient is fiscal policy and the larger will the fiscal policy response be.

The interesting parameter, that will be key to the forthcoming analysis, is the ratio a_1/h_1. When a_1/h_1 is big, fiscal policy will be highly responsive and monetary policy will be kept low. The intuition behind this result can be traced back to the first order conditions derived from the optimal exchange rate response

it would not change anything to the analysis to assume that each instrument is determined by two indepedent branches of the government, provided that each of these branches (determining respectively monetary and fiscal policy) have full information on the other one's decision.

to a shock. Ceteris paribus, accommodating a shock through monetary policy will involve a depreciation of the currency that will have spill-over effect on demand. Raising inflation by one percentage point will depreciate the currency by $1/a$ and raise demand by h/a. If h/a is big, or a/h low, monetary policy can achieve two goals at the same time: stabilizing the Philipps curve and accommodating demand: it will a perfect instrument that dominates fiscal policy.

The other (symmetric) way of looking at it is to analyze the consequences of raising the fiscal stimulus: it appreciates the currency by $1/h$ and offset inflation by a/h. If the number is big, then fiscal expansion achieves two goals: stabilizing supply and demand, and again it will be the perfect instrument to stabilize output.

Solving the model altogether, one can then substitute π and A for their equilibrium value and solve the 2 equations system.

Call

$$\Delta = \frac{a_1}{h_1}\left[1 + \frac{1}{\phi_0} g^2 \frac{a_1/h_1}{b + a_1/h_1}\right] + \left[b + \frac{1}{\phi_1} \frac{1}{b + a_1/h_1}\right] \tag{4}$$

One gets the following equilibrium:

$$\begin{cases} Q_1 = -\dfrac{1}{\Delta}\left[-\varepsilon + \dfrac{a_1}{h_1}\eta\right] \\ z_1 = -\dfrac{1}{h_1\Delta}\left[(1 + \dfrac{1}{\phi_0} g^2 \dfrac{a_1/h_1}{b + a_1/h_1})\varepsilon + (b + \dfrac{1}{\phi_1}\dfrac{1}{b + a_1/h_1})\eta\right] \end{cases} \tag{5}$$

The solution fits the intuition that we obtained from diagram 1. In response to a positive price shock (ie one wich reduces output, $\varepsilon > 0$), output contracts and the real exchange rate appreciates (competitiveness is reduced). In response to a negative demand shock ($\eta < 0$), output shrinks but the exchange rate is depreciated. The more responsive monetary and fiscal policy will be (low ϕ_0 and ϕ_1) the more output will be stabilized. Let us see the implications for exchange rate volatility.

First consider a price shock ($\eta = 0$). Tough fiscal policy ($1/\phi_0$ low) *lowers* the volatility of exchange rate, while tough monetary policy ($1/\phi_1$ low) raises the volatility of the exchange rate. The intuition follows from what was said. By accommodating a price shock through monetary policy, a Central Bank would dampen the effect of the shock on the exchange rate. This fits the convention wisdom (à la Volker or à la Tietmeyer): tough Central Banks raises exchange rate fluctuations.

Instead, tough fiscal policies would *lower* the volatility of exchange rates originating from price shocks: if they were to intervene they would add, as we have seen, another wave of disturbances to the original one. This was the Reagan way to accompany the Volker shock: loose fiscal policy boosted output but rose the volatility of the exchange rate.

4 Exchange rate volatility and (lack) of coordination

Let us now investigate in detail how EMU will affect the strategic interactions between European policy makers. In this section we shall deal with a symmetric shock $\varepsilon = \varepsilon_1 = \varepsilon_2$; $\eta = \eta_1 = \eta_2$ affecting Europe. We deal with asymmetric shocks in the appendix.

Let us first analyze the non-cooperative outcome of a game in which each country picks up a strategy (π_i^*, A_i^*) which is the best response to the other country's choice.

When determining its own choice, a country, say country 1, is subject to the following model originating from country 2:

$$\begin{cases} \pi_2^*(\varepsilon, \eta) = a_1 z_2 - az + bQ_2 + \varepsilon \\ Q_2^* = h_1 z_2 - hz + gA_2(\varepsilon, \eta) + \eta. \end{cases}$$

This system, when account is taken of the identity $z_2 = z_1 - z$ allows country 1 to calculate the intra-European exchange rate as:

$$z(t) = \theta z_1(t) + f(\varepsilon, \eta)$$

in which $f(\varepsilon, \eta)$ depends upon the response given by country 2 to the shocks (ε, η) while θ is a constant:

$$\theta = \frac{a_1 + bh_1}{a + a_1 + b(h + h_1)}$$

This implies that the model under which country 1 operates is written:

$$\begin{aligned} \pi_1 &= [a_1 + \theta a]\, z_1 + bQ_1 + \varepsilon + af(\varepsilon., \eta) \\ Q_1 &= [h_1 + \theta h]\, z_1 + gA_1 + \eta + hf(\varepsilon, \eta) \end{aligned}$$

Clearly, under this model, the same first order condition as those which we obtained in the one-country framework set up in the previous section will apply.

Call $\hat{a} = a_1 + \theta a$

$\hat{h} = h_1 + \theta h$

One obtains a monetary and fiscal policy response:

$$\pi_1 = -\frac{1}{\phi_1}\frac{1}{b+(\hat{a}/\hat{h})}Q_1 \qquad (6a)$$

$$A_1 = -\frac{1}{\phi_0}g\frac{(\hat{a}/\hat{h})}{b+(\hat{a}/\hat{h})}Q_1 \qquad (6b)$$

In order to obtain the equilibrium itself, one will recognize that the equilibrium value of intra-european competitiveness, z, is nil by symmetry of the responses.

Call

$$\hat{\Delta} = \frac{a_1}{h_1}\left[1+\frac{1}{\phi_0}g^2\frac{\hat{a}/\hat{h}}{b+\hat{a}/\hat{h}}\right] + \left[b+\frac{1}{\phi_1}\frac{1}{b+\hat{a}/\hat{h}}\right]$$

One can then write the outcome of the Nash game among European policy makers as:

$$Q_1^* = \frac{1}{\hat{\Delta}}\left[-\varepsilon + a_1/h_1\eta\right] \qquad (7a)$$

$$z_1^* = -\frac{1}{h_1\hat{\Delta}}\left[(1+\frac{1}{\phi_0}g^2\frac{\hat{a}/\hat{h}}{b+\hat{a}/\hat{h}})\varepsilon + (b+\frac{1}{\phi_1}\frac{1}{b+\hat{a}/\hat{h}})\eta\right] \qquad (7b)$$

The comparison of this equilibrium to the one-country model set up above will then simply depend upon the comparison between a_1/h_1 and $\frac{a_1+\theta a}{h_1+\theta h}$ which itself will simply depend upon the comparison between a_1/h_1 and a/h. We then have two cases.

(i) $a_1/h_1 < a/h$ is a case in which the goods purchased abroad are relatively more substituable to the domestic goods than the goods purchased in Europe.

(ii) $a_1/h_1 > a/h$ is the opposite case. It is reasonnable to assume that such is indeed the relevant case. Intuitively, Europe is a market in which "trade effects" matter realtively more than "price effects" because the subsituability of goods among European products is higher than within with the rest of the world. (This is demonstrated empirically in Cohen and Wyplosz, 1991 and I will return to it in the section 6). In the sequel we shall then assume that

(8) $\qquad a_1/h_1 > a/h$

holds.

In order to see the implications of such an inequality, let us first compare the policy outcome that is reached under the Nash equilibrium to the one-European country model.

Inequality (8) implies that $g(\theta) = \dfrac{a_1 + \theta a}{h_1 + \theta h}$ is a decreasing function of θ. We then have that:

$$\frac{\hat{a}}{\hat{h}} \equiv \frac{a_1 + \theta a}{h_1 + \theta h} < \frac{a_1}{h_1}$$

$\hat{\triangle}$ is then larger or lower than $\triangle$ depending upon the relative weight of $\dfrac{1}{\phi_0}$ and $\dfrac{1}{\phi_1}$, and this will be translated upon the volatility of output. When fiscal policy is more active than monetary policy (g^2/ϕ_0 is high), then $\hat{\triangle}$ will be lower than $\triangle$ and output will *more* volatile in a non-coordinated Europe than in a one-government Europe. In order to understand the intuitition behind such result, let us investigate the effects of a lack of coordination upon exchange rate. One gets here a non-ambiguous result:

In response to a price shock, the lack of coordination will *lower* the volatility of the exchange rate while instead in response to a demand shock, the lack of coordination will *raise* the volatility of the exchange rate.

The intuition behind this result goes to the root of the problem of designing an optimal policy response in Europe.

The lack of policy coordination leads each European policymaker to over-state the trade effects of exchange rate volatility relatively to their price effects.

When acting on their own, European policymakers fear intra-European trade disequilibria that an independent economic policy could trigger: they fail to acknowledge the fact that a *symmetric* shock makes such fears irrelevant at the aggregate level. As a result, as evident from equations (6), monetary policy will be overly active, while fiscal policy will be under-responsive. This is why, when fiscal policy is the dominant feature of economic stabilization (g^2/ϕ_0 high) economic stabilization will be reduced and output will be more volatile. More specifically, consider the implications of a negative supply shock ($\varepsilon > 0$). Because monetary policy is *too* responsive, the shock will be more dampened than it needs to be. By exaggerating the trade effect, un-coordinated policy makers will fail to appreciate European currency against the rest of the world.

Consider now the effect of a demand shock. Here it is the opposite that happens. In their attempt to stabilize the shock, each European policymaker fear trade disequilibria and under-react to the shock, henceforth under-adjusting the exchange rate response.

We can summarize these results as follows.

Lack of coordination leads European policymakers to under-adjust to demand shocks and to over-ajust to price shocks.

At the root of this mismanagement, stands *an overly responsive monetary policy and an unduly inactive fiscal policy. As a result, exchange rate volatility will be too low in response to price shocks and too large in response to a demand shock.*

Since we want to focus on the euro question, only symmetric shocks are relevant for our analysis here. Indeed, asymmetric shocks defined as $\varepsilon_1 = -\varepsilon_2$ and $\eta_1 = -\eta_2$ would cancel out for Europe as a whole so that the net effect of such shocks on the competitiveness of Europe with the Rest of the world is necessarily zero. At this stage however, it might be important to stress that opposite results would apply in the case of asymmetric shocks so far as the response of each instrument is concerned. In such cases indeed (that we analyze in appendix) policy makers fail to internalize the fact that their European counterparts move in a direction that is exactly opposite to theirs. In that case, monetary policy is too tight and should be loosened while fiscal policy needs to be tightened. This might sound like the "stability pact" whose validity, it then seems, would only be relevant for the kind of shocks that were experienced in the nineties.

5 The implications of monetary integration

We are now in a position to understand the effect of monetary integration upon the design of economic policy. In our framework, when dealing with symmetric shock, monetary union is simply interpreted as the design of a joint monetary policy that sets $\pi_1 = \pi_2 = \pi^*$ for the zone as a whole, while we keep fiscal policy un-coordinated.

Building upon the distinction between a_1/h_1 and $\hat{a}/\hat{h}$ that is spelled out above, it is straightforward to see that monetary policy will be designed so as to accommodate output shocks along the following line:

$$\pi = -\frac{1}{\phi_1}\frac{Q}{b + a_1/h_1}$$

while fiscal policymakers, instead, failing to fully internalize the symmetry of the shocks, will design the following response:

$$A = -\frac{1}{\phi_0}g\frac{\hat{a}/\hat{h}}{b + \hat{a}/\hat{h}}Q.$$

White fiscal response is therefore unchanged, one then sees that *monetary policy will be less accomodative under a monetary union than it is currently in* *response to a symmetric shock.* This is not the effect of a change of policy preferences. Indeed, in our framework, we assume that policy preferences are unchanged. This is the outcome of a change of incentives. When policymaking is designed cooperatively, as will be automatically the case so far as monetary policy is concerned, policymakers can internalize the fact that a symmetric shock will have no effect on *intra-European* competitiveness. They are therefore less worried to let competitiveness fluctuate: this will "only" trigger trade desequilibria with the Rest of the world (which is less responsive to the shift of competitiveness).

As a result, one gets an equilibrium that will be intermediate, between the one-European country outcome and the Nash equilibrium across the two countries. Call:

$$\tilde{\Delta} = \frac{a_1}{h_1}\left[1 + \frac{1}{\phi_0}g^2\frac{\hat{a}/\hat{h}}{b+\hat{a}/\hat{h}}\right] + \left[b + \frac{1}{\phi_1}\frac{1}{b+a_1/h_1}\right]$$

The new equilibrium will be characterized as:

$$Q_1^* = \frac{1}{\tilde{\Delta}}\left[-\varepsilon + a_1/h_1\eta\right]$$

$$z_1^* = -\frac{1}{h_1\tilde{\Delta}}\left[(1 + \frac{1}{\phi_0}g^2\frac{\hat{a}/\hat{h}}{b+\hat{a}/\hat{h}})\varepsilon + (b + \frac{1}{\phi_1}\frac{1}{b+a_1/h_1})\eta\right]$$

The comparison between monetary union and the Nash equilibrium is now unambiguous, both with repect to output and with respect to exchange rates. One can indeed observe, first, that

$$\hat{\Delta} > \tilde{\Delta}$$

so that output is always *more* volatile under a monetary union. The reason is straightforward, and the intuition should be clear by now. Monetary union leaves fiscal policy response unchanged, while it will tightens monetary policy: output will then be more volatile, but this will nevertheless raise the welfare of Europe.

If we turn to exchange rate volatility, the outcome will clearly depends upon the nature of the shock. In response to a price shock, the lack of a strong monetary response will raise exchange rate volatility, while instead in response to a demand shock, EMU will dampen exchange rate volatility.

There is then no a priori reason to believe that the euro will be a more "stable" currency than its European prodecessors. Only if we trust that we are entering into a world where price shock (such as those in countered in the seventies) are something of the past while key fluctuations would now originate from demand shocks will such expectations materialize.

6 Empirical implications

Let us now try to put some empirical flesh upon the previous reasoning. Our goal here is not to give precise results on the likely behavior of the Euro, but rather to give some order of margniture of the effects that we have been discussing in the text. We first tried to get estimates of what we called price and output shocks and measure their influences on exchange rates. Previous estimates of so-called output and demand shocks have already been offered by Bayoumi and Eichengreen (1993). The question of the relationship between exchange rate and macro-economic imbalances is also adressed in Canzoneri et al. (1996). Our strategy here is to try to estimate as closely as we could the model that is represented in the text. As we shall now see, it works fairly well empirically.

Let us first deal with price shocks. Assume that $\pi^e = \rho\pi_{-1} + (1-\rho)\pi^*$. One model can then be estimated as:

$$\pi_t = \rho\pi_{t-1} + az_t + bQ_t + \text{ Time dummies } + \varepsilon_t \tag{9}$$

in which z is taken to be the deviation of current exchange rate with respect to purchasing power parities (Summers-Heston data) and Q_t represents deviation of output to potential output (such as measured by the OECD).

We then ran the following output regression:

$$Q_t = \lambda Q_{t-1} + hz_t + gA_t + \text{ Time dummies } + \eta_t \tag{10}$$

in which Q_t and z_t are defined as before and A_t is the structural deficit such as measured by the OECD.

We use a panel model with fixed effects. All such regressions are obtained through instrumental variables in which the instruments are the lagged values. The sample of countries include the following European countries: Denmark, Finland, France, Germany, Italy, Portugal, Spain, Sweden, UK. We obtain the following results :

Equation (9) :

	T-statistics
ρ = *0.264*	*(1.6)*
a = *0.147*	*(3.4)*
b = *0.356*	*(2.70)*
R^2= *0.81*	

Equation (10) :

	T-statistics
λ = *0.384*	*(3.36)*
h = *3.9* 10^{-2}	*(1.51)*
g = *0.397*	*(2.54)*
R^2= *0.54*	

Except for h which is only significant at the 10% degree of confidence, one sees that all coefficient are significant and fit the intuition that is spelled out in the text.

The regressions have been made for European countries only. When are includes all OECD countries, the most significant factor that changes is h which becomes wrongly signed (but is insignificant). We interpret this as a confirmation of the view that European countries are *relatively* more dependent upon trade effect than other countries.

From equations (9) and (10) we can reconstruct the price and output shocks. Call T_π the time dummies of the price equation and T_Q the time dummies of the output equation, these shocks are (for each individual countries) $T_\pi + \varepsilon_i(t)$ and $T_Q + \eta_i(t)$ respectively. For Europe as a whole they simply boils down to T_π and T_Q. We represent then in graph 1 and 2. As we see, and as should be expected, price shocks have been more pronounced in the seventies while output shocks have been more pronounced in the eighties. More specifically, we can decompose the period into three sub-periods. During the second half of the seventies, price and demand shocks were both positive; according to the theory this leads unambigously towards a loss of competiveness: this is indeed what we observe. During the first half of the eighties, the shocks were both in the opposite direction, leading unambiguously to a rise of competitiveness: this is again what we observe; in the second half of the eighties, the shocks were in opposite directions: price shocks remained negative, raising competitiveness, while demand shcoks were piwitive, reducing competitiveness: the outcome is theoretically ambiguous, but the oberved pattern is in favor of demand shocks effects.

In order to investigate empirically whether exchange rate can be tracked as the outcome of these shocks, we have run a regression in which the average value of European competitiveness is regressed upon the average value of the price and demand schocks: in brief we simply estimated an equation such as (7b). The result comes as follows:

z = 0.11 -2.50 ϵ - 5.7 η

.............(-5.3)....(-7.1)

$R^2 = 0.87$; $DW = 1.6$
t statistic in parenthesis; number of osbervations: 16.

As expected, a price shock $\epsilon > 0$ lowers the competitiveness, as does a demand shock $\eta > 0$. Both coefficients are highly significant and the quality of the fit is excellent (see graph 3). Interestingly including a lag value of competitiveness in the regression (to account for a mean reverting process as in Rogoff 1996) does not raise the quality of the fit and makes the lagged value of z insignificant. We find these results encouraging: they do seem to imply that exchange rates one driven by those macroeconomics fundamentals that our model suggest.

As a simple way to assess the implication of these results for the euro, we have plotted, in graph 4, the net effects of price and output shocks on the exchange rate such as they are captured by the above equation. We see that each schoks appears to carry the same weight in the final outcome, and follows well the loose characterization that we sketeched above regarding the effects of price and output shocks on exchange rates.

As an example to illustrate the impact of a "tough" monetary policy, we have simulated the optimal policy response preferences of the government are characterized by $1/\phi_1 = 0$. This means that, under our simulation, that fiscal stabilization is as important as output stabilization while monetary policy is assumed to be absolutely passive. Using the value of the parameters a, h and g that we estimated, we find feed-back values worth respectively 6.3 and 1.95 for price and demand shocks. The results are shown in graph 5, in which we also plot the response obtained from our econometric equation. Under such simulation, competitiveness may fluctuate by as much 40% instead of the 20-25% fluctuation that was obtained in the past. Although clearly only a very ad-hoc estimate, this gives some light on the potential effect of a non accomodating monetary policy upon the volatility of exchange rates.

7 Conclusion

Although our results are still preliminary, they point to a simple conclusion. Price and demand shocks management stand at the core of the determination of the real exchange rate. *Any tightening of monetary policy carries the risk of raising the volatility of the real exchange rate if price uncertainties are dominant, while they would reduce it, if demand volatility is dominant.* The conclusions fit what a naive observation of the dollar would imply. Economic policies become bolder in their management of the exchange rate when they fear less trade disequilibria. To summarize this result, we may say that the "benign neglect" of American economic policy towards the dollar may also become, for the same reasons, the attitude of European policy makers towards the euro (see Bergsten,1997, and Benassy-Queré *et al.*, 1997, on a similar interpetration). Under some circumstances (European domestic price volatility) this is likely to create more volatility of the exchange rates.

APPENDIX
ASYMMETRIC SHOCKS

We have dealt in the text with the response of European policymakers to European-wide shocks. Let us now investigate the outcome of an asymmetric shock. (This distinction is also critical in the pionnering work of Canzoneri and Gray, 1985). More specifically consider any one of the following shock:

$$\varepsilon_1 = -\varepsilon_2$$
$$\eta_1 = -\eta_2$$

which neutralize each other at the European level. Here, because of the symmetry of the economies, one will get that whatever the response of the European policy makers:

$$z_1 = -z_2, \; ie : \; z = 2z_1$$

whatever one country gains in terms of competitiveness will be lost by the other.

First consider the outcome of the non-cooperative game in which each country retains its sovereignty over both instrument. The same reasoning as before applies so far as the perception of each policy maker is concerned. The response of each of them to the shock is still characterized by equations (6). The difference is that the equilibrium is now a solution to:

$$\pi_1 = [a_1 + 2a]\, z_1 + bQ_1(t) + \varepsilon_1$$
$$Q_1 = [h_1 + 2h]\, z_1 + gA_1(t) + \eta_1$$

Call

$$\triangle_a = \frac{a_1 + 2a}{h_1 + 2h}\left[1 + \frac{1}{\phi_0} g^2 \frac{\hat{a}/\hat{h}}{b + \hat{a}/\hat{h}}\right] + \left[b + \frac{1}{\phi_1}\frac{1}{b + \hat{a}/\hat{h}}\right]$$

The outcome of the non-cooperative game among European policymakers should be written as:

$$Q_1^* = \frac{1}{\triangle_a}\left[-\varepsilon + \frac{a_1 + 2a}{h_1 + 2h}\eta\right]$$
$$z_1^* = -\frac{1}{(h_1 + 2h)\triangle_a}\left[(1 + \frac{1}{\phi_0} g^2 \frac{\hat{a}/\hat{h}}{b + \hat{a}/\hat{h}})\varepsilon + (b + \frac{1}{\phi_1}\frac{1}{b + \hat{a}/\hat{h}})\eta\right]$$

It is straightforward to compare this non-cooperative equilibrium to the outcome of the cooperative equilibrium. All that it takes is to take $\theta = 2$ in the definition of

$$\frac{\hat{a}}{\hat{h}} = \frac{a_1 + \theta a}{h_1 + \theta h}.$$

This is to say that the first best outcome is characterized by

$$\begin{cases} \pi_1 = -\dfrac{1}{\phi_1} \dfrac{1}{b + \dfrac{a_1 + 2a}{h_1 + 2h}} Q_1 \\ A_1 = -\dfrac{1}{\phi_0} \dfrac{(a_1 + 2a)/(h_1 + 2h)}{b + \dfrac{a_1 + 2a}{h_1 + 2h}} Q_1 \end{cases}$$

Under our (maintained) hypothesis that $\frac{a}{h} < \frac{a_1}{h_1}$ one has:

$$\frac{a_1 + 2a}{h_1 + 2h} < \frac{a_1 + \theta a}{h_1 + \theta h} < \frac{a_1}{h_1}$$

This shows that, contrary to the outcome of a symmetric shock, *fiscal policy* is *too expansionary in the non-cooperative case while monetary policy instead is too cautions* when coordination is lacking. As we already repeated stressed, this will imply that exchange rate will be too volatile in response to a price shock and too stable in response to a demand shock.

The intuition should be clear. When they act non-cooperatively, European policymakers fail to internalize the fact that their European counterparts move in a direction which is opposite to theirs. In other words, more weight than what they perceive should actually be given to intra-European desequilibria (which is clearly the opposite to the case of symmetric shock). If trade effects are relatively more important *within* Europe than price effects, this implies that monetary policy should be expanded, while fiscal policy should be tightened. This sounds like a "fiscal stability pact" *cum* a more laxist monetary policy, which is perhaps what the stability pact is about. It would then be only valid in cases of asymmetric shocks, which were indeed dominant in the nineties, but need not be so in the future.

References

Barro, R. and D. Gordon (1983) "Rules, Discretion and Reputation in a Model of Monetary Policy" *Journal of Monetary Economics* : 101-121.

Bayoumi, T. and B. Eichengreen (1993) "Shocking aspects of European Monetary Integraion" in Torres and Giavazzi (eds), *Adjustments and Growth in the European Monetary Union,* CUP.

Benassy-Queré, A., B. Mojon and J. Pisani-Ferry "The Euro and Exchange Rate Stability", *this volume.*

Bergsten, F. (1997) "The Impact of the Euro on Exchange Rates and International Policy Cooperation", *this volume.*

Canzoneri, M. and J.A. Gray (1985) "Moneatry Policy Games and the Consequences of Non-Coopeartive Behavior", October 1985, *International Economic Review,* 26, pp 547-564.

Canzoneri , M. , J. Valles and Jose Vinals (1996) "Do exchange rates move to adress international macroeconomci imbalances? " CEPR, DP n1498.

Cohen, D. and Ch. Wyplosz (1995) "Price and trade effects of exchange rate fluctuations and the design of polciy coordination", *Journal of International Money and Finance,* vol 14, 3, pp 331-374.

——————————— (1991) "France and Germany in the EMS:the exchnage rate cosntraint' in *The Exchange Rate Constraint,* Alogoskoufis, Portes and Papademos eds, Cambridge: CUP.

Rogoff K. (1996) "Purchasing Power Parity: a Survey" *Journal of Economic Litterature,* June.

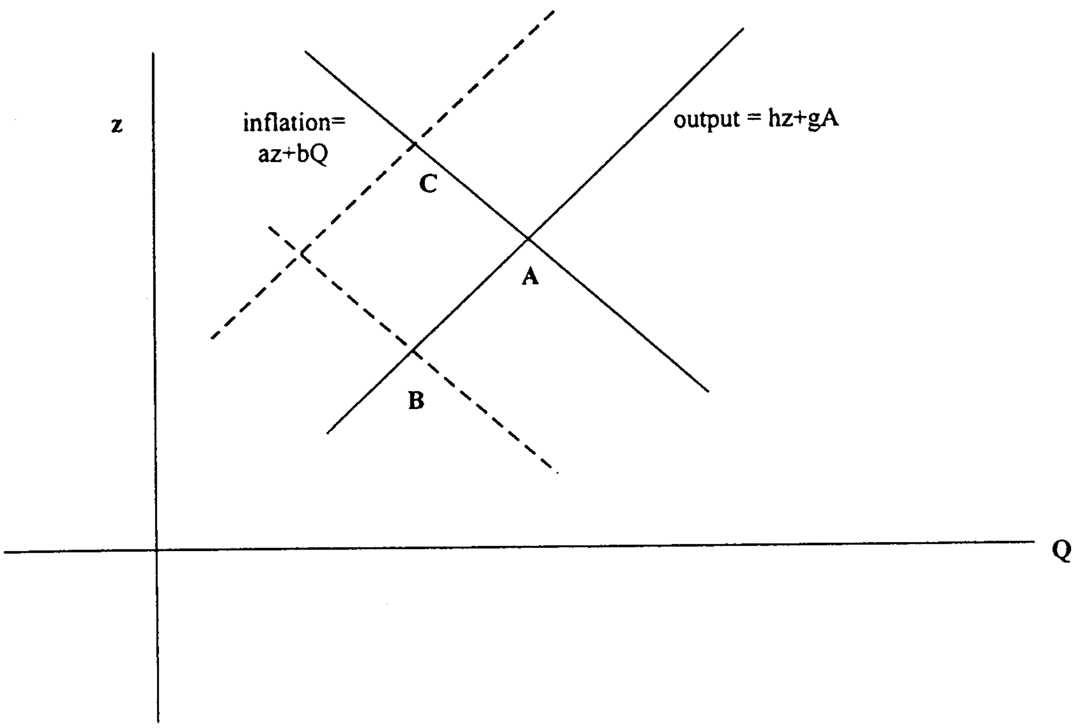
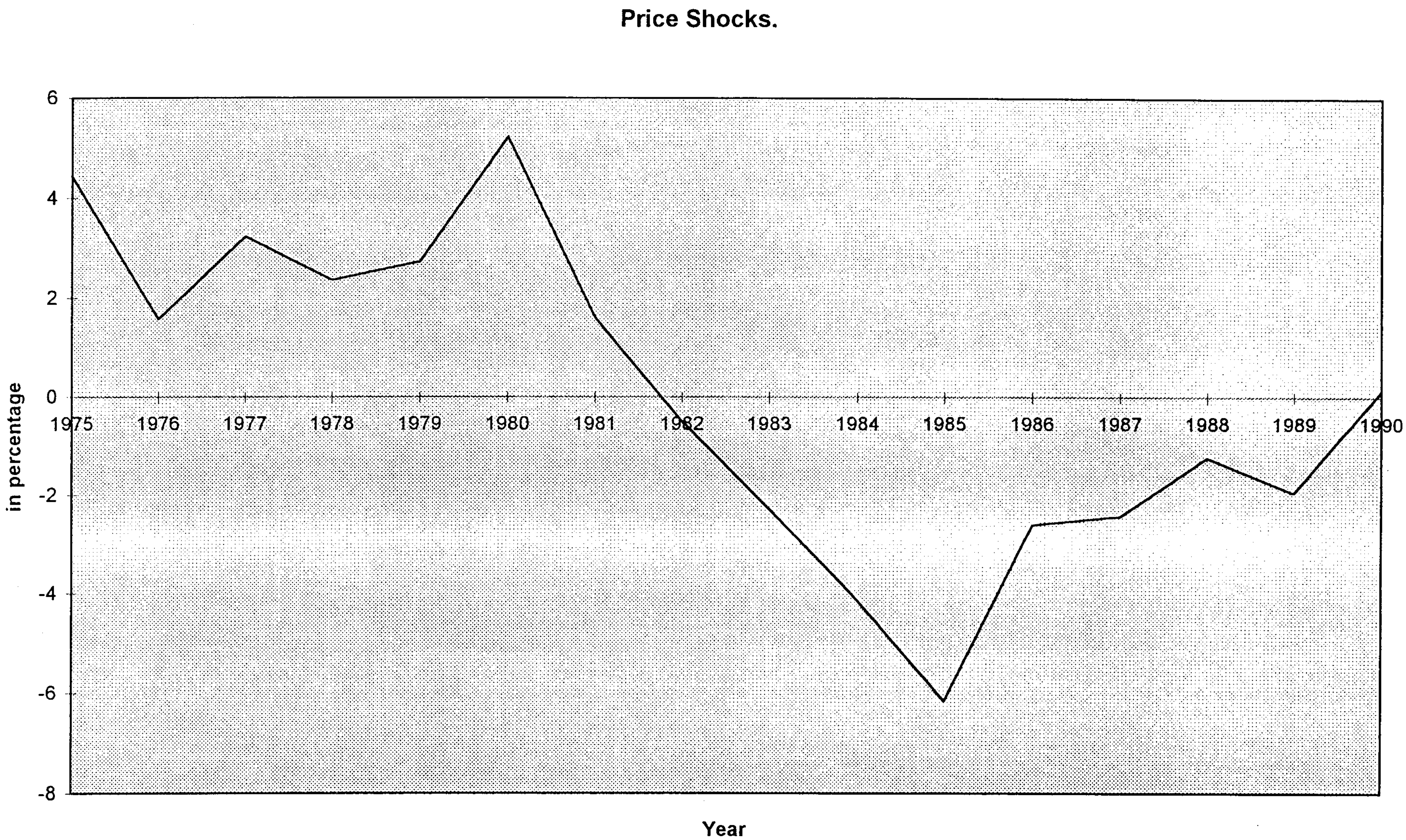
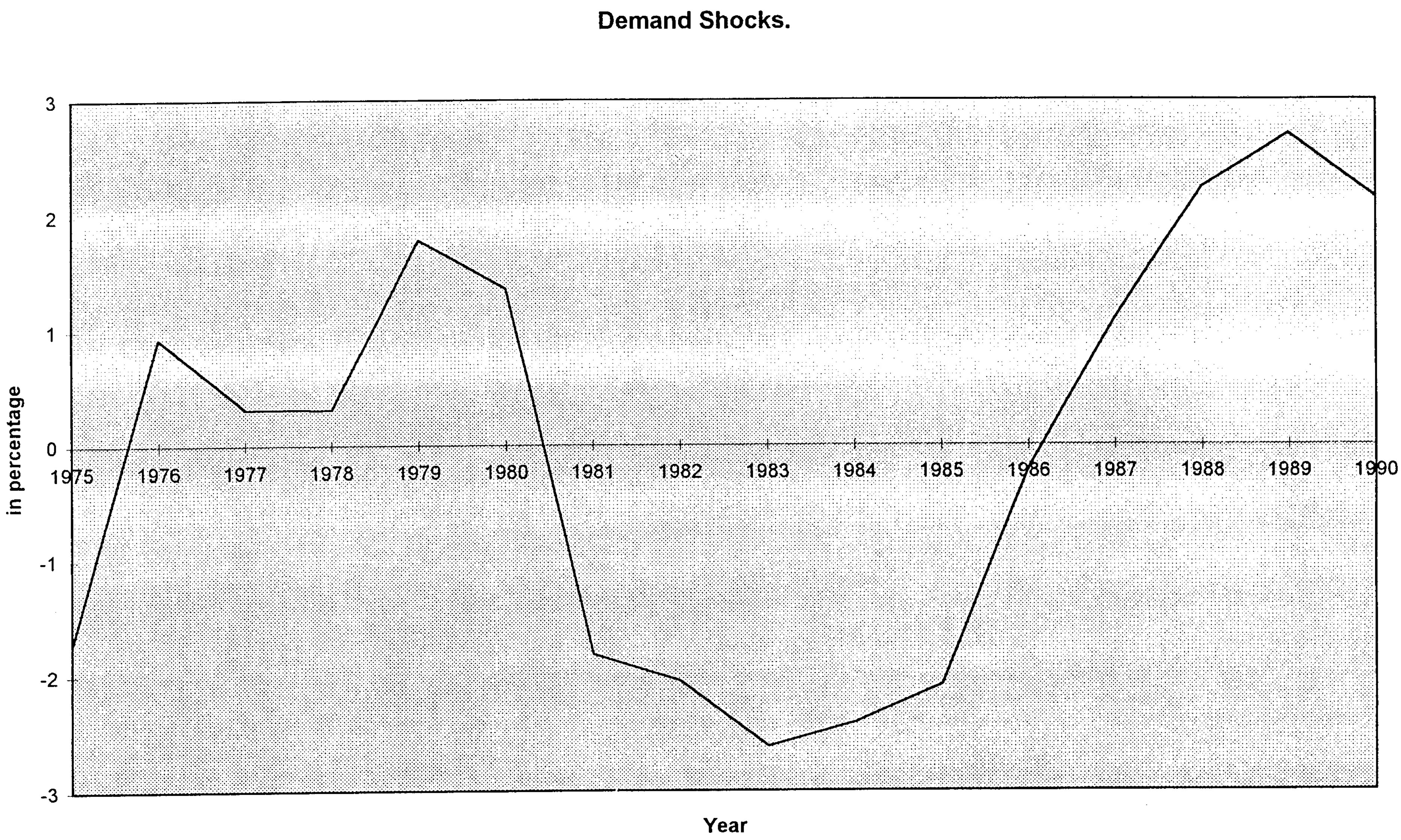
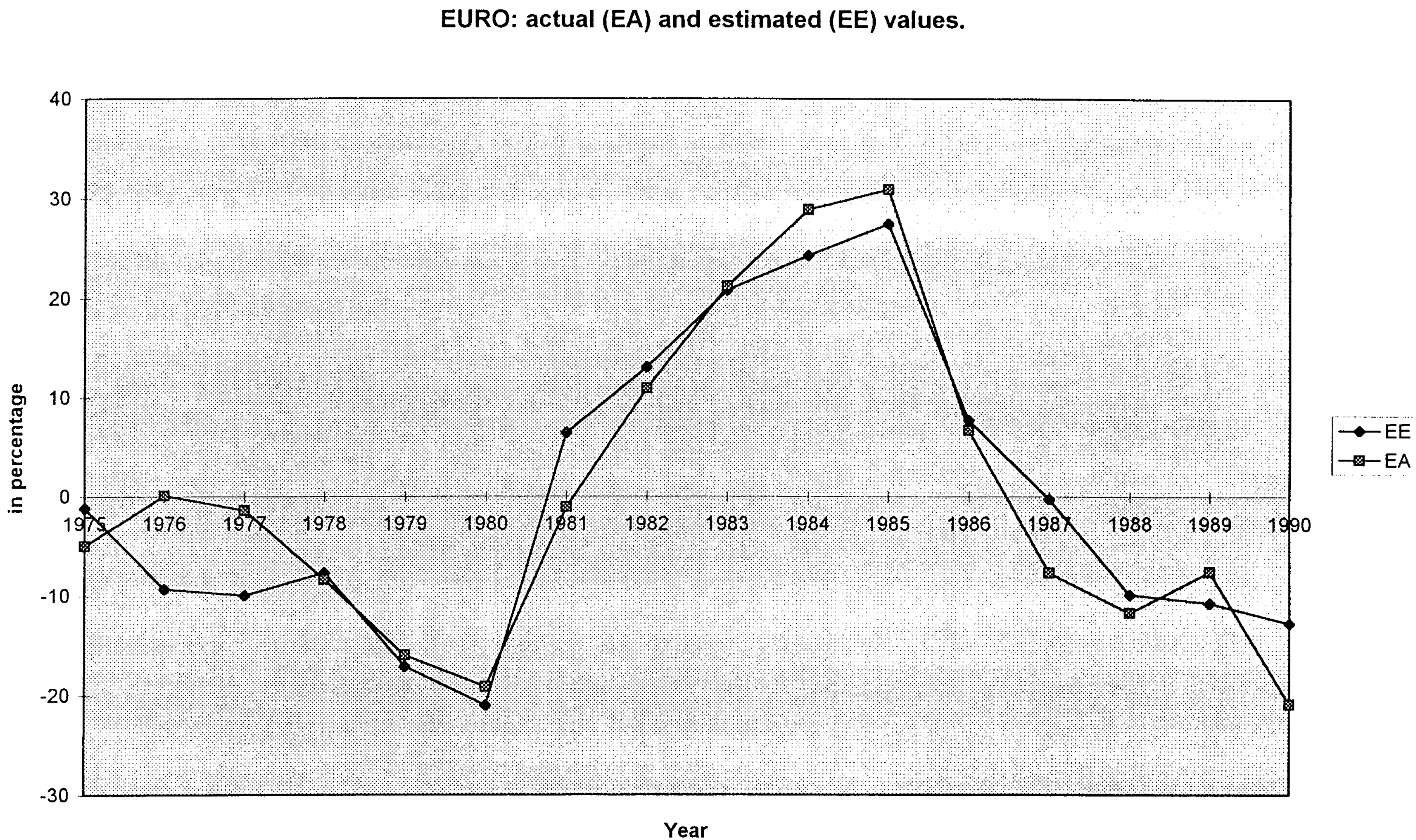


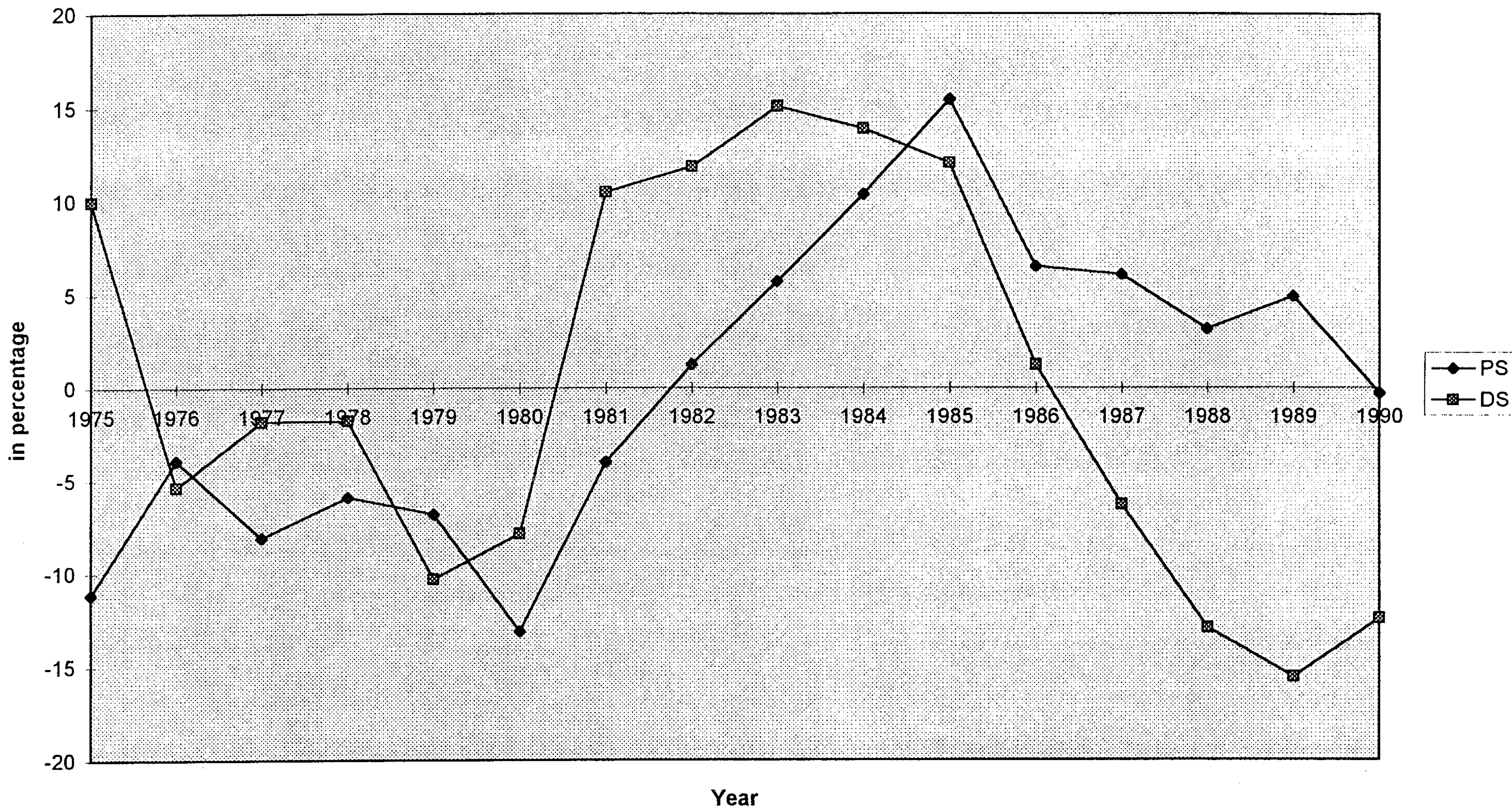
Figure 1: output and comptetitiveness

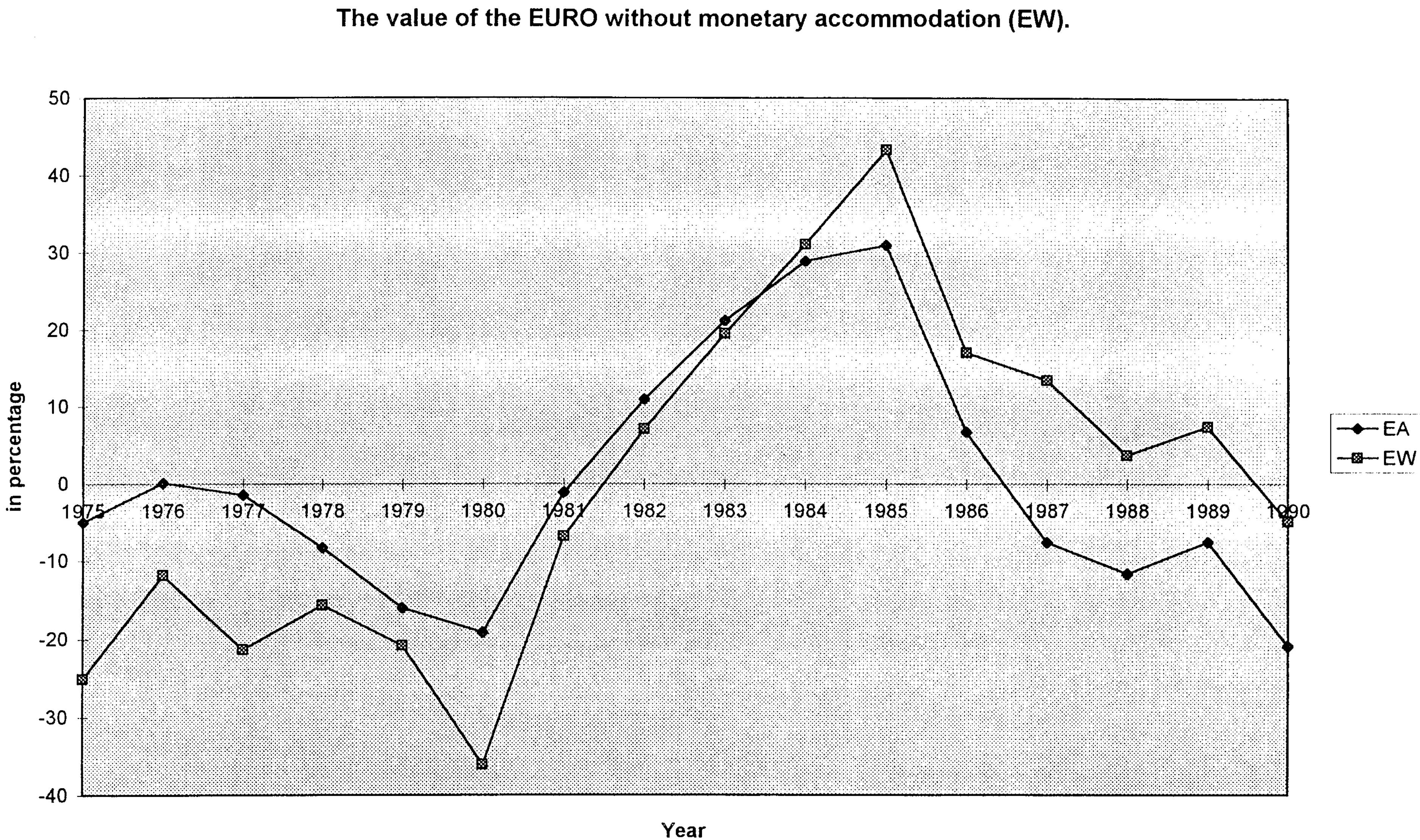

Price Shocks.
6
4
2
0
-2
-4
-6
-8
in percentage
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
Year


Demand Shocks.
3
2
1
0
-1
-2
-3
in percentage
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
Year


EURO: actual (EA) and estimated (EE) values.
40
30
20
10
0
-10
-20
-30
in percentage
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
Year
EE
EA

Contribution of price (PS) and demand (DS) shocks to the value of the EURO.




The value of the EURO without monetary accommodation (EW).
50
40
30
20
10
0
-10
-20
-30
-40
in percentage
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
Year
EA
EW