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ABSTRACT

Why was the Euro Weak? Markets and Policies*

Against all odds, the euro turned out to be a weak currency. We argue that this outcome can readily be explained by the policy mix that was chosen at the onset of the period: tight fiscal policies following the convergence mechanism that was imposed by the Maastricht treaty and loose monetary policy that resulted from the convergence of interest rates to the lower point of the spectrum. We investigate this outcome empirically and show that the euro's weakness can be understood as the result of an excess supply in the zone, which is channelled abroad in the usual 'beggar thy neighbour' way. We also outline how an optimal policy mix could be set in the future and discuss a suggestion that has been made by Alessandra Casella on the proper way to determine the fiscal deficit of the zone.

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NON-TECHNICAL SUMMARY

The Euro was expected to be a strong currency. Its weakness has been an embarrassment until it became – in the words of the IMF chief economist Michael Mussa – 'a problem'. Early work indicated that the growth differential between Europe and the US was the cause of the problem. The euro's weakness, however, was also noticeable with respect to the yen so that this explanation alone cannot do. Another (and related) explanation holds that the euro was weak because of large capital flows to the US, which were themselves triggered by a booming US stock market. As we shall review however, the euro fell even when the European stock market performed better than its US counterpart. In fact, despite the fall of the euro, the dollar-denominated value of the European stock market did not lose ground to its US counterpart. Other interpretations have built upon the lack of 'political unity' of Europe and the correspondingly poor design of the Maastricht treaty. To summarize in a few words a very dense literature, one can say that the core of the debate has hinged upon the free-riding behavior of fiscal authorities in any particular country against the rest of the zone. Free riding may take many different forms, but in essence, it amounts to either enjoying (low) interest rates from the zone and borrowing too much, or floating too much nominal debt with respect to the servicing capacity of the fiscal authorities, leaving it to the inflation of the zone to adjust. Is the failure of the various governments of the zone to internalize their intertemporal budget constraint properly such a daunting problem? More specifically, can it be one of the causes for the euro's weakness during its first year of existence? It is hard to find any convincing evidence that the risk of default, or at the least the risk of fiscal unsustainability, looms behind the recent performance of the euro. Spreads on government bonds have been almost non-existent and when it appears it is essentially in small countries where the liquidity of the market seems to be the driving force. Is the risk of rising inflation a critical problem? Again, if any thing, inflation has been low in Europe compared to the US. Combined with the weakness of the euro, the low inflation figure points to an opposite direction, namely that fiscal policies have been too tight, rather than too loose. Such is indeed the explanation that we shall offer. In the empirical section of this Paper, we relate the euro/dollar nominal exchange rate to daily values of the European and the American stock market indexes, the European and the American day-to-day nominal interest rates. Our time horizon encompasses the first 17 months of the euro (January 1999 – May 2000). Building upon a fairly standard identification procedure, we identify supply and demand structural shocks underlying these data. We show that the euro's weakness can be understood fairly well as the result of excess supply in the zone, which is channeled abroad in the usual 'beggar thy neighbour' way. The weakness of the euro can then be interpreted as nothing else but the reflection of the initial policy mix of the zone: tight fiscal policies following the sharp tightening that was imposed on the zone by the Maastricht numerology and loose

monetary policy that has resulted from the convergence of interest rates at the lower end of the zone, then by the loosening of monetary policy. The question of whether this policy mix is itself an optimal response to the situation is obviously a difficult matter on which we shall shed some theoretical light.

In order to do that, we present a Mundell-Fleming-Dornbusch perspective according to which the optimal policy mix is critically dependent on the exchange rate regime that the country lives in. So far as Euroland as a whole is concerned, the model suggests that, being in a floating exchange rate regime, it can only be stabilized by monetary policy. On the other hand, each individual country in the zone, being part of a fixed exchange rate regime, finds it instead extremely useful to stabilize its output through fiscal policy. In such a world, the distribution of tasks is obvious: monetary policy should manage the aggregate European economy and fiscal authorities stabilize their own idiosyncratic shocks. This is where, however, the need for fiscal coordination steps in: each fiscal authority has the incentive to stabilize its own economy, not only its idiosyncratic part. In the absence of an explicit mechanism, the outcome of macroeconomic management is likely to be inefficient. Fiscal policies indeed are bound to react to a Europe-wide shock, when they should not. If such is the problem, imposing a structural balance of each country's deficit or a check on the stock of debt will not do. It is a mechanism in the spirit of a suggestion that has been made by Alessandra Casella that is needed: as she convincingly argues, Euroland governments need to agree on the aggregate deficit that they want to pursue (in cooperation, if possible, with the ECB) and then let each country reveal its further need according to the idiosyncratic shocks to which it is exposed.

1 INTRODUCTION

The Euro was expected to be a strong currency. Its weakness has been an embarrassment until it became -in the words of the IMF chief economist Michael Mussa- a problem. Early work (by Corsetti and Pesenti, 1999) indicated that the growth differential between Europe and the US was the cause of the problem. The euro's weakness, however, was also noticeable with respect to the yen so that this explanation alone cannot do. Another (and related) explanation holds that the euro was weak because of large capital flows to the US, which were themselves triggered by a booming US stock market. As we shall review however, the euro fell even when the European stock market performed better than its US counterpart. In fact, despite the fall of the euro, the dollar denominated value of the European stock market did not lose ground to its US counterpart when measured from January 1999 to March 2000.

Other interpretations have built upon the lack of "political unity" of Europe and the correspondingly poor design of the Maastricht treaty. To summarize in a few words a very dense literature, one can say that the core of the debate has hinged upon the free-riding behavior of fiscal authorities in any particular country against the rest of the zone (see Canzoneri, Cumby and Diba, 1998). Free riding may take many different forms, but in essence, it amounts to either enjoy (low) interest rates from the zone and borrow too much or to float too much nominal debt with respect to the servicing capacity of the fiscal authorities, leaving it to the inflation of the zone to adjust (see Chari and Kehoe, 1998). Is the failure of the various governments of the zone to internalize properly their intertemporal budget constraint such a daunting problem? More specifically, can it be one of the causes for the euro's weakness during its first year of existence? It is hard to find any convincing evidence that the risk of default, or to the least the risk of fiscal unsustainability, looms behind the recent performance of the euro. Spreads on government bonds have been almost non existent, and when it appears it is essentially on small countries where the liquidity of the market seems to be the driving force (see Von Hagen, 2000). Is the risk of rising inflation a critical problem either? Again, if any thing, inflation has been low in Europe compared to the US. Combined with the weakness of the Euro, the low inflation figure points to an opposite direction, namely that fiscal policies have been too tight, rather than too loose. Such is indeed the explanation that we shall offer. The weakness of the euro, we argue, is nothing else but the reflection of the initial policy mix of the zone: tight fiscal policies following the sharp tightening that was imposed on the zone by the Maastricht numerology, and loose monetary policy that has resulted from the convergence of interest rates to the lower end of the zone, then by the loosening of monetary policy. The question of whether this policy mix is itself an optimal response to the situation is obviously a difficult matter on which we shall shed some theoretical flash.

In the first section of this paper, we shed some empirical light on the euro's movement during its first year and a half of existence. Our analysis relies on a VAR based upon daily values of the European and the American stock market indexes, the European and the American day-to-day nominal interest rates, and the Euro/Dollar nominal exchange rate. Our time horizon encompasses the first seventeen months of the Euro (January 1999/May 2000). We identify what we call the supply and demand structural shocks underlying these data. We show that the euro's weakness can fairly well be understood as the result of excess supply in the zone, which is channelled abroad in the usual beggar my neighbor way.

In order to understand the mechanics underlying these results, we offer a Mundell-Fleming-Dornbusch perspective according to which the optimal policy mix is critically dependent on the exchange rate regime that the country lives in. So far as euroland as a whole is concerned, the model suggests that, being in a floating exchange rate regime, it can only be stabilized by monetary policy. On the other hand, each individual country in the zone, being part of a fixed exchange rate regime, finds it instead extremely useful to stabilize its output through fiscal policy. In such a world, the distribution of tasks is obvious: monetary policy should manage the aggregate European economy, and fiscal authorities stabilize their own idiosyncratic shocks. This is where, however, the need for fiscal coordination steps in : each fiscal authority has the incentive to stabilize its own economy, not only its idiosyncratic part. In the absence of an explicit mechanism, the outcome of macroeconomic management is likely to be inefficient. Fiscal policies indeed are bound to react to European-wide shock, when they should not. If such is the problem, imposing a structural balance of each country's deficit or a check on the stock of debt will not do. It is a mechanism in the spirit of Casella's suggestion that is needed: as she convincingly argues, Euroland governments need to agree on the aggregate deficit that they want to pursue (in cooperation, if possible, with the ECB) and then let each country reveal its further need in function of the idiosyncratic shocks that it is exposed to.

2 THE FIRST YEAR OF THE EURO

Before the launch of the euro, we may say that they were basically two school of thoughts predominant. One was that the euro would be too strong, the other was that it would be too volatile. It would be too strong because the demand for euro as a reserve currency would be boosted up; it would be too volatile because of a new "benign neglect" view of the European authorities towards the dollar. Even at the time, many counter arguments existed against each of these views (see Demertzis and Hughes Hallett, 1999). Since the euro was launched, one can say that a third school of thought has developed: that the euro is bound to be weak. Although many different variants of arguments have been advanced, one directly hinges upon the fact that the euro is weak for the very reason why fiscal restraints were needed: when fiscal policies are not restrained the fear of say rising inflation depreciates the currency.

One simple way to contemplate the empirical implications of these models is to consider their prediction about the effect of a positive supply shock on the value of the euro. A natural prediction of the theories advocating the need to strengthen the credibility of fiscal policies is that a positive supply shock is good for the euro inasmuch as it is likely to raise fiscal revenues and strengthen the likelihood that the dynamic budget constraint of the governments will be met.

To check whether the data fit this prediction, we collected daily data about the European and the American stock market indexes (respectively noted Q and Q^*), the European and the American day-to-day nominal interest rates (respectively I and I^*), and the Euro/Dollar nominal exchange rate (noted E), expressed in Dollars per Euro[1]. The period considered starts from the launch of the Euro at the 1^{st} of January 1999 and ends in May 2000, the 26^{th}. During this period the Euro has steadily depreciated, with the possible exception of a few month long stabilization in summer-autumn 1999. As can been observed on the graphs displaying the data, from the end of 1999 there is a surge in the European stock market index, contemporaneous with a further fall of the Euro. This development does not support the models based on a lack of credibility of fiscal policies. We chose therefore to

[1] I was furnished by the *Banque de France*, I^* and E were collected from the *Fed* website, and the national stock market indexes were found on the www.mscidata.com Website. Q was built from national data, using the 1999 GDP figures published by *Eurostat* as national weights inside the Euro zone. I and I^* are expressed in per cent per year, E in Dollars per Euro, Q derives from indexes expressed in Euros and Q^* from an index expressed in Dollars. All variables are tranformed in log, except I and I^*.

consider two different estimation periods, even if Chow tests indicate that no structural break occurs during this first year and a half. The first estimation period considered is made of the whole sample, and the second one is limited to the year 1999. We obtained very similar results in the two cases. What is presented in the following is the results corresponding to the estimation period limited to the year 1999. It will enable us to confront the predictions of this estimation with what has been observed so far in 2000.

One way to gather the information contained in these data would be to consider a perfectly symmetric world, which would amount to use the relative variables $Q - Q^*$, $I - I^*$ and E. We decide instead to allow for a certain asymmetry between the two sides of the Atlantic Ocean. Distinguishing I from I^* proves not conclusive, either because few changes in interest rates have been decided by monetary authorities during the short period considered, or because of the particularities of these data (as explained below). Therefore we distinguish only Q from $Q^*$and we use accordingly the variables Q, Q^*, $I - I^*$ and E. The Dickey-Fuller and the Phillips-Perron unit root tests, with or without trend, show that among these four variables, only $I - I^*$ cannot be considered as a non-stationary variable at the standard 95% confidence level. This result is likely to be due, at least partially, to the tender invitations conducted by the ECB and the Fed, responsible for peaks and troughs in series $I - I^*$ throughout the period. It may also be due, as already said, to the fact that few monetary policy decisions have been taken during the estimation period. The same tests strongly suggest, at a more than 99% confidence level, that ΔQ, ΔQ^* and ΔE should be considered as stationary variables. Finally, the Johansen's trace and $\lambda_{\max}$ tests, carried out with or without trend, indicate that the hypothesis of no cointegration relations between variables Q, Q^* and E cannot be rejected at the 90% confidence level. We therefore decide to estimate a four-dimension VAR whose stationary dependent variables are ΔQ, ΔQ^*, $I - I^*$, ΔE.

Constants are included in this VAR, which means that variables Q, Q^* and E are supposed to follow deterministic trends[2]. All that will be said in what follows about movements of these variables refers therefore to the movements of these variables relatively to their trends. Finally, the last point to settle before estimation can take place is the choice of the order of the VAR, that is to say the number of its lags. The Akaike criterion suggests to retain a high order for this VAR (more than ten), whereas the Hannan-

[2]The correponding Student tests indicate that each constant is significant at the 70% confidence level, except that in equation ΔQ^*. Estimating the VAR without the constants leads otherwise to non-relevant results.

Quinn and the Schwartz criteria advocate the use of a low order (about one or two). We choose accordingly to set the order at the intermediate value of five. Besides, we assume in the standard way of the structural VAR literature that the movements in our four variables are caused by the occurrence of four structural shocks. More precisely, the residuals in the VAR equations are expressed as linear combinations of orthogonal white noises. The structural shocks we consider are a European supply shock ϵ^s, an American supply shock ϵ^{s*}, a common monetary shock ϵ^{m+m*} and a shock on the nominal exchange rate ϵ^e. This last shock should not be confused with some relative monetary shock, although considering such a ϵ^{m-m*} would have been interesting. It corresponds rather to a shock on the confidence in the Euro, which would explain the part of fluctuations in E that are not due to supply or monetary shocks. Therefore if the models based on a lack of credibility of fiscal policies are right, then one should expect the shock on the confidence in the Euro to play an important role in the depreciation of the new currency.

These structural shocks are identified by three short-run and three long-run restrictions[3]. One first short-run constraint is that the common monetary shock ϵ^{m+m*} has the same instantaneous impact on both interest rates I and I^*, that is to say that it has no instantaneous impact on the relative variable $I - I^*$. The remaining short-run constraints aim at disentangling the two supply shocks ϵ^s and ϵ^{s*} from each other, by imposing no instantaneous effect of ϵ^s on Q^* and of ϵ^{s*} on Q. The latter restriction can be justified by the time difference between Europe and the United States, so that Wall Street opens roughly when the European financial centers close. The former amounts to neglect the instantaneous effect of news about European productivity on the American stock market index. Finally, the long-run restrictions say that ϵ^e has no long-run impact neither on Q nor on Q^*, whereas the common shock ϵ^{m+m*} has no long-run impact on the relative variable $Q - Q^*$. In other words, the nominal shocks (ϵ^e and ϵ^{m+m*}) are supposed to have limited or no long-run influence on Q and Q^*, contrary to the supply shocks. What is meant by 'long-run' (how long it is) will be part of the results.

The graphs of the impulse-response functions are displayed with their 90% confidence bootstrapping bands[4]. These impulse-response functions correspond to the simulated reactions of the different variables to one-off shocks,

[3] The short-term restrictions matter especially here, as the R^2 for equation with dependent variable E amounts to no higher than 5%, to be compared to 78% for equation with dependent variable $I - I^*$.

[4] The results are obtained with the help of two different softwares, RATS and MATLAB, the latter being used only to determine the instantaneous impacts of shocks on variables. As these softwares cannot call each other easily, it proves little tractable to allow the

whose size equals their estimated standard error. Some of these responses appear as conventional, others do not. A common restrictive monetary shock has the expected effects (some of them coming directly from the chosen restrictions), that is to say a significant negative impact on both stock markets, and no significant impact on the relative variables $I-I^*$ and E, be it at short- or long-run.

As for a shock on the nominal exchange rate, tending to an appreciation of the Euro, it leads to a significant short-run fall in the European stock market index, does not affect the American stock market, and decreases I relatively to I^* for a while. That an appreciation of the Euro, due to a shock ϵ^e, results in a temporary fall in Q, suggests that the European stock market index is sensitive to the level of demand (indeed, an appreciation of the Euro cools down external demand). Under the sensible assumption of a link between the stock market index and the production level, this result would point to a European economy in excess supply. The same shock ϵ^e is associated with a fall of I relatively to I^*, either as the direct effect of the increase in the demand for the Euro, or because of a monetary policy reaction. This monetary policy reaction may be both European and American and is quite conventional. Finally, the move in the exchange rate, due to a shock ϵ^e, has no significant impact on Q^*. This insensitivity can be explained by two different reasons. One is that the American economy is in excess demand, so that the additional demand induced by the depreciation of the Dollar does not affect the American stock market index, assuming once again a link between the stock market index and the production level. The other is that the potential effect of this additional demand on Q^* is entirely compensated by the effect of a rise in I^* on Q^*.

As far as supply shocks are concerned, the results can be summed up in three points. First, all happens as if Wall Street set the fashion, followed the next day by the European financial centers. Indeed, on the one hand an American positive supply shock results in a permanent increase in the American stock market as well as a temporary increase in the European stock market, and on the other hand, a European positive supply shock raises the European stock market without significantly affecting the American one. Note that the effect of a supply shock on the domestic stock market index proves strongly significant in the United States, but hardly significant at the 90% confidence level in Europe, comforting the idea of an American excess

instantaneous impacts of shocks on variables to be modified throughout the bootstrapping replications. As a consequence, the confidence bands do not arise as early as the period contemporaneous with the simulated shock.

demand and a European excess supply, once again under the assumption of a link between the stock market index and the production level. Second, a positive supply shock, either American or European, leads to a fall of the domestic interest rate relatively to the foreign one, as could be expected, the monetary policies leaning against the wind, be it in- or de-flationnary. That this evidence is much more clear-cut in Europe than in the United States would suggest that prices are more responsive to supply shocks here than there, as will be shortly discussed in section 3. Third, supply shocks have strikingly opposite effects on the exchange rate, depending on whether we consider the Euro zone or the United States. Indeed, an American positive supply shock appreciates the Dollar, and on the contrary, a European positive supply shock depreciates the Euro. This result tends to confirm the previous analysis: additional supply in Europe due to the shock ϵ^s has to find its outlet abroad, since internal demand proves insufficient, and this goes through a currency depreciation, whereas additional supply in the United States due to the shock ϵ^{s*} meets and is absorbed by excess internal demand, so that there is no need for the Dollar to depreciate, and the foreign capital attraction effect predominates, resulting in a currency appreciation.

Some of these results may be considered as surprising at first sight, for instance the depreciation of the Euro following a positive European supply shock. They are not specific to the year 1999, since only one out of the sixteen impulse-response functions significantly changes when the VAR is estimated from January 1999 to May 2000 (the reaction of E to a restrictive common monetary shock becomes then significantly negative). We also insist on the fact that these results are not by-products of the structural VAR methodology. To check this point, we computed the cross-correlations $corr\,(X_{t-k}, Y_t)$, with k from -10 to +10, for each couple (X, Y) of variables among ΔQ, ΔQ^*, $I - I^*$, ΔE. The only following four correlations proved significant[5], $corr\,(\Delta Q_t, \Delta E_t) = -31\%$, $corr\,(\Delta Q_t^*, -\Delta E_t) = 16\%$, $corr\,(\Delta Q_t^*, \Delta Q_t) = 36\%$ and $corr\,\left(\Delta Q_{t-1}^*, \Delta Q_t\right) = 37\%$. The nature and the sign of these correlations corroborate the results we obtain with the structural VAR. Moreover, causality tests were conducted[6] for each couple of variables among ΔQ, ΔQ^*, $I - I^*$, ΔE, as well as among the levels Q, Q^*, $I - I^*$, E.

[5] For such correlations (based on roughly 260 entries), the threshold of significance at the 90% confidence level amounts to 13%.

[6] Several statistical precedures are available to test "causality" of variable X by variable Y. The Granger test consists in regressing Y on lagged Y and lagged X, then in testing the lags of X, the Sims test in regressing X on past, present and future Y, then in testing the leads of Y, and the Geweke-Meese-Dent test in regressing X on past, present and future Y as well as on past X, then in testing the leads of Y. We chose the number of lags and the number of leads equal respectively to 20 and 10.

Only two "causalities" were found significant in a clear-cut way, that of Q causing E (or ΔQ causing ΔE) and that of Q^* causing Q (or ΔQ^* causing ΔQ). These results go also in the same direction.

One of our main interests is also to determine the sources of the exchange rate fluctuations around the steady Euro depreciation throughout the year 1999. This corresponds to the diagram displaying the decomposition of the exchange rate fluctuations into the parts due to the different shocks. Thus, according to the estimated VAR, the common monetary shock has played no role in these fluctuations, so that the main contributory shocks are ϵ^s (slightly tending to depreciate the Euro), ϵ^{s*} (tending to depreciate the Euro, except from July to October) and ϵ^e (neutral from January to July, then tending to strongly appreciate the Euro)[7]. The same exercise can be done for the first five months of the year 2000, by projecting off sample the estimated VAR and reconstructing the patterns of structural shocks which have appeared to drive these evolutions. The results come as follows: the shocks ϵ^s and ϵ^{m+m*} contributed to depreciate the Euro, the shock ϵ^e to appreciate the Euro, and the shock ϵ^{s*} proved relatively neutral (note that the contribution of ϵ^s corresponds to the surge in Q that we considered at the beginning of this section). But these last results are to be considered cautiously, since the shocks reconstructed off-sample fail to verify the basic statistical properties of the structural shocks coming directly from estimation - in particular some of them cannot be considered as centered and others as orthogonal to each other at the 90% confidence level. Notwithstanding, all these results, be they within or off-sample, point to the same conclusion: the Euro depreciation may be due not to a gradual loss of confidence in the new currency - on the contrary, but to the occurrence of positive American and European supply shocks.

3 THE MODEL

The result that we obtained empirically, that a positive European supply shock tends to depreciate the Euro, is at odds with theories that underline the lack of credibility of European institutions as a source of the Euro's weakness.

[7] These results are changed significantly at first sight when the VAR is estimated from January 1999 to May 2000. However, this change is mainly due to the fact that estimated trends are then modified. As already said, the impulse-response functions hardly differ between the two estimations.

In this section, we highlight a very simple source to the Euro's fluctuation, namely a basic Mundell-Fleming-Dornbusch model. We present the model of an economy, Euroland, which is composed of a (large enough) number of countries which share the same nominal variables (prices, money, exchange and interest rates), but which might be affected by different transitory shocks to their output. We assume that wages are set (European wide) at the beginning of the period. We take:

$$w_t = E_{t-1}p_t \tag{1}$$

in which p_t is the price level at time t. We assume that they are set as:

$$p_t = w_t - \xi_t$$

in which ξ_t is a transitory price shock.

We further assume a money-demand function:

$$m_t = p_t - \lambda i_t + \phi y_t \tag{2}$$

in which i_t is the nominal interest rate and y_t is output; the uncovered interest rate arbitrage is expected to hold so that:

$$i_t = i_t^* + (e_{t+1}^a - e_t) \tag{3}$$

For simplicity we take $i_t^* = 0$ (in the empirical application we considered the interest rate differential between Europe and the US). All the variables written so far are aggregate European variables, which implicitly assumes that the law of one price holds over the zone, as well an identical functional form for all money holdings.

Regarding output, we assume that each country is affected by a shock which is partly idiosyncratic and partly European wide. We also assume that output depends on competitiveness (which is European wide) and on a fiscal stimulus which depends on each country's policymakers. For each country i in the euro zone we then write:

$$y_{it} = h(e_t - p_t) + gA_t^i + \varepsilon_t^i$$

in which ε_t^i is a (white noise) shock to output i which is aggregated into:

$$\varepsilon_t = \int_i \varepsilon_{it} di$$

Finally we assume that money supply is geared towards price stability, up to unforeseen shocks. More specifically, we take:

$$m_t = p_{t-1} + \eta_t \tag{4}$$

in which η_t is a white noise.

In order to grasp the logic of the model, we shall simply assume here that fiscal policy responds to the shock ε_{it} through a counter-cyclical response:

$$gA_{it} = -\delta\varepsilon_{it} \ .$$

We return in the last section of the paper on the determinants of an endogenous fiscal response. In the simple case that we examine, output can be written:

$$y_t = h(e_t - p_t) + (1-\delta)\varepsilon_t$$

One only need to conjecture the exchange rate behavior as

$$e_t = p_{t-1} + a\eta_t + b\varepsilon_t + c\xi_t$$

and get :

$$a = \frac{1}{\lambda + \phi h}$$
$$b = -\frac{(1-\delta)\phi}{\lambda + \phi h}$$
$$c = -1 + \frac{1}{\lambda + \phi h}$$

We can then write output as:

$$y_t = \frac{h}{\lambda + \phi h}\eta_t + \frac{\lambda(1-\delta)}{\lambda + \phi h}\varepsilon_t + \frac{h}{\lambda + \phi h}\xi_t$$

and:

$$y_{it} = y_t + (1-\delta)(\varepsilon_{it -}\varepsilon_t)$$

A few striking results emerge, directly drawn from the Mundell-Fleming intuitions.

1) For low values of λ, which is typically the case empirically, fiscal stabilization (captured by the term $(1-\delta)\ \varepsilon_t$) carries little weight in macroeconomic outcome, which is primarily the outcome of monetary stabilization.

2) So far as idiosyncratic shocks are concerned, fiscal policy is instead perfectly tuned to the purpose of stabilization, inasmuch as each individual country lives in a fixed exchange rate regime.

3) With respect to exchange rate fluctuations, however, fiscal policies, albeit unsuccessful so far as macroeconomic stabilization, do stabilize exchange rate inasmuch as they dampen a source of exchange rate fluctuation. We then immediately see, in the context of this very simple model, that exchange rate volatility is in no way a sign of inefficiency but quite the contrary may reveal the proper functionning of the euro zone.

4) We finally see that the impact of the price shock is a priori ambiguous. By lowering prices, it raises real cash holding, hence lowers interest rates and tends to depreciate -ceteris paribus- the exchange rate. On the other hand, by boosting productivity and output, it tends to appreciate the exchange rate. By considering a "pure supply shock", characterized by $\xi_t = (1-\delta)\varepsilon_t$, we see however that the net impact on the exchange rate is $\dfrac{(1-\phi)-\lambda-\phi h}{\lambda+\phi h}$, which -here- typically appreciate the exchange rate when $\phi = 1$. Let us now interpret a supply shock as a linear combination of a price shock and of an output shock. More specifically let us write the output shock as:

$$\varepsilon_t = \rho\xi_t + \varepsilon_t^d.$$

in which ε_t^d is a pure demand shock which is orthogonal to the price shock ξ_t. The reasons why $\rho \neq 1$ are numerous. One can argue that a technological shock is rarely uniform across sectors, so that some reallocation of labor is needed in order to foster output growth. Also, inasmuch as a supply shock favors investment, the magnitude of the latter depends on the behavior of financial markets. Whichever the cause, the larger ρ , the more likely it is that the supply shock will *appreciate* the exchange rate (lower e). For ρ near 0 it will depreciate it (raise e). As we have seen, the reactions of Europe and the US to a supply shock (in the country of origin) are widely different: it depreciates the euro, and appreciates the dollar. Two interpretations arise. One is that the US are characterized by a larger correlation of price and output shocks. This will be typically the case if firms invest or consumers borrow in response to a positive technological shock. An alternative theory stems from the response of policymakers themselves to such shocks. We now sketch how such differences might occur.

4 ENDOGENOUS FISCAL RESPONSES

4.1 Non Cooperative responses

Let us analyze how fiscal policies might be endogenously selected, and highlight the potential of policy coordination. Assume that fiscal policy in Euroland is set so as to:

$$Minimize(y_1^i - y^*)^2 + \beta E_0(y_2^i - y^*)^2$$

subject to $A_1^i + \frac{1}{1+r}A_2^i = 0$,

in which the constraint ties the fiscal stimuli in both period out of an intertemporal budget constraint. Let us further assume for the time being that:

$$\beta(1+r) = 1$$

In that case one gets that the solution is:

$$y_1^i = E_0 y_2^i$$

which yields

$$gA_t^i = -\frac{\beta}{1+\beta}[h(e_t - p_t) + \varepsilon_{it}]$$

and

$$y_{it} = \frac{1}{1+\beta}[h(e_t - p_t) + \varepsilon_{it}]$$

Aggregating this relationship and plugging into the money equation, we reach:

$$e_t = p_{t-1} + \frac{(1+\beta)}{\lambda(1+\beta)+\phi h}\eta_t - \frac{\phi}{\lambda(1+\beta)+\phi h}\varepsilon_t + (\frac{(1+\beta)}{\lambda(1+\beta)+\phi h} - 1)\xi_t$$

Output can then be written as:

$$y_t = \frac{h}{\lambda(1+\beta)+\phi h}\eta_t + \frac{\lambda(1+\beta)}{\lambda(1+\beta)+\phi h}\varepsilon_t + \frac{h}{\lambda(1+\beta)+\phi h}\xi_t$$

while fiscal policies can be written as:

$$gA_t^i = gA_t - \frac{\beta}{1+\beta}(\varepsilon_{it} - \varepsilon_t)$$

The results are quite similar to those that were reached in the simple case that we examined before. For low values of λ we find that the exchange rate fluctuations absorb the impact of the output shock. The larger the responsiveness of the authorities (large values of β), the more important is the effect. We also find that the impact of a price shock is exactly identical to the impact of a monetary shock, so far as output is concerned, but different so far as the exchange rate is concerned. The same discussion as the one we reached before is valid here: the exchange rate can appreciate or depreciate depending upon the strength of the competiveness effect.

4.2 Ex ante first best

The failure of policymakers to coordinate their response in ways that distinguish idiosyncratic and aggregate shocks is a source of inefficiencies whose correction may as well raise or lower exchange rate volatility. In order to see what an optimum response would look like, let us assume that policymakers agree ex ante upon a fiscal response that does differentiate each of these terms:

$$gA_{it} = -x\varepsilon_t - z\eta_t - k\xi_t - \delta\nu_{it}$$

in which $\nu_{it} = \varepsilon_{it} - \varepsilon_t$.

We reach:

$$e_t = m_{t-1} + a\eta_t + b\varepsilon_t + c\xi_t,$$

with:

$$a = \frac{1 + z\phi}{\lambda + h\phi}$$

$$b = -\frac{\phi(1 - x)}{\lambda + h\phi}$$

$$c = -1 + \frac{1 + k\phi}{\lambda + h\phi}$$

Plugging these values into the output and money markets, we reach:

$$y_{it} = \frac{h - z\lambda}{\lambda + h\phi}\eta_t + \frac{\lambda(1 - x)}{\lambda + h\phi}\varepsilon_t + \frac{h - k\lambda}{\lambda + h\phi}\xi_t + (1 - \delta)\nu_{it}$$

Minimizing $(y_1^i - y^*)^2 + \beta E_0(y_2^i - y^*)^2$ subject, for each government, to the budget constraint $A_{it} + \beta A_{it+1} = 0$, now delivers a policy response:

$$\begin{aligned}
x^* &= \frac{\beta\lambda^2}{(\lambda + h\phi)^2 + \beta\lambda^2} \\
z^* &= \frac{\beta h\lambda}{(\lambda + h\phi)^2 + \beta\lambda^2} \\
k^* &= \frac{\beta\lambda h}{(\lambda + h\phi)^2 + \beta\lambda^2} \\
\delta^* &= \frac{\beta}{1 + \beta}
\end{aligned}$$

We now do find that low values of λ will trigger low responses of fiscal policies to aggregate shocks, while only idiosyncratic shocks will be duly accommodated: when plugging the effect of these policy responses upon the exchange rate, one finds:

$$e_t = p_{t-1} + \frac{1 + z^*\phi}{\lambda + h\phi}\eta_t - \frac{(1 - x^*)\phi}{\lambda + h\phi}\varepsilon_t + \frac{1 + k^*\phi}{\lambda + h\phi}\xi_t$$

Assuming that the US react to shocks as expressed in this equation while Europe stands as in the previous section, we reach the following results:

1) $\left|\frac{\partial\ e}{\partial\ \eta}\right|_{US} < \left|\frac{\partial\ e}{\partial\ \eta}\right|_{EU}$

2) $\left|\frac{\partial\ e}{\partial\ \varepsilon}\right|_{US} \sim \left|\frac{\partial\ e}{\partial\ \varepsilon}\right|_{EU}$

3) $\left|\frac{\partial\ e}{\partial\ \xi}\right|_{US} < \left|\frac{\partial\ e}{\partial\ \xi}\right|_{EU}$

These inequalities conveniently summarize our findings so far. The failure of European countries to coordinate their fiscal responses imply that they will react too much to price or monetary shocks, by which they will raise the volatility of the exchange rate. In particular the result we obtain, that a positive European supply shock tends to depreciate the Euro with respect to the dollar when hit by a similar shock, offers one alternative explanation to the results that were obtained in section 2. According to this model, following such a supply shock, fiscal policies try to dampen a process on which they have no hold, thus exacerbating the net impact on the exchange rate.

4.3 Casella's model

In order to see how the cooperative outcome could be implemented, let us analyze a scheme that has been suggested by Alessandra Casella. She ties the aggregate deficit to each country's needs through a "budgetary" market which gives country i the right to have a deficit A_t^i at a price q_t. The government budget constraint is then written:

$$A_t^i(1-q_t) + \beta A_{t+1}^i(1-q_{t+1}) = X_t^i(q_t, q_{t+1})$$

whose first order condition will deliver:

$$y_t^i - y^* = \beta(1+r_t)(y_{t+1}^i - y^*)$$

when $1 + r_t = \frac{1}{\beta}\frac{1-q_t}{1-q_{t+1}}$ is the trade-off between current and future expansion. The computation would then straightforwardly deliver a policy response that can be written:

$$gA_{it} = X_t - \frac{\nu_{it}}{1+\beta(1+r)^2}$$

As one sees, however, this is not exactly what the cooperative agreement that would be decided ex-ante would deliver. Indeed, in the calculation that we performed previously, governments were willing to trade off ex-ante, under the veil of ignorance on which country could be hit, their rights to "pollute". It is in fact a straightforward exercise to restore such an equilibrium along the lines put forward by Casella. Imagine instead that countries are endowed a right to pursue a deficit X_t that is indexed on the economic cycle of Europe. In that case their budget constraint can be written:

$$A_t^i + \beta A_{t+i}^i = X_t$$

The policy response of policymakers will then be written:

$$gA_t^i = -\frac{\beta}{1+\beta}\nu_{it} - M_t + \frac{1}{1+\beta}X_t$$

in which M_t is the component of the country i's deficit that is indexed on the European cycle. In that case, all that it takes is to make sure that the value X_t is indeed such that it cancels out more effects of M_t. In this model, X_t must then be *pro-cyclically* adjusted on the aggregate economy. Indeed, one wants here to make sure that countries do *not* try to dampen the aggregate cycle. A tax on European activity that would be redistributed to governments in times of expansion, and *levied* upon them in case of recessions would do the trick.

5 CONCLUSION

It is clearly too early to make a definite statement on the euro, except that the fear of over valuation has clearly been misplaced. It remains to be seen whether the euro is weak or volatile and this will take time to test. Yet a few remarks can be made already about the first year of the Euro. These remarks would point to the fact that the European economy was in excess supply at that time, which would have significantly contributed to the depreciation of the Euro. The European economy was indeed still convalescent compared to the American economy, and inflationary pressures were less acute here than there. This paper presents a model which could explain why such an excess supply. Some of the most distinctive features of this model seem to be supported by the data, in particular the depressing effect of a positive European supply shock on the Euro. Of course, other factors are likely to have played a role. One explanation may be that the European labor market is more rigid than its American counterpart, so that a positive European supply shock occurring in one sector leads to a slow increase in production and an immediate fall in prices, because of a slow employment reallocation between the sectors, thus resulting in a decrease of I relatively to I^* and therefore in a depreciation of the Euro. Another factor may be the existence of a wealth effect in the United States, which would imply that an increase in the American stock market index due to a positive supply shock stimulates internal demand, so that prices adjust less to a supply shock in the United States than in Europe.

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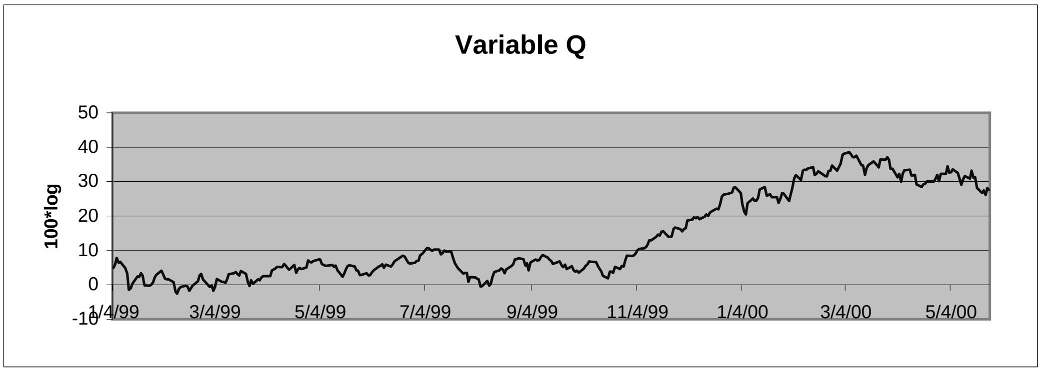

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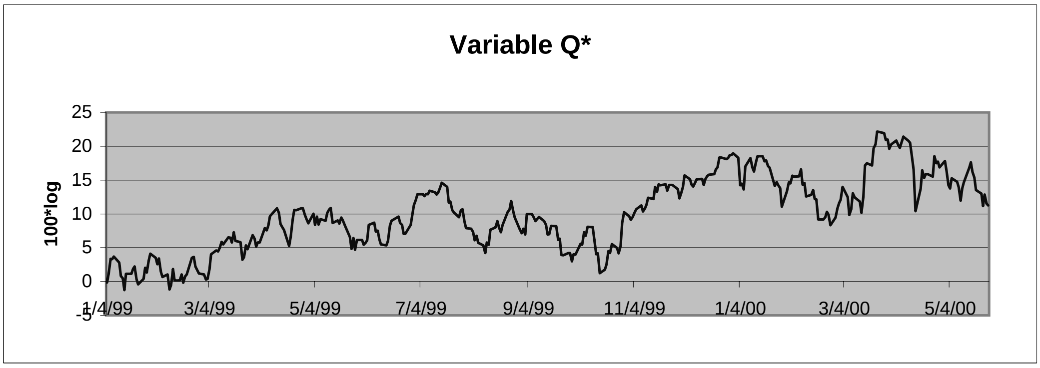

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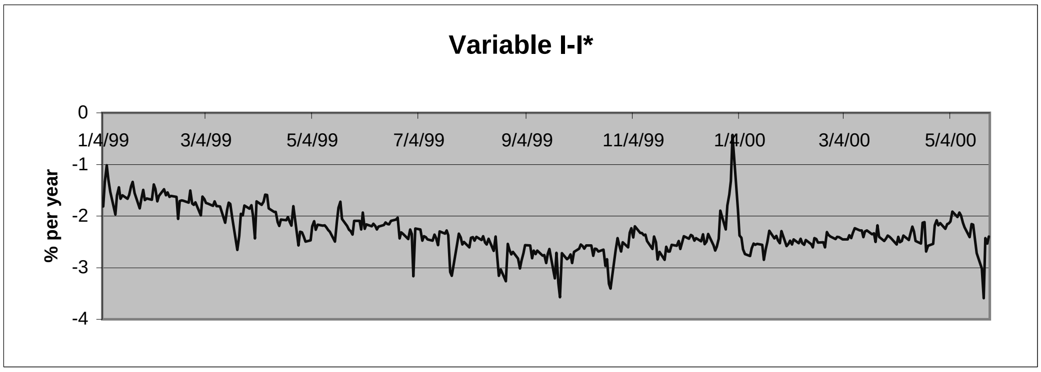

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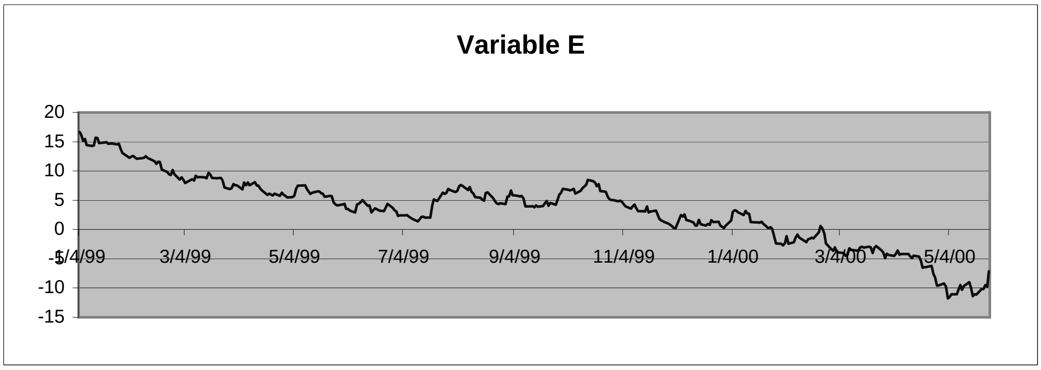

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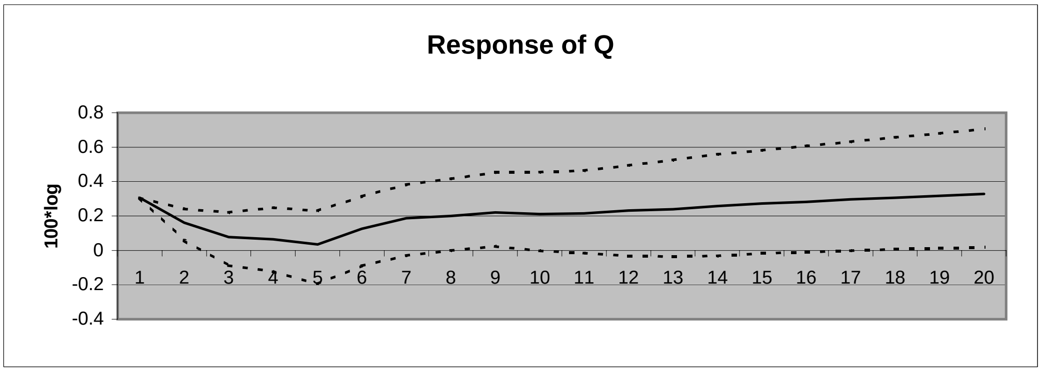
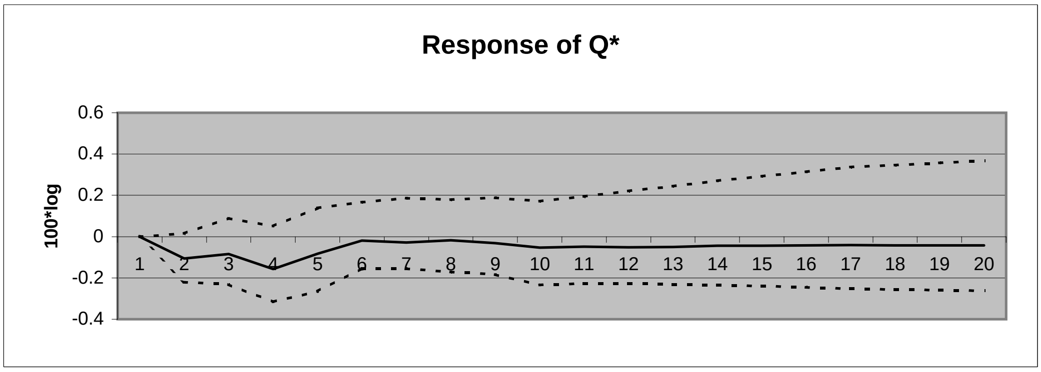
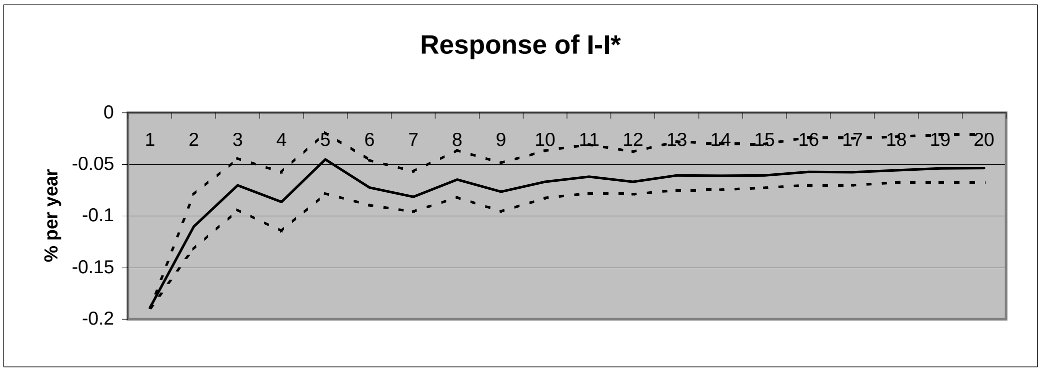
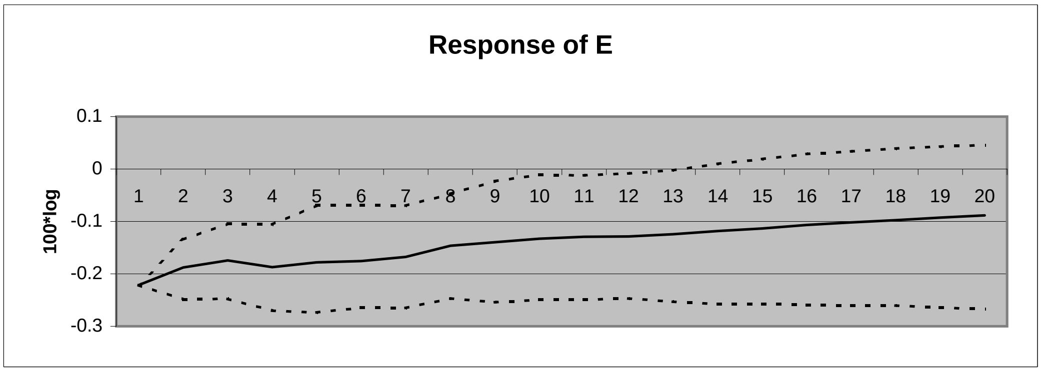
Responses to a European supply shock









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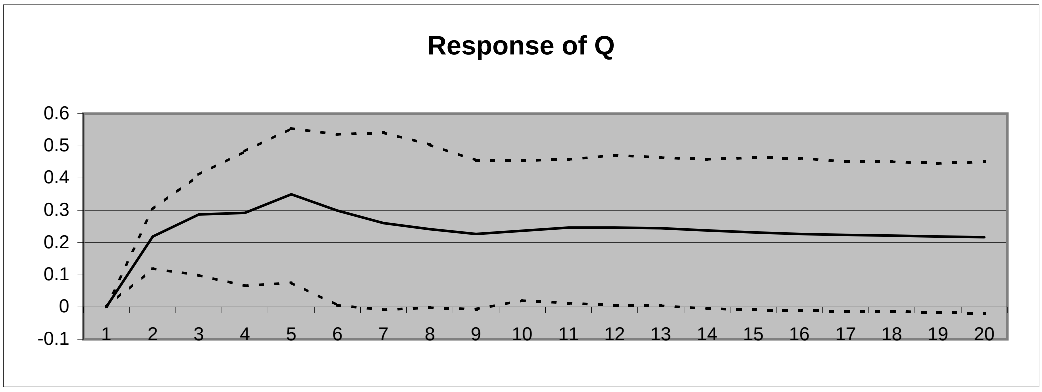
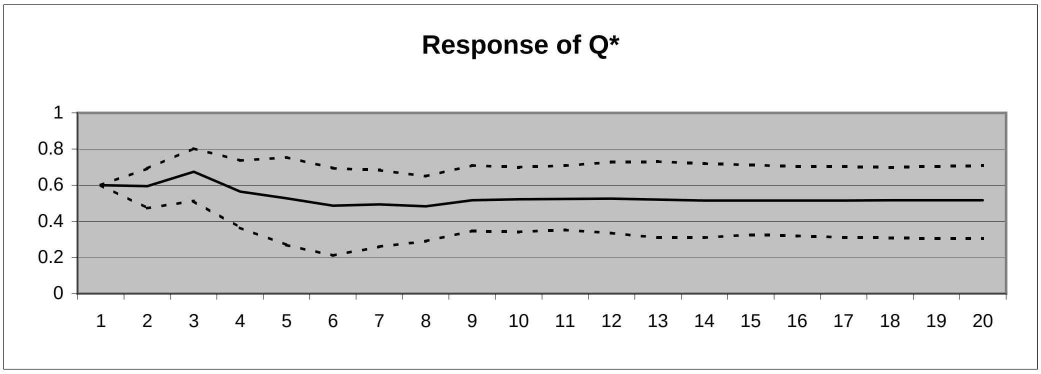
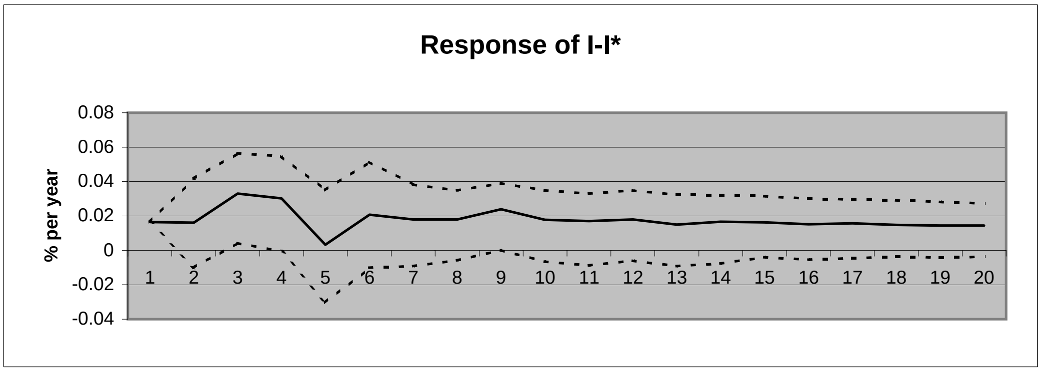
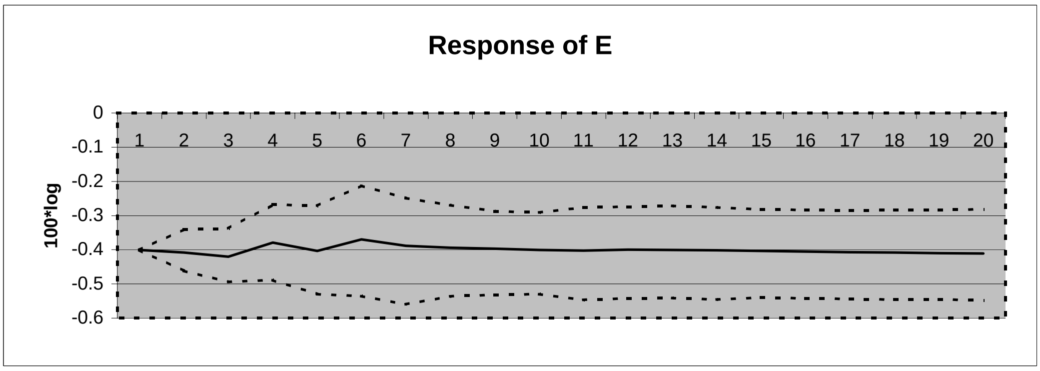
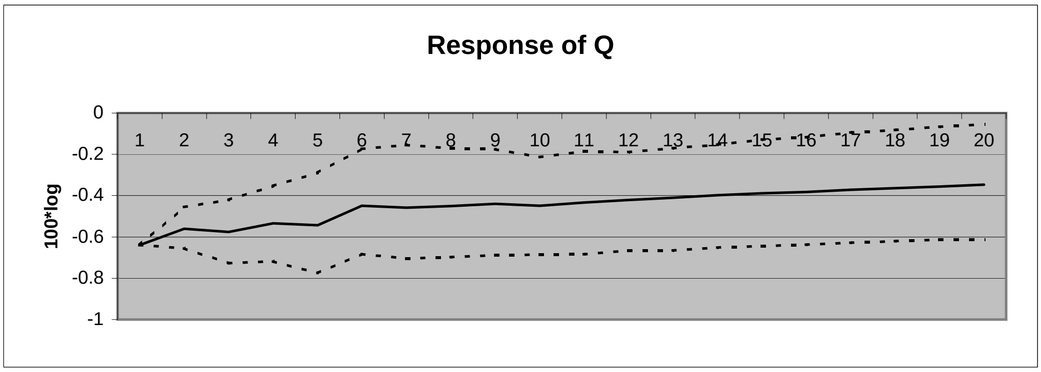


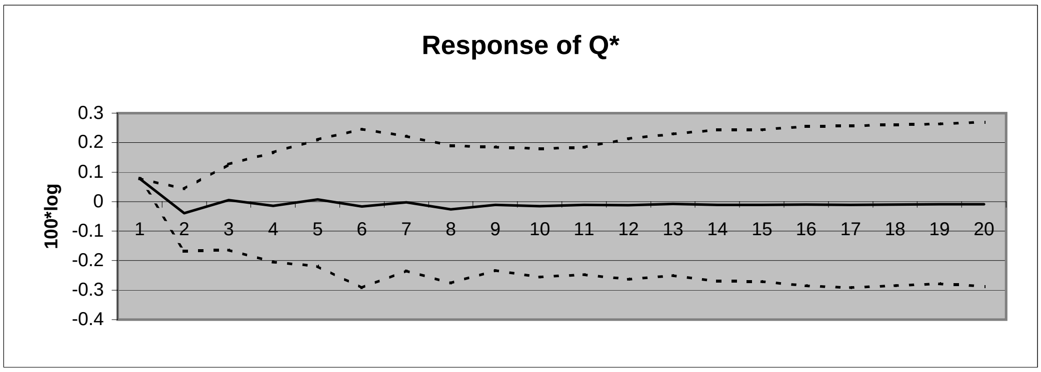


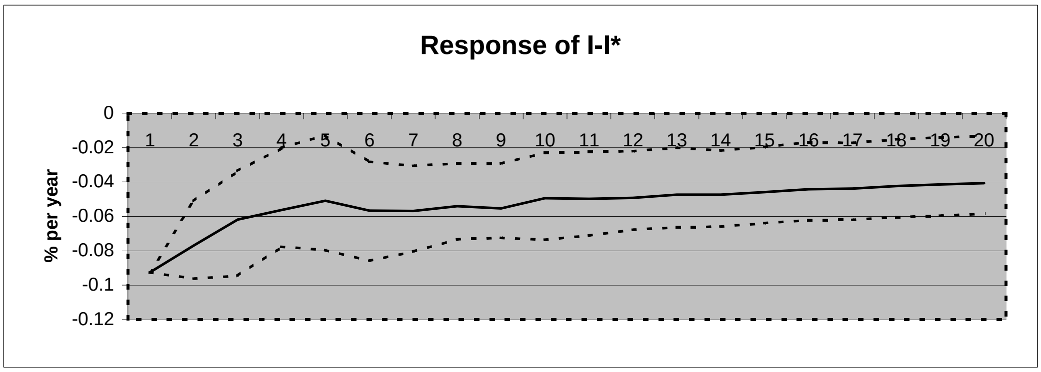


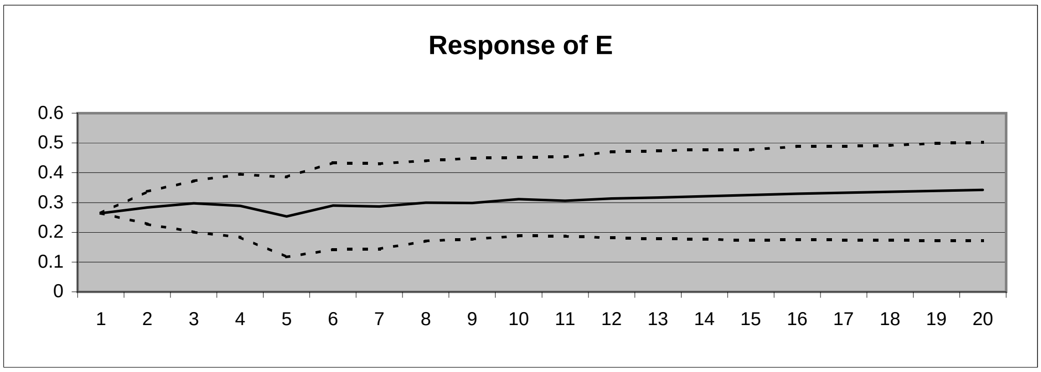


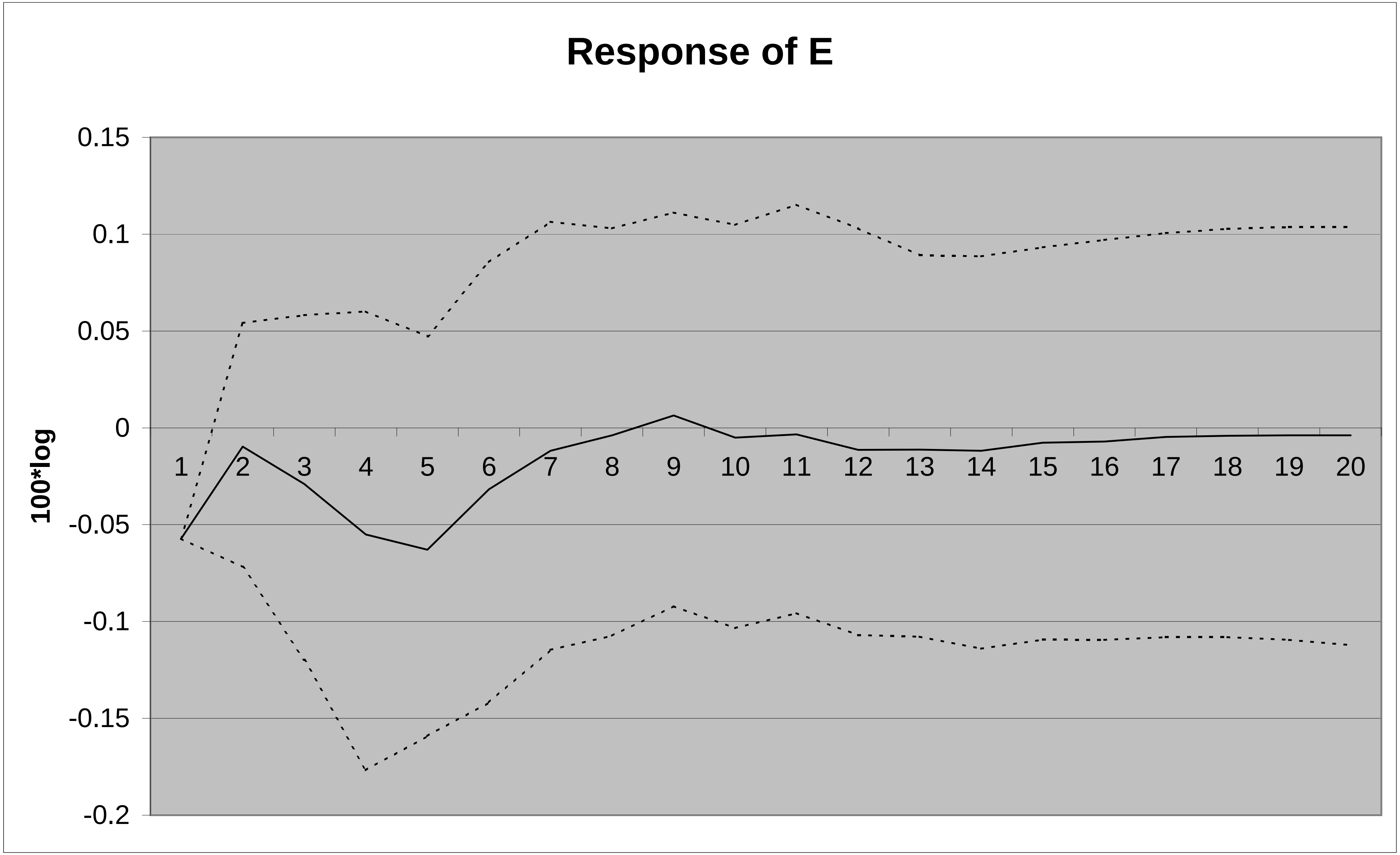
Responses to a shock on the exchange rate







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Decompositions of variable E