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How do European monetary and fiscal authorities behave?

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How do European monetary and fiscal authorities behave?*

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Abstract

The objective of this study is to investigate the behaviour of monetary and fiscal authorities in the Euro area. Our main contribution is joint modelling of behaviour of the two authorities. Our investigation highlights a number of facts. The systematic monetary policies adopted by the non-German authorities in the seventies were not capable of stabilizing inflation. Such results has been achieved in the eigthies and the nineties by anchoring more tightly domestic monetary policy to German monetary policy. All the main episodes of expansionary fiscal policy occurred in the course of the eigthies and the nineties in Europe cannot be explained by the sytematic behaviour of fiscal authorities. Stabilization of inflation has been achieved independently from the lack of fiscal discipline. There are important interactions between the two authorities but they depend exclusively on the responses of governemnts expenditures and receipts to interest rate payments on the public debt.

JEL Classification numbers: E47, E62, E63

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1 Introduction

The objective of this study is to investigate the behaviour of monetary and fiscal authorities in the Euro area. Our main contribution is joint modelling of behaviour of the two authorities. Simultaneous modelling of fiscal and monetary reaction allows both a more precise estimation of the effects of each policy and an investigation of their reciprocal implications. Moreover, such choice seems of particular relevance when one of the two authorities is subject to an intertemporal budget constraint which links present and future policy choices and therefore present policy choices and their effects on future macroeconomic conditions.

We conduct our investigation by specifying a small structural model containing three type of variables: macroeconomic indicators, fiscal policy indicators and monetary policy indicators. We consider four EMU countries: France, Germany, Italy and Spain.

2 The available empirical evidence

The available empirical evidence is best summarized as follows: there is plenty of evidence on the behaviour of monetary policy authorities and its macroeconomic effect, there is some evidence on the behaviour of fiscal authorities and its macroeconomic effect and there is very little evidence on the interactions between monetary and fiscal authorities and their joint effects on macroeconomic conditions.

The evidence on monetary policy reaction and its effects comes from VAR models and estimated reaction functions. VAR models, as very well described by Christiano, Eichenbaum and Evans(1998), identify monetary policy shocks in actual economies to describe the response of relevant economic variables to monetary shocks. State of art VAR models of the monetary transmission mechanism(see Bernanke and Mihov,2000) are based on the estimation of a reduced form including macroeconomic and monetary variables. The structure of interest is then identified by (i) assuming orthogonality of the structural disturbances; (ii) imposing that macroeconomic variables do not simultaneously react to monetary variables, while the simultaneous feedback in the other direction is allowed, and (iii) imposing restrictions on the monetary block of the model reflecting the operational procedures implemented by the monetary policy-maker. Such set of restric-

tions is minimal in the sense that it allows to distinguish monetary policy shocks from non-policy shocks, but no further identification of non-policy shocks is usually implemented. The application of this procedure leads to the derivation of the following stylized facts on the effect of contractionary policy shocks on price, output and interest rates: *(i)* the aggregate price level initially responds very little; *(ii)* interest rates initially rise, and *(iii)* aggregate output initially falls, with a j-shaped response, with a zero long-run effect of the monetary impulse. This evidence, originally extracted from US data, has been more recently extended to European Countries (see, for example, Mojon and Peersman,2001)).

VAR models concentrate on deviations of monetary policy makers from their systematic behaviour. There are a number of reasons for this choice. The focus is not on rules but on deviations from rules, since only when central banks deviate from their rules it becomes possible to collect interesting information on the response of macroeconomic variables to monetary policy impulses, to be compared with the predictions of the alternative theoretical models. Moreover, if VAR models are to be interpreted as reduced form of forward-looking models, then the only valid simulations are those implemented by keeping all parameters constant, and simulating shocks serve this purpose. So, by their nature, VAR models do not provide explicit evidence on the systematic behaviour of monetary policy makers. Such evidence has been provided in the literature by the estimation of Taylor rules. Rules have been very successful in describing the behaviour of policy rates as adjusting, slowly, towards an equilibrium determined by the real interest rate (usually taken as constant) deviations of output from its trend level and deviations of expected inflation from its equilibrium level (usually exogenously given). The specification of the equation for policy rates in a VAR can obviously be interpreted as a reduced form of a forward-looking Taylor-rule. In fact, as shown by Favero-Marcellino(2001), structural monetary policy shocks from a monetary VAR are very strongly correlated with innovation from forward looking Taylor-rules estimated for all the countries in the euro area which we are considering.

Importantly, virtually all monetary VARs do not include a measure of fiscal policy among the macro variables, and the reaction functions of monetary authorities have been modelled without considering an explicit response to fiscal behaviour, or by including any fiscal variable among the set of instruments used by monetary authorities to forecast future inflation.

Studies of fiscal policy and its effect are less common than those on mon-

etary policy. This can be due to the less immediate availability of fiscal policy indicator at higher than annual frequency or to a more skeptical attitude towards the validity of the block recursive assumption when applied to the interactions between macroeconomic and fiscal variables. Mountford and Uhlig(2002) note that there is a specific, non-standard problem, in VAR modelling of fiscal policy: fiscal policy surprises do not necessarily coincide with VAR shocks. The typical example is the (unexpected) success in political election of a candidate who will implement a different fiscal package. The change in expectations for fiscal policy is generated much earlier than the policy is implemented and becomes measurable with a VAR. Blanchard and Perotti(1999) solve the identification problem by using a mixed structural VAR event-study approach to characterize the dynamic effects of shocks in government spending and taxes on economic activity in the US postwar period. Identification is achieved by using institutional information about the tax and transfer system and the timing of tax collections to identify the automatic response of taxes and spending to activity and, by implication, to infer fiscal shocks. Fiscal shocks have positive effect on output, however both increases in taxes and increases in government spending have a strong negative effect on investment spending.

Fatas and Mihov(2000a, 2001) discriminate discretionary fiscal policy from automatic stabilizers by assuming that government spending does not react to macroeconomic conditions within a quarter. Their results show that the largest fiscal impact on the economy comes from transfer, taxes and government employment. Furthermore their evidence on GDP components suggests that expansionary fiscal policy leads to an increase in consumption.

Burnside et al(1999)., Eichenbaum et al.(1998) use case studies to evaluate the evidence on the effects of fiscal policy and investigate which model is better capable of explaining it. As a consequence these papers solve the problem of identifying fiscal shocks by concentrating on outliers in fiscal variables.

Both the VAR and the case studies approach do not deal explicitly with the specification of a systematic fiscal reaction function. Moreover fiscal policy and its effect are almost invariably considered by omitting interactions with monetary policy from the analysis. Interestingly Taylor, in a number of papers (Taylor,1996, 2000a, 2000b), has shown that a fiscal policy rules can be successfully derived for the US case by simply relating the measure of fiscal stance to the deviation of output from its equilibrium level. He finds evidence for a countercyclical pattern of systematic fiscal policy, with

a reaction coefficient of the primary deficit with respect to the output gap of 0.5. The specification of the Taylor fiscal rules implies stationarity of the deficit to GDP, which is a linear function of a constant and a stationary variable, but does not explicit allow for a reaction by fiscal policy makers to the dynamics of the deficit and the debt. Such a reaction must be built into models aimed at describing economies subject to the Growth and Stability Pact. Evidence along these lines has been provided by Bohn(1988) for the US case, by showing that a century of US data reveal a positive correlation between the Government surplus to GDP ratio and the government debt to GDSP ratio.

The evidence based on simultaneous modelling of monetary and fiscal authorities is very limited and mainly concentrates on the reaction function of policy maker without assessing simultaneously the effect of monetary and fiscal policy on the economy.

Melitz(1997) uses pooled annual data for 19 OECD countries over the period 1960-1995, to find that monetary and fiscal policy tend to move in opposite directions. Looser fiscal policy promotes tighter monetary policy and viceversa; the unpleasant Sargent-Wallace scenario in which a sustained fiscal boost eventual triggers a monetary relaxation it is rejected by the data. Evidence of strategic substitutability is also found in Wyplosz(1999), while Favero, Missale and Primiceri(1999) find a significant effect of the duration of the debt in interest rate rules.

3 Modeling monetary and fiscal policy jointly

Our empirical work is based on the joint estimation of monetary and fiscal policy. Our research strategy hinges on the separation of monetary and fiscal policies in their systematic and non-systematic components to address a series of relevant questions raised by the literature.

3.1 Identifying systematic monetary and fiscal policies

We use a small structural model containing macroeconomic, fiscal and monetary variables. We start by imposing some identifying restrictions to estimate a model which separates systematic policy from policy shocks. We then construct a counterfactual scenario in which monetary and fiscal authorities never deviate from their rules: we simulate dynamically the model

setting the policy shocks to zero. The comparison between actual and simulated series measures the impact of shocks. The exercise will allow to assess the outcome of the systematic behaviour of policy makers and its compatibility with the monetary and fiscal targets. Such simulation involves no change in the parameters describing systematic policy and it could therefore be thought as an exercise robust to the Lucas critique, even if our estimated VAR is interpreted as reduced form of a forward-looking structure.

3.2 The questions to our interest

Our exercise is aimed at answering to a number of questions raised in the literature.

First, what are the interactions between monetary and fiscal policies?

Fiscal discipline might affect the credibility of monetary policy-makers. The government budget constraint links budget deficits to monetary policy. A change in the budget deficit necessarily changes the amount of interest-bearing government bonds or high-powered money needed to finance the deficit. Governments with access to the credit markets can finance the deficit by issuing bonds and there is no automatic link between deficits and seignorage. However, there is another "unpleasant"monetary implication of government budget constraint: suppose that high government deficits and debt raise the real interest rate to a level above the growth rate of the economy. Then monetary actions aimed at reducing the rate of inflation can have perverse effect and actually increase inflation. Given the level of deficit today, less money growth today means higher level of the debt tomorrow as bond finance replaces monetary finance, this will raise interest payments and the size of future budget deficits relative to GDP, requiring more money growth in the future.(Sargent and Wallace(1981)). Another possible link between the debt and effectiveness of monetary policy maybe generated by the fact that higher government debt can reduce or even reverse the negative impact of interest rates in slowing down the economy and reducing inflation. Debt holders income rises with higher interest rates. Higher real interest rates here do have a positive effect on the economy even if they are lower than the growth rate of output.

A final possible interactions comes from the fact that in a closed economy the equilibrium level of real interest rates is determined by the budget deficits, and getting it wrong in a Taylor type rule might have effects on the equilibrium real rate to which an economy converge. However, this kind

of mis-specification might be of a lesser relevance for small open economies, where the real interest rate is determined by the level of the real world interest rate.

On the other hand monetary policy might affect fiscal policy. If the costraints of the Growth and Stability pact are binding, then fiscal rules must have a built in stabilizer generating an automatic reaction to fluctuations in the interest rate payment component of the deficits. The higher the debt the stronger the importance of such stabilizer.

Second, what is the cause of the cross-countries differences in fiscal policy?

Fatas and Mihov(2001) have noted that as long as the divergence in fiscal policy is the result of differences in business cycle, it would be difficult to argue that these differences would have any negative impact on the implementation of monetary policy. But when the differences in fiscal policy are the result of discretionary changes in national fiscal policy, then the implementation of monetary policy and its interaction with fiscal policy might lead to tension among different economic authorities.

Third, what are the effects of modeling jointly fiscal and monetary policy?

It is important to evaluate how the results we obtain by considering policies jointly differ from those available based on the separate considerations of the effect of the two policies. Consider for example the issue of the determinants of inflation, monetary VAR show very little impact of interest rates on inflation, could the inclusion of a fiscal indicator in the model help a better understanding of inflation? Leaving aside the fiscal theory of price-level(Cochrane 1999)[1], there is a time inconsistency related issue: using taxes to pay interest on the existing debt is "inefficient" relative to repudiation because of the deadweight loss of taxation. As long as government debt is not indexed to inflation a surprise increase in inflation engineered by monetary policy is equivalent to repudiation. As a consequence lower deficits should be associated with lower rates of inflation.

[1]The fiscal theory of price level claims that the price level adjusts to equilibrate the real value of nominal government debt with the present value of surpluses. The empirical evidence evidence from high debt country seems to suggest that in presence of such an imbalance is the price of the debt (via an increase in the default premium) which bears the burden of the adjustment. I personally agree with Buiter(1999).

4 A first look at the data

We consider OECD semi-annual data for France, Germany, Italy and Spain. The data-set, described in the appendix, contains observations on GDP, the GDP deflator, the output gap, primary government deficits, decomposed into revenue and expenditure, interest payments and total government debt for our four countries over the sample 1960-2000. OECD provides also cyclically adjusted fiscal variables, however, as there are many gaps in the cyclically adjusted series, we decided to use the original data and make the dependence of the fiscal variables on the cycle endogenous to our specification. We have completed the OECD data with a monetary policy indicator, a money market rate, taken from Datastream. We report macroeconomic variables, inflation and the output gaps, in Figure 1, nominal and real monetary policy rates in Figure 2 and fiscal variables in Figure 3.

Insert Figure 1-3 about here

Taking Germany as a benchmark for inflation, the data show the existence of two periods: a divergent period going from the first oil shock to the beginning of the eighties where the inflation differentials between Germany and all other European countries show a common tendency to open up and a convergent period, from the beginning of the eighties onward, where the tendency of the previous period is completely reversed. The data on output gaps bring evidence in favour of synchronization of the business cycle in the early seventies in the late eighties and in the nineties, while some asymmetries emerge at the end of the seventies and at the beginning of the eighties. The data on nominal and real interest policy rates reported in Figure 2 confirm rather strongly the presence of two monetary regimes for France, Italy and Spain: a period of weak accommodative monetary policy from the beginning of our sample to the eighties and a period of stronger anti-inflationary monetary policy from the beginning of eighties onward. In the first part of the sample the French, Italian and Spanish, real ex-post interest rates go often negative in presence of inflationary shocks and they clearly diverge from German rates. In the second part of the sample real rates converge for all four countries, with the exception of some short-lived divergence periods coinciding with speculative attacks. This graphical evidence seems to extend the conclusions of analyses of US monetary policy that a shift in policy emphasis occurred between 1979 and 1980. For instance, according to Goodfriend (1995, p.129)

"the announcement [by Fed Chairman Paul Volcker] on 6 October 1979 of the switch to non-borrowed reserve targeting officially opened the period of disinflation policy"[2]. This date is generally assumed to be the beginning of the new policy regime, which later continued under the Chairmanship of Alan Greenspan. Empirical analyses of the Fed's reaction function confirm this discontinuity. In a recent paper, Clarida, Gali and Gertler (2000) present different estimates of forward-looking Taylor-type monetary policy rules across various sub-samples. Their assessment of the evidence is that "the striking difference in the reaction function across time is the rise in the slope coefficient on inflation from slightly less than unity pre-Volcker to around two in the Volcker-Greenspan era" (p.164). They conclude that "in the pre-Volcker years the Fed typically raised nominal rates by less than any increase in expected inflation, thus letting real short-term rates decline as anticipated inflation rose. On the other hand, during the Volcker-Greenspan era the Fed raised real as well as nominal short-term interest rates in response to higher expected inflation. Thus, our results lend quantitative support to the view that the anti-inflationary stance of the Fed has been stronger in the past two decades"(p.177)[3]. The behaviour of fiscal variables is different and there is no correspondence between the monetary policy regimes and fiscal policy regimes. Debt to GDP ratios begun raising at the beginning of the seventies, the eighties were a period of very high deficits for Italy and more moderate deficits for the rest of Europe, with debt to GDP ratios still raising everywhere and raising on an explosive path for Italy. At the beginning of the nineties Italy started a convergence process while, after German reunification and two the EMS crises, deficits in France, Germany and Spain run higher deficits than in the eighties. From 1996 onwards deficits are fully synchronized and the are progressively reduced to meet Maastricht criteria in the last observations of our sample. Consistently debt to GDP ratio are back on a convergent path.

[2]However that first attempt at gaining control over inflation was soon aborted and, following the inflation scare at the beginning of 1980, an aggressive disinflation policy was to be re-inaugurated only in August 1980 (Goodfriend, 1995, pp. 129-133).

[3]This is not, of course, the only explanation for the high inflation of the pre-Volcker period. For instance, according to Orphanides (2000), the policy mistake of keeping US interest rates too low in the face of mounting inflationary expectations was due to a persistent *overestimation* of potential output.

5 A baseline model

Our investigation is based on the estimation of an empirical model for inflation, the output gap, the monetary policy rate, government revenues, government expenditure and interest rate payments. We identify monetary and fiscal shocks by imposing that macroeconomic variables do not contemporaneously react to them. We do not identify non-policy shocks. We estimate the model over the period 1980-2000, when monetary policy ensured the convergence of inflation towards the central banks target, to perform a dynamic simulation by setting policy shocks to zero and keeping the non policy shocks at their observed values. The simulation allows to assess counterfactually how the economies would have behaved if monetary and fiscal authorities never deviated from their systematic rules. We estimate the following specification for our four countries of interest:

$$\begin{aligned}
\pi_t^j &= c_1\pi_{t-1}^j + c_2 y_{t-1}^j + u_{1t}^{NP,j} && (1)\\
y_t^j &= c_3 + c_4 y_{t-1}^j + c_5\pi_{t-1}^j + c_6 i_{t-1}^j + c_7 g_{t-1}^j && (2)\\
&\quad + c_8\tau_{t-1}^j + c_9 y_{t-1}^{US} + u_{2t}^{NP,j} \\
i_t^j &= c_{10} + c_{11} i_{t-1}^j + c_{12}\pi_t^j + c_{13} y_t^j + c_{14} i_t^{GER} + u_{3t}^{M,j} && (3)\\
avc_t^j &= c_{15} avc_{t-1}^j + c_{16} i_t^j + u_{4t}^{NP,j} && (4)\\
g_t^j &= c_{17} + c_{18} g_{t-1}^j + c_{19} y_t^j + c_{20} y_{t-1}^j + \frac{c_{21}}{\left(1+\Delta x_t^j + \pi_t^j\right)} avc_t^j * DY_t^j \\
&\quad + c_{22}\frac{\Delta x_t^j + \pi_t^j}{\left(1+\Delta x_t^j + \pi_t^j\right)} DY_t^j + u_{4t}^{g,j} && (5)\\
\tau_t^j &= c_{23} + c_{24}\tau_{t-1}^j + c_{25} y_t^j + c_{26} y_{t-1}^j + \frac{c_{27}}{\left(1+\Delta x_t^j + \pi_t^j\right)} avc_t^j * DY_t^j \\
&\quad + c_{28}\frac{\Delta x_t^j + \pi_t^j}{\left(1+\Delta x_t^j + \pi_t^j\right)} DY_t^j + u_{5t}^{\tau,j} && (6)\\
DY_t^j &= DY_{t-1}^j + \frac{avc_t^j - \Delta x_t^j - \pi_t^j}{\left(1+\Delta x_t^j + \pi_t^j\right)} DY_{t-1}^j + \left(g_t^j - \tau_t^j\right) && (7)
\end{aligned}$$

where the j index refers to the country and π_t^j is annual inflation of the GDP deflator, y_t^j is the percentage difference between output and potential output as measured by the OECD, i_t^j is the monetary policy rate in country j, g_t^j is the ratio of government expenditure to GDP, g_t^j is the ratio of

government revenue to GDP, IP_t^j is the ratio of interest payment on government debt to GDP and DY_t^j is the ratio of government debt to GDP, Δx_t^j is real annual GDP growth.[4] The model complements the aggregate demand and supply equation with monetary and fiscal policy rules and it is closed by an equation linking the average cost of the debt to policy interest rates and by identity defining the debt-deficit dynamics. The specification of aggregate demand and supply is in line with the recent strand of the empirical macroeconomic literature based on small macroeconometric models (see, for example Rudebusch-Svensson(1999), Clarida et al.,2000). We introduce fiscal policy on the demand side and we enter government expenditure and revenue separately to allow for a different elasticity of output with respect to the different components of government deficit. The specification of the monetary reaction function is in line with the recent generation of Taylor-rule type specifications and it could be derived as the solution of the intertemporal optimization problem of a central bank who minimizes a quadratic loss function in the deviation of inflation from target, the deviations of output from potential output and volatility in policy rates (see, for example, Favero and Rovelli(2002)). The fiscal reaction function is constructed by assuming that fiscal authorities react smoothly and their behaviuor is determined by an output stabilization motive and a debt stabilization motive. Then, the primary balance smoothly adjusts to a target value determined by the difference between output and potential output and the debt stabilizing balance. Given that government and expenditure enter separately the demand function we also consider the components of primary balance separately when we model the behaviour of fiscal authority. Our general specification nests as a special case the one adopted by Bohn(1988), who allows for a reaction of primary deficits to the output gap and the debt to gdp ratio. To see this point, consider our equations for government revenues and expenditure:

[4]For dynamic simulation purposes the model is closed by an equation linking real gdp growth to the output gap.

$$
\begin{aligned}
g_t^j &= c_{17} + c_{18} g_{t-1}^j + c_{19} y_t^j + c_{20} y_{t-1}^j + \frac{c_{21}}{\left(1 + \Delta x_t^j + \pi_t^j\right)} avc_t^j * DY_t^j \\
&\quad + c_{22} \frac{\Delta x_t^j + \pi_t^j}{\left(1 + \Delta x_t^j + \pi_t^j\right)} DY_t^j + u_{4t}^{g,j} \qquad (8) \\
\tau_t^j &= c_{23} + c_{24} \tau_{t-1}^j + c_{25} y_t^j + c_{26} y_{t-1}^j + \frac{c_{27}}{\left(1 + \Delta x_t^j + \pi_t^j\right)} avc_t^j * DY_t^j \\
&\quad + c_{28} \frac{\Delta x_t^j + \pi_t^j}{\left(1 + \Delta x_t^j + \pi_t^j\right)} DY_t^j + u_{5t}^{\tau,j} \qquad (9)
\end{aligned}
$$

By imposing appropriate restrictions the two above equations can be combined into the following model for the primary deficit:

$$
\left(g_t^j - \tau_t^j\right) = \beta_0 + \beta_1 \left(g_{t-1}^j - \tau_{t-1}^j\right) + \beta_2 y_t^j + \beta_3 DY_t^j + u_t \qquad (10)
$$

Clearly the validity of (10)as an approximation depends on the validity of an high number of restrictions. Such restrictions might well be satisfied when a long-time series of annual data is considered , and it might therefore be appropriate for the analysis in Bohn(1998), but we feel that they are not appropriate in our case. In particular our specification allows for a time varying response of primary deficit to the level of the debt which depends on the average cost of the debt and on the nominal rate of growth of output. Such responses can be approximated by a constant over a large sample.

We shall illustrate the properties of the model by considering in turn issues related to identification, estimation and simulation.

5.1 Identification

We have a backward looking semi-structural VAR model in which policy shocks are identified from non-policy shocks, but no further structure is imposed on non policy shocks. Monetary and fiscal shocks are identified by assuming non contemporaneous effects of policies on inflation and output gaps and by limiting the simultaneous feedback between monetary and fiscal policies to the impact of policy rates on interest rate payments. We do not investigate if our backward looking structure is a genuine one or if it is the reduced form of a forward looking model because this distinction is not relevant for the type of simulation we conduct.

5.2 Estimation

The model is estimated on a sample of semi-annual observations going from 1980:1-1999:2. The initial sample choice is motivated by the importance of estimating the model over a single monetary policy regime in which inflation is stabilized around its target value. The unusual semi-annual frequency of data depends on the choice of modelling jointly monetary and fiscal rules. Fiscal data are not available at higher frequency than semi-annual for all four countries to our interest. Moreover, fiscal decisions are not taken at quarterly or higher frequencies and estimating the model on, say, quarterly data would deliver fiscal shocks in periods(quarters) when no fiscal decisions are taken. As a consequence our sample is rather short and we have opted for a parsimonious parameterization. The models are estimated country by country using Seemingly Unrelated Regression Equations. The results from estimation are reported in Table 1, while the correlation matrices of residuals are reported in Table 2.

Insert Table 1-2 about here

Inflation is very persistent in all four countries, in fact the restriction that the coefficient on lagged inflation is one can never be rejected at the one per cent level in all specifications. The output gap has a positive, but not statistically significant, impact, respectively of 0.08 and 0.18, on inflation in France and Spain, while it has a significant impact of 0.08 in Germany and a significant impact of 0.22, much larger than in the other European countries, in Italy.

The output gap is also persistent everywhere,Germany is the only exception in which the coefficient on the lagged dependent variable is small and does not differ statistically from zero. However, Germany is also the only country for which the lagged US output gap has a positive significant effect with a coefficient not far from one. The dependence on the US cycle is much smaller, and not significant for Italy France, and of Spain. Policy rates have a significant direct effect on the output gap only in Italy, while the ratio of government receipts to GDP has a negative significant impact in Germany, Italy and Spain, and the ratio of government expenditure to GDP has a positive significant impact in Italy, and non significant impact in the other countries. Overall the restrictions that coefficients on receipts and expenditure have the same magnitude in the equation for the output gap is rejected.

The interest rate rules show persistence. The behaviour of the Bundesbank is such that inflationary shocks are not accommodated(see Bernanke and Mihov, 1996, Clarida and Gertler, 1996): the long-run response of nominal policy rates to inflation is about two (.64/.32). There is also a positive, smaller (0.20/0.32), response of policy rates to the output gap. All other European countries peg their policy rates to the German ones, in fact the null of long-run equalization of German and non German policy rates can never be rejected. French policy rates respond also to past domestic macroeconomic conditions, while the role for past domestic inflation and output gap is very limited in Italy and Spain. In all non-German European countries the convergence of inflation to the target is guaranteed by the peg to German policy rates and not by the responses of central banks to domestic macroeconomic conditions. However, policy rates in all European countries react significantly to shocks hitting the macroeconomic variables.

Government expenditures are persistent and have a generalized negative correlation with output shocks. To evaluate the role of stabilization in fiscal rules we have also allowed expenditures and receipts to respond to the level of the debt according to the level of interest rate and nominal output growth. A negative response of the primary deficit to interest payment plays for fiscal policy the same role that a positive response of real policy rates to inflationary shocks plays for monetary stabilization. Our estimate suggest that systematic fiscal policies in all countries react to re-equilibrate different between surplus and debt-stabilizing surplus, such correction is implemented more by adjusting revenues than by adjusting expenditure, especially in the French case. Importantly, the dependence of fiscal variables on policy rates generates an indirect channel through which monetary policy can affect macroeconomic conditions and explains while interest rate effects on output gap are generally significant in other studies of European countries and are instead not significant, for France, Germany and Spain, in our specification for the output gap which allows an explicit role for both monetary and fiscal variables.

Our dynamic specification for the average cost of the debt links it to the policy rate, as expected there is a strong long-run relationship and a slow dynamic adjustment in all countries.

The model is closed by the stock-flow relation between debt and deficit, in which no parameter is estimated.

Table 2 reports the correlation of residuals for the four estimated system in each countries. As we do not identify non monetary policy shocks there are no reasons to worry about the correlation of residuals from the first two

equations in the system. However, it is important to note that the only deviations from diagonality occur in these positions for all countries. In fact significance off-diagonal elements in the fiscal and monetary policy block of the correlation matrix of residuals would have questioned our identification and the validity of the counterfactual simulation experiment, which we are going to describe in the next section.

5.3 Different monetary policy regimes in Europe

Our main argument for concentrating on the sample 1980-2000 to simulate our model and assess the effect of systematic monetary and fiscal policy has been that we cannot use data form previous years because (leaving aside availability) the systematic monetary policy adopted in non-German European countries were not capable of granting stability of our model under simulation. The visual inspection of the behaviour on real interest rates supported our view, showing clearly that inflationary shocks were accommodated by monetary authorities in the course of the seventies. To further circumstantiate this evidence we directly compare systematic monetary policy before and after the eighties by estimating our monetary reaction functions for all four countries to our interest over two different samples. Ideally we would like to have non-overlapping samples and look at the period 1960-1979 separately from the period 1980-1999. The availability of OECD data is such that we can do so only for Italy and Germany while we have to start estimation from a later period for France and Spain. The results are reported in Table 3.

Insert Table 3 about here

Our estimates support the claim of the existence of two different monetary regimes. Germany monetary policy has become more "hard-nosed" over the period 1980-1999, with the Bundesbank reacting more strongly both to observed inflation and to inflationary shocks. The estimates for France, Italy and Spain show clearly that the policy of pegging the domestic rates to the German ones was pursued much more effectively in the eigthies and the nineties, in fact the coefficient on German interest rates is not significant in the monetary rule for the Bank of Italy and the Bank of Spain over the first subsample, while it is significantly different form zero but not significantly different from one in the second sub-sample. The differences between the two subsamples are similar, although less dramatic, for the Bank of France.

Moreover the estimation shows that the attitude against domestic inflation has grown stronger in France in more recent years.

5.4 Simulation

Given the results of our estimation, we proceeded to simulate the model dynamically over the estimation sample period. Our dynamic simulation is counterfactual in the sense that we keep the macroeconomic shocks while simulating the model but we set to zero all monetary and fiscal shocks. The spirit of our exercise is to compare what happened with what would have happened if monetary and fiscal authorities never deviated from their rules over the available sample. The results of our simulations are reported, country by country, in Figures 4-7.

The evidence for our four countries shows some interesting common features. Disinflation is a common feature of actual and simulated data, moreover simulated monetary policy rates stay always very close to actual rates. This evidence is consistent with the statement that disinflation was generated by the monetary policy rules and central bankers never deviate systematically form these rules. The evidence on the behaviour of fiscal authorities is very different, in fact fiscal rules imply a much more disciplined policy than that observed in the data. Our conterfactual simulations attributes to deviations from the rules several episodes of expansionary fiscal policy: the high French budget deficits in the period 1992-1996, the steep increase in German debt after reunification, the very high Italian deficits in the period 1986-1993[5], the high Spanish deficits in the period 1984-1986 and then in the years following the collapse of EMU, 1992-1994. Interestingly, towards the end of the sample, as the EMS start-up draws nearer and nearer, a pattern of convergence between actual and simulated series seems to be re-established. In fact, our simulations provide evidence that in the build-up to EMU fiscal authorities were more virtuous than their systematic behaviour would have indicated. These evidence, might explain why other authors(Ballabriga and Martinez-Mongay,2002, Buti-Sapir,2002, Brunila and Martinez,2002) have found some evidence in favour of the "fiscal fatigue" hypothesis by comparing the year pre-EMU with the first year of the EMU era. However, it is important to note that our methodology is not appropriate to bring evidence on the fiscal

[5]These results are consistent with the analysis of Italian fiscal policy in the eighties provided by Giavazzi and Spaventa(1989)

fatigue hypothesis given the very limited availability of observations from the new regime. We would rather more confidently highlight the conclusion that our results lend support to the view that independent fiscal authorities should be established(see Wyplosz,2001).

Our simulation exercise allows also to assess if the differences across countries in fiscal policies depend on their systematic component or on deviations of fiscal authorities from their rules. Figure 8 reports the deficits to GDP ratios for our four countries and their decomposition into systematic and non-systematic components.

Insert Figure 8 about here

The data show a much stronger convergence of systematic fiscal policy than those observed in the deficits in the period 1980-1995. However, in the last part of the sample the near equality of deficits across countries has been delivered by some deviations from the estimated rules.

6 The effects of misspecification

Many studies on the effects of monetary policy are available, some studies on the effect of fiscal policy are available, but the standard practice in the analysis of the effect of any of the two policies is to exclude the other type of policy by the empirical model considered. We use our specification to give an assessment of the consequences of such procedure. We report in Table 3 estimated parameters for three versions of the specification for the output gap in Italy.

Insert Table 3 about here

The first set of parameters is generated by estimated a single equation version of the specification for the output gap used in our model, which includes both monetary and fiscal policy indicators. We label this specification as baseline model. We then estimate a second specification where monetary policy is omitted by excluding the nominal short-term interest rates from the estimated model. Finally, we consider a third specification where fiscal policy is omitted by excluding the ratio of government receipts to GDP and the ratio of government expenditure to GDP. By comparing the four country in our sample we reach the conclusion that the general problem of omitted

variables applies in our case. The omission of significant variables alters the interpretation of the results. Consider the case of Italy. The baseline model features significant effects for both monetary and fiscal policy. The short run impact of rates on the output gap is -0.2, while the long-run impact is -0.66. The ratio of government expenditure to GDP is 0.3 in the short-run, and it increases up to 1 in the long-run. The impact of government receipts to GDP is somewhat smaller, with a coefficient of -0.2 in the short-run and of -0.66 in the long-run. All these effects are statistically significant. The omission of monetary policy renders the point estimates of the effects of fiscal policy much lower and statistically not significant. Likewise the omission of fiscal policy draws the point estimate on the nominal short term interest rates to zero. The omission of domestic factors generates an increase in the statistical significance of international factors in the explanation of the Italian output gap. The omitted variables problem has much lesser effect in the other three countries, where the impact of fiscal and monetary variables on output is much looser than in the Italian case. Overall we conclude that our case study makes a rather strong argument in favour of joint modelling of the effects of monetary and fiscal policies on macroeconomic variables

7 Conclusions

Our investigation on the behaviour of monetary and fiscal authorities of the four main countries in the Euro area highlighted a number of facts.

The systematic monetary policies adopted by the non-German authorities in the seventies were not capable of stabilizing inflation. Such results has been achieved in the eigthies and the nineties by anchoring more tightly domestic monetary policy to German monetary policy, which in turn has become more aggressive in fighting inflation in the last twenty years.

All the main episodes of expansionary fiscal policy occurred in the course of the eigthies and the nineties in Europe cannot be explained by the systematic behaviour of fiscal authorities. The high French budget deficits in the period 1992-1996, the steep increase in German debt after reunification, the very high Italian deficits in the period 1986-1993, the high Spanish deficits in the period 1984-1986 and then in the years following the collapse of EMU, 1992-1994 are all attributable to non-systematic fiscal policy. In fact the convergence among systematic fiscal policies in Europe in the course of the eigthies is much stronger than that of observed variables. Importantly, the

deviations of fiscal authorities from their rules does not cause any modification in the behaviour of monetary authorities. Stabilization of inflation in the eighties and the nineties is achieved independently from the lack of fiscal discipline. There are important interactions between the two authorities but they depend exclusively on the responses of governments expenditures and receipts to interest rate payments on the public debt.

Finally our study, makes a strong case in favour of joint modelling of the effects of monetary and fiscal policies on macroeconomic variables. Considering the case of Italy, we have illustrated how the omission of one of the two policies from the specification of the model changes the values of point estimates and renders them not significant. Moreover, the interpretation of the transmission mechanism of the two policies is also affected in that important interactions are not considered.

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Appendix 1: the data-set

SERIES	FREQUENCY		SOURCE
GDP	semi annual data		OECD
GDP Deflator	semi annual data		OECD
Potential GDP	semi annual data		OECD
Gov.	semi annual data		OECD
(= Total Direct Taxes + Social Security Contribution +			
Other Current Transfers Received + Indirect Taxes)			
Gov.Exp.	semi annual data		OECD
(= Consumption + Subsidies + Social Benefits Paid +			
Nominal Investment + Capital Consumption + Other			
miscellaneous capital transactions)			
Interest Payments	semi annual data		OECD
(= Gross Gov. Interest Payment - Gross Gov. Interest			
Receipts)			
DEBT (Total Gov.Debt)	semi annual data		OECD
CPI	semi annual data (end of period)		Datastream
Money Market Rate	semi annual data (end of period)		Datastream

Table 1	The estimated models - sample 1980:1-1999:2; by SURE								
	GER	**ITA**	**FRA**	**SPA**		**GER**	**ITA**	**FRA**	**SPA**
C_1	1.000 (0.031)	0.949 (0.019)	0.969 (0.027)	0.951 (0.020)	C_{15}	0.919 (0.023)	0.891 (0.022)	0.947 (0.016)	0.962 (0.021)
C_2	0.082 (0.034)	0.218 (0.092)	0.081 (0.063)	0.189 (0.117)	C_{16}	0.073 (0.019)	0.073 (0.015)	0.036 (0.009)	0.025 (0.009)
C_3	42.435 (13.707)	-3.383 (3.926)	6.378 (7.488)	3.409 (2.195)	C_{17}	10.8835 (3.022)	2.168 (2.384)	7.188 (3.809)	4.324 (1.069)
C_4	-0.063 (0.172)	0.741 (0.072)	0.802 (0.087)	0.945 (0.083)	C_{18}	0.771 (0.066)	0.994 (0.064)	0.842 (0.087)	0.932 (0.032)
C_5	0.558 (0.294)	0.077 (0.062)	-0.130 (0.060)	-0.085 (0.062)	C_{19}	-0.136 (0.040)	-0.477 (0.118)	-0.382 (0.101)	-0.354 (0.117)
C_6	0.028 (0.180)	-0.179 (0.055)	0.056 (0.050)	0.026 (0.026)	C_{20}	0.222 (0.036)	0.554 (0.108)	0.384 (0.105)	0.561 (0.112)
C_7	0.091 (0.228)	0.248 (0.077)	-0.165 (0.108)	0.036 (0.084)	C_{21}	-0.219 (0.128)	-0.127 (0.055)	0.151 (0.221)	-0.133 (0.048)
C_8	-1.144 (0.398)	-0.132 (0.052)	0.027 (0.126)	-0.124 (0.107)	C_{22}	-0.239 (0.073)	-0.121 (0.053)	0.069 (0.153)	-0.302 (0.069)
C_9	0.836 (0.183)	0.047 (0.072)	0.008 (0.068)	0.068 (0.049)	C_{23}	26.682 (4.824)	8.492 (1.699)	5.153 (4.680)	5.039 (1.391)
C_{10}	0.789 (0.303)	-0.165 (0.554)	0.520 (0.554)	0.011 (1.208)	C_{24}	0.387 (0.110)	0.809 (0.042)	0.854 (0.104)	0.870 (0.043)
C_{11}	0.632 (0.076)	0.832 (0.070)	0.565 (0.072)	0.657 (0.118)	C_{25}	-0.052 (0.040)	-0.138 (0.115)	-0.315 (0.114)	-0.027 (0.078)
C_{12}	0.647 (0.137)	0.137 (0.062)	0.299 (0.062)	0.263 (0.157)	C_{26}	-0.023 (0.040)	0.273 (0.103)	0.304 (0.128)	0.113 (0.082)
C_{13}	0.194 (0.052)	0.129 (0.131)	0.117 (0.109)	-0.001 (0.286)	C_{27}	0.034 (0.122)	0.194 (0.064)	0.492 (0.221)	0.069 (0.082)
C_{14}		0.165 (0.081)	0.352 (0.096)	0.333 (0.192)	C_{28}	-0.318 (0.078)	-0.270 (0.060)	0.322 (0.172)	-0.028 (0.069)

Table - 2 The correlation of residuals and the S.D. on each principal diagional

ITA	u^{NP}_{1t}	u^{NP}_{2t}	u^{M}_{3t}	u^{NP}_{4t}	u^{g}_{5t}	u^{τ}_{6t}
	1.25	0.51	0.37	0.11	0.09	-0.02
		0.65	0.37	0.03	0.17	-0.01
			1.05	-0.04	-0.14	-0.11
				0.37	0.27	0.19
					0.59	-0.17
						0.53

GER	u^{NP}_{1t}	u^{NP}_{2t}	u^{M}_{3t}	u^{NP}_{4t}	u^{g}_{5t}	u^{τ}_{6t}
	0.58	0.08	0.11	0.11	-0.48	0.14
		1.30	-0.21	-0.01	0.00	-0.25
			0.74	-0.35	-0.23	0.45
				0.35	0.00	0.16
					0.42	-0.03
						0.46

FRA	u^{NP}_{1t}	u^{NP}_{2t}	u^{M}_{3t}	u^{NP}_{4t}	u^{g}_{5t}	u^{τ}_{6t}
	0.88	0.18	0.02	-0.31	-0.11	-0.25
		0.73	0.09	0.09	0.03	0.03
			1.01	-0.27	0.05	0.14
				0.27	-0.38	0.33
					0.48	0.33
						0.5

SPA	u^{NP}_{1t}	u^{NP}_{2t}	u^{M}_{3t}	u^{NP}_{4t}	u^{g}_{5t}	u^{τ}_{6t}
	1.08	0.00	-0.30	0.25	-0.01	-0.57
		0.60	0.11	-0.13	-0.13	-0.11
			2.63	-0.13	0.19	0.33
				0.60	0.12	0.17
					0.40	0.24
						0.48

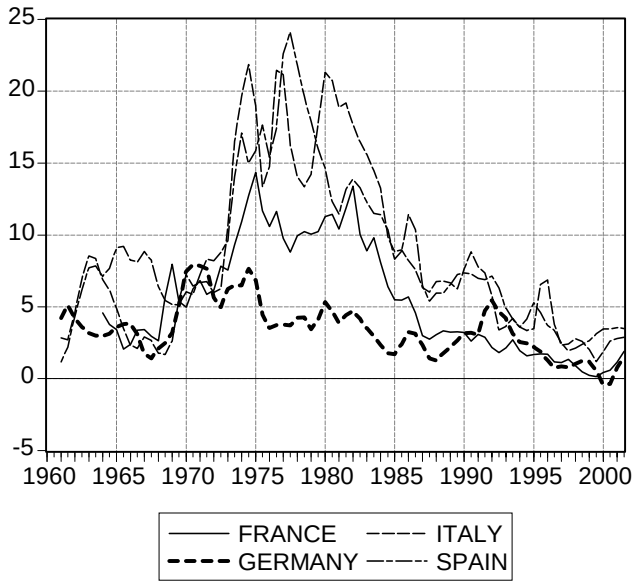
$$
\begin{aligned}
\pi_t^j &= c_1\pi_{t-1}^j + c_2 y_{t-1}^j + u_{1t}^{NP,j} \\
y_t^j &= c_3 + c_4 y_{t-1}^j + c_5\pi_{t-1}^j + c_6 i_{t-1}^j + c_7 g_{t-1}^j \\
&\quad + c_8\tau_{t-1}^j + c_9 y_{t-1}^{US} + u_{2t}^{NP,j} \\
i_t^j &= c_{10} + c_{11} i_{t-1}^j + c_{12}\pi_t^j + c_{13} y_t^j + c_{14} i_t^{GER} + u_{3t}^{M,j} \\
avc_t^j &= c_{15} avc_{t-1}^j + c_{16} i_t^j + u_{4t}^{NP,j} \\
g_t^j &= c_{17} + c_{18} g_{t-1}^j + c_{19} y_t^j + c_{20} y_{t-1}^j + \frac{c_{21}}{\left(1+\Delta x_t^j + \pi_t^j\right)} avc_t^j * DY_t^j \\
&\quad + c_{22}\frac{\Delta x_t^j + \pi_t^j}{\left(1+\Delta x_t^j + \pi_t^j\right)} DY_t^j + u_{4t}^{g,j} \\
\tau_t^j &= c_{23} + c_{24}\tau_{t-1}^j + c_{25} y_t^j + c_{26} y_{t-1}^j + \frac{c_{27}}{\left(1+\Delta x_t^j + \pi_t^j\right)} avc_t^j * DY_t^j \\
&\quad + c_{28}\frac{\Delta x_t^j + \pi_t^j}{\left(1+\Delta x_t^j + \pi_t^j\right)} DY_t^j + u_{5t}^{\tau,j} \\
DY_t^j &= DY_{t-1}^j + \frac{avc_t^j - \Delta x_t^j - \pi_t^j}{\left(1+\Delta x_t^j + \pi_t^j\right)} DY_{t-1}^j + \left(g_t^j - \tau_t^j\right)
\end{aligned}
$$

Table 3	The changing behaviour of monetary policy makers					
	c_{10}	c_{11}	c_{12}	c_{13}	c_{14}	*S.E. of regres.* *mean dep. var.*
GER **66 - 79**	0.350 (0.931)	0.368 (0.213)	0.633 (0.297)	-0.003 (0.225)		1.683 5.307
GER **80 - 99**	0.780 (0.336)	0.590 (0.090)	0.727 (0.162)	0.169 (0.059)		0.739 6.093
ITA **62 - 79**	0.532 (0.825)	0.432 (0.105)	0.425 (0.081)	-0.097 (0.149)	-0.076 (0.146)	1.770 7.309
ITA **80 - 99**	-0.159 (0.608)	0.834 (0.078)	0.125 (0.069)	0.170 (0.145)	0.179 (0.091)	1.047 12.522
FRA **70 - 89**	0.968 (0.881)	0.383 (0.126)	0.221 (0.091)	-0.385 (0.143)	0.495 (0.102)	1.328 9.646
FRA **80 - 99**	0.825 (0.627)	0.539 (0.083)	0.324 (0.070)	0.121 (0.123)	0.323 (0.111)	1.007 8.797
SPA **75 - 93**	9.129 (3.881)	0.408 (0.164)	-0.050 (0.155)	-0.195 (0.588)	-0.062 (0.344)	4.766 13.760
SPA **80 - 99**	0.817 (1.378)	0.648 (0.137)	0.210 (0.178)	0.106 (0.313)	0.276 (0.219)	2.603 12.062

The reported coefficients refer to the monetary rule extracted by our model:

$$i_t^j = c_{10} + c_{11} i_{t-1}^j + c_{12} \pi_t^j + c_{13} y_t^j + c_{14} i_t^{GER} + u_{3t}^{M,j}$$

Table - 4	The effects of misspecification - by OLS					
1980:1 1999:2	Baseline	Omitted Monetary Police	Omitted Fiscal Policy	Baseline	Omitted Monetary Police	Omitted Fiscal Policy
	GERMANY			**ITALY**		
c_3	47.049 (15.314)	46.996 (15.098)	-1.786 (1.042)	-1.573 (5.156)	2.507 (5.454)	-0.306 (0.528)
c_4	-0.038 (0.193)	-0.026 (0.184)	0.345 (0.161)	0.691 (0.091)	0.693 (0.095)	0.728 (0.105)
c_5	0.472 (0.330)	0.523 (0.241)	0.435 (0.366)	0.062 (0.081)	-0.051 (0.078)	0.053 (0.055)
c_6	0.047 (0.202)		0.008 (0.223)	-0.204 (0.071)		-0.011 (0.058)
c_7	-0.037 (0.257)	-0.032 (0.252)		0.276 (0.100)	0.084 (0.082)	
c_8	-1.122 (0.446)	-1.123 (0.440)		-0.194 (0.068)	-0.139 (0.072)	
c_9	0.756 (0.205)	0.738 (0.186)	0.572 (0.204)	0.088 (0.095)	0.179 (0.098)	0.226 (0.095)
S.E. of reg.	1.287	1.269	1.431	0.624	0.687	0.739
logLikel.	-63.011	-63.043	-68.420	-34.061	-38.492	-41.996
	FRANCE			**SPAIN**		
c_3	7.439 (1.091)	8.465 (1.075)	-0.274 (0.494)	12.530 (4.268)	13.046 (4.256)	-0.119 (0.488)
c_4	0.706 (0.121)	0.720 (0.119)	0.816 (0.070)	0.993 (0.075)	1.022 (0.071)	0.877 (0.059)
c_5	-0.123 (0.087)	-0.098 (0.080)	-0.037 (0.051)	-0.338 (0.107)	-0.317 (0.106)	-0.070 (0.050)
c_6	0.055 (0.072)		0.027 (0.070)	0.049 (0.044)		0.047 (0.047)
c_7	-0.267 (0.156)	-0.246 (0.152)		0.043 (0.128)	0.074 (0.125)	
c_8	0.105 (0.184)	0.069 (0.177)		-0.343 (0.182)	-0.376 (0.180)	
c_9	0.076 (0.099)	0.041 (0.087)	0.151 (0.084)	0.062 (0.087)	0.033 (0.083)	0.168 (0.083)
S.E. of reg.	0.687	0.683157	0.698	0.752	0.755	0.827
logLikel.	-37.918	-38.266	-39.691	-41.526	-42.256	-46.500



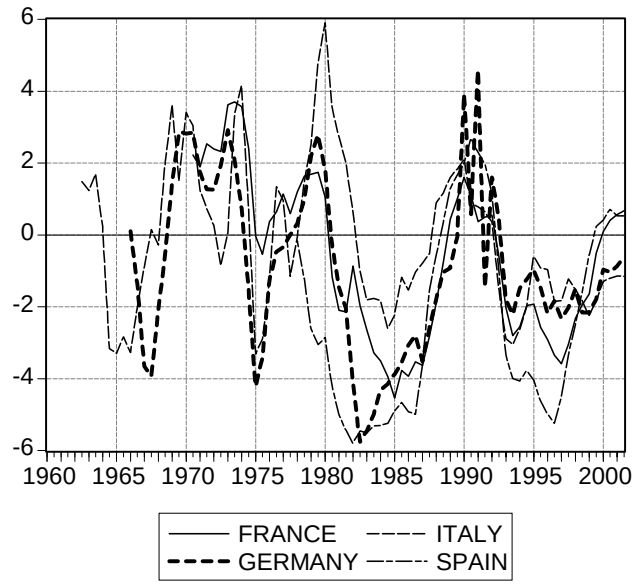


Figure 1: Inflation(top panel) and output gaps(bottom panel)

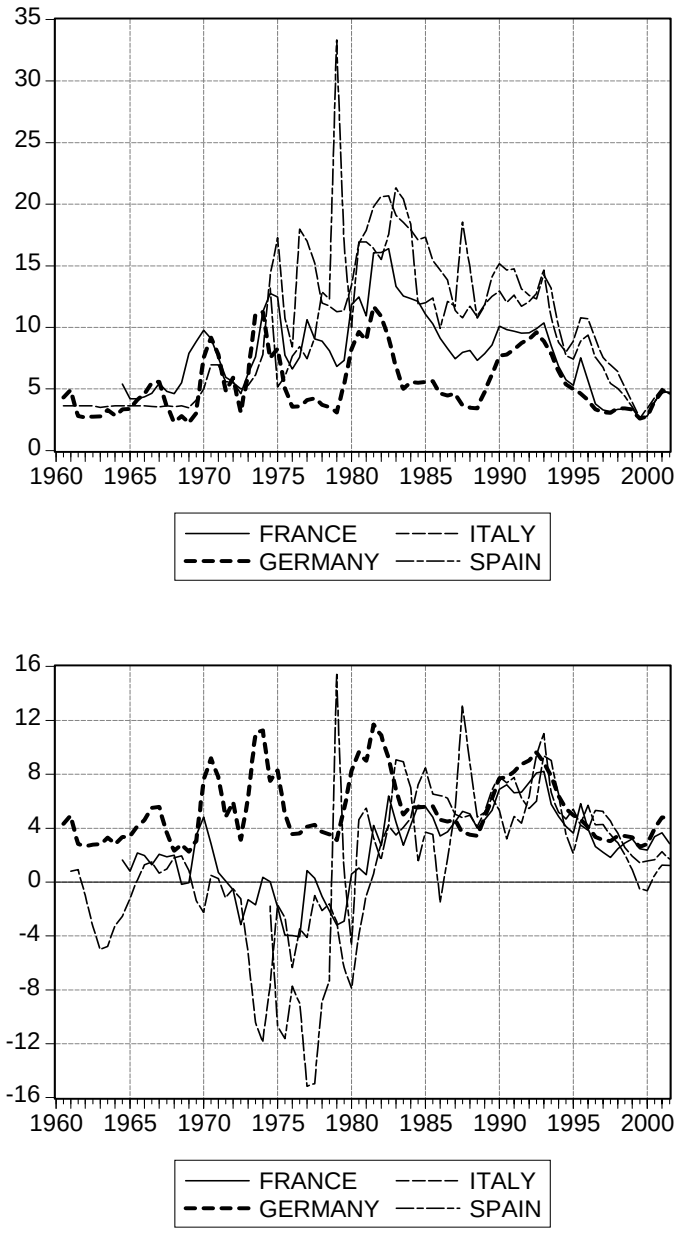


Figure 2: Nominal (top panel) and real (ex-post)(bottom panel) monetary policy rates

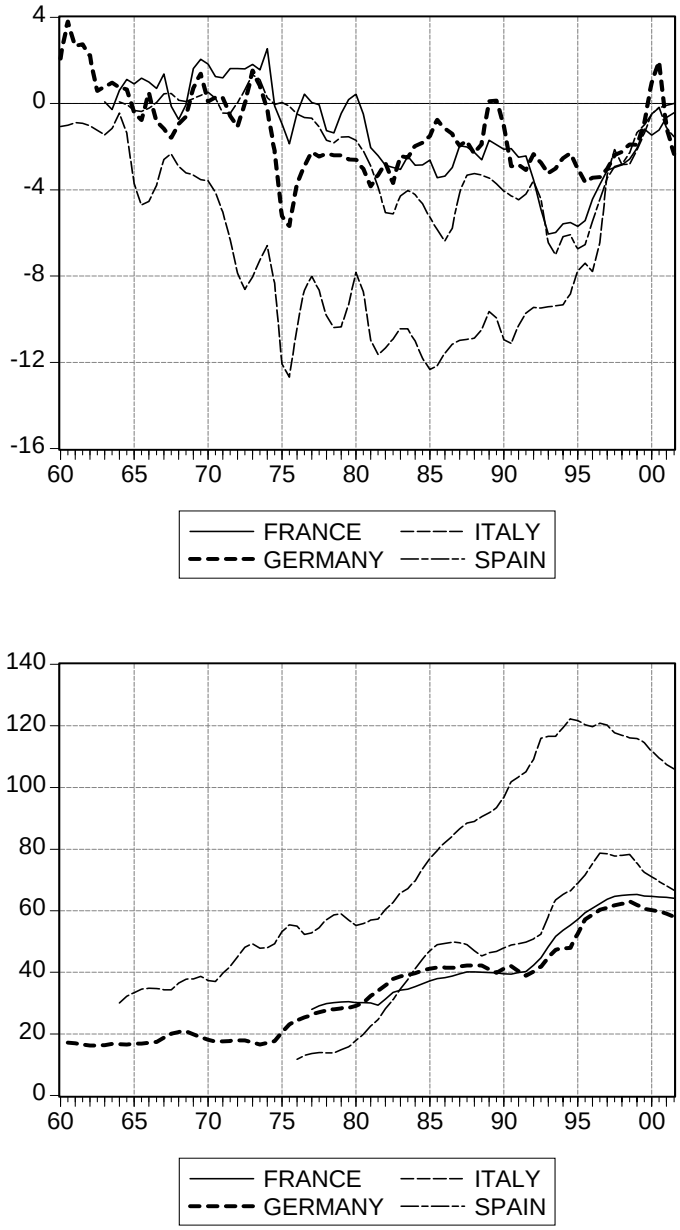


Figure 3 Government deficits(top panel) and debts(bottom panel) as percentage of GDP

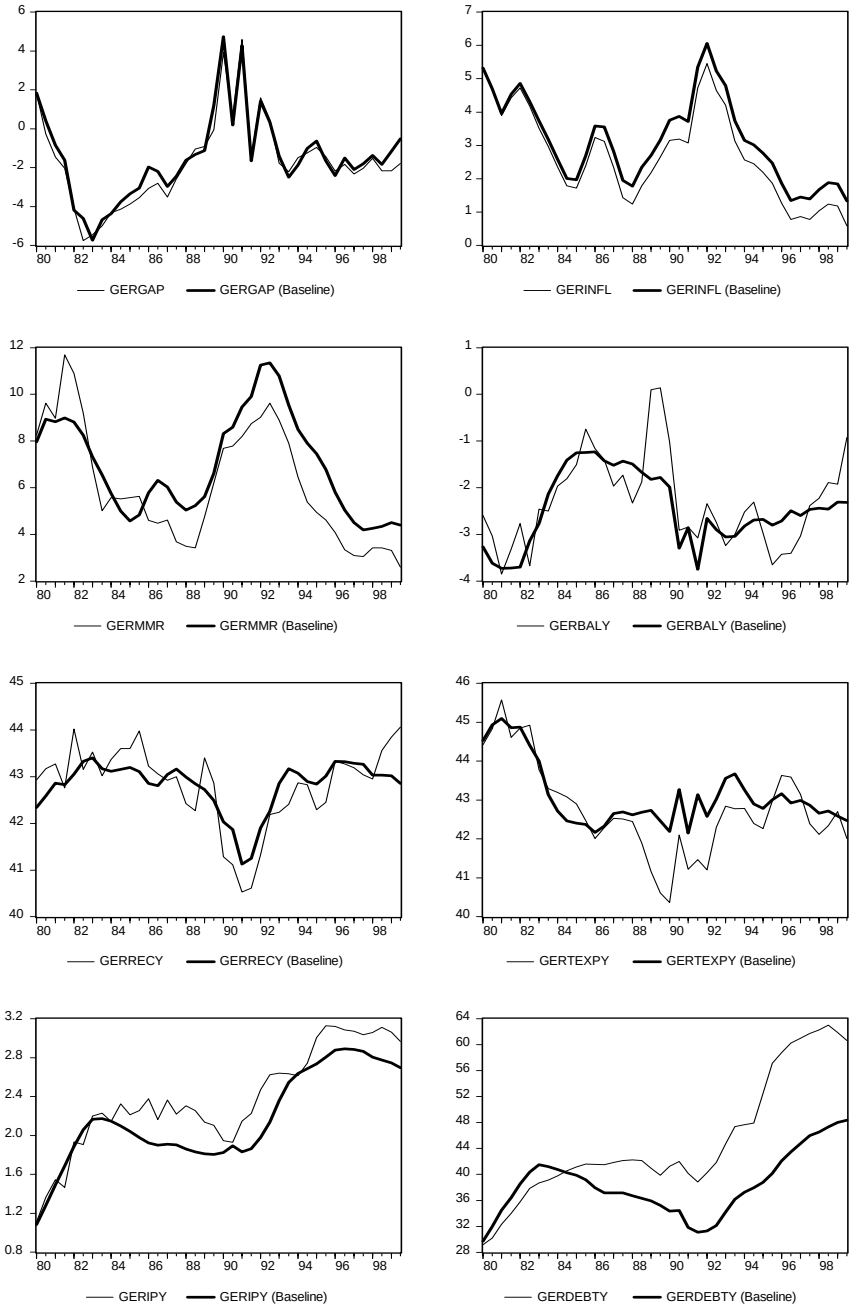


Figure 4: counterfactual simulations - Germany

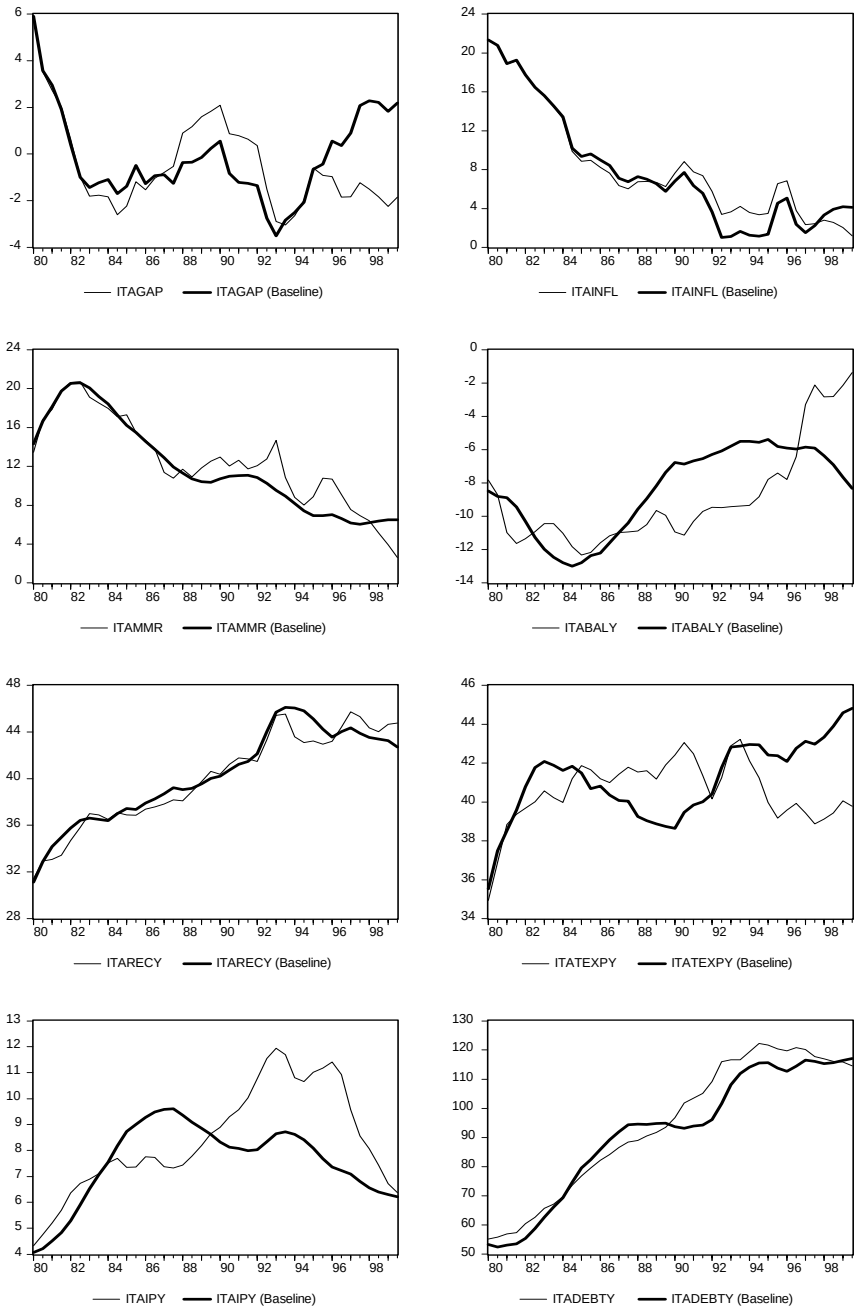


Figure 5: counterfactual simulations - Italy

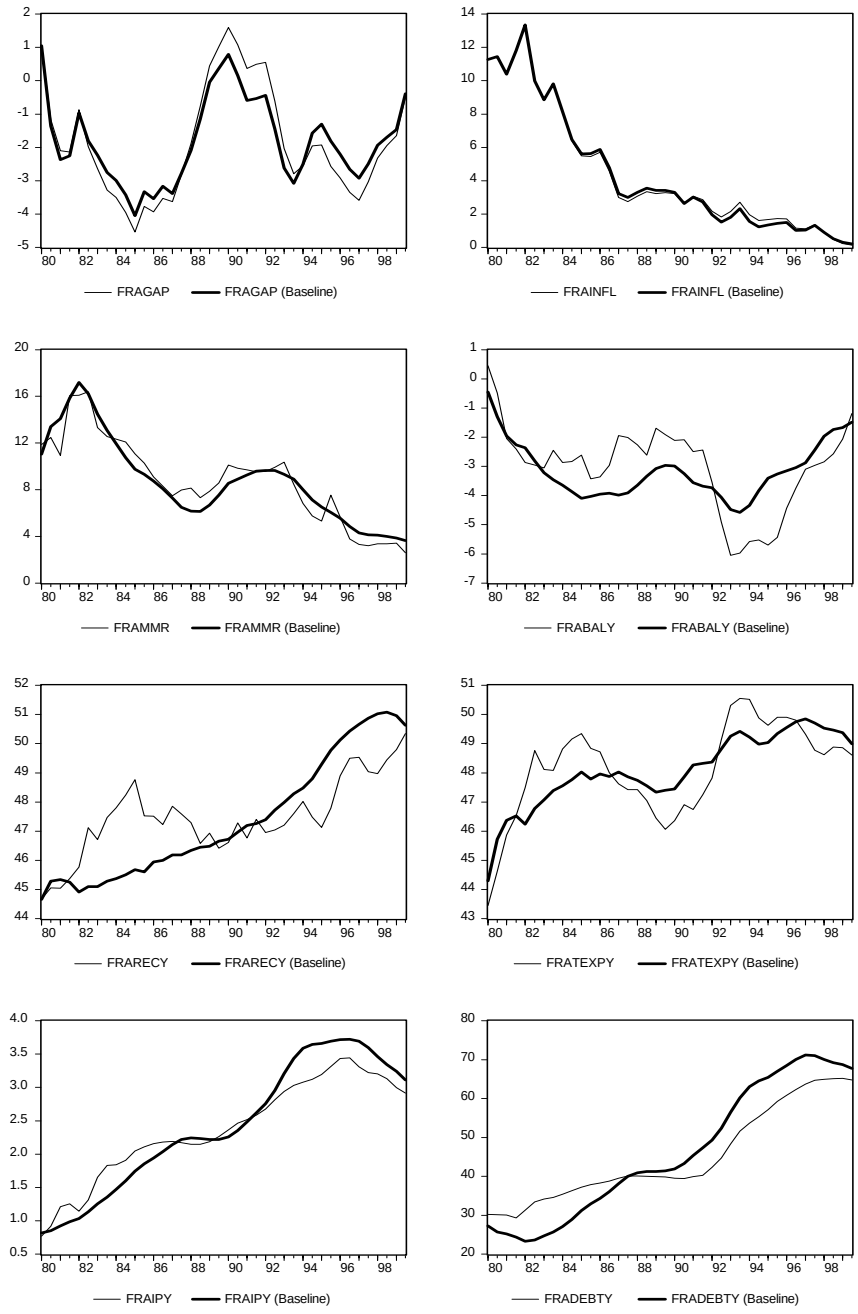


Figure 6: counterfactual simulation - France

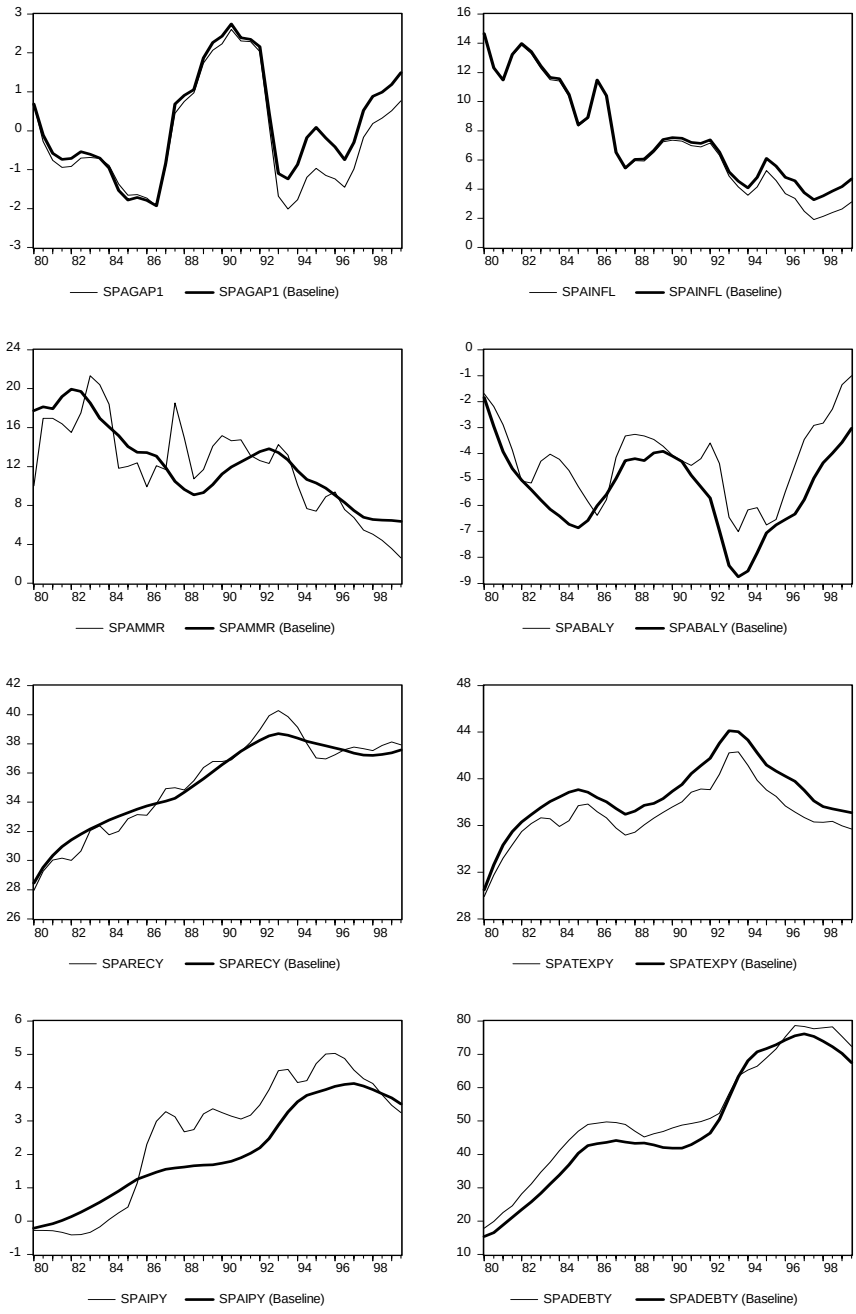


Figure 7: counterfactual simulation - Spain

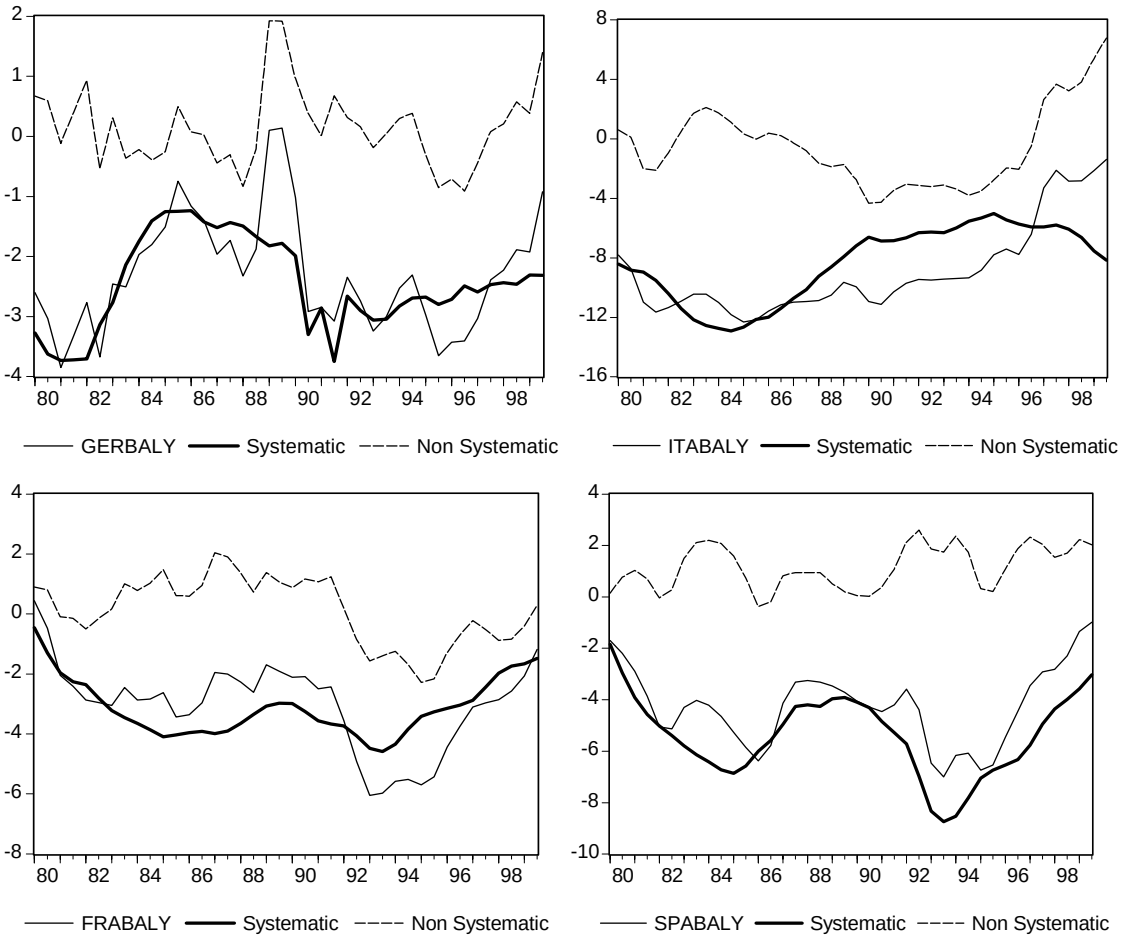


Figure 8 :Systematic and non-systematic total surpluses: Germany, Italy, France and Spain