
NOTES D'ÉTUDES

ET DE RECHERCHE

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TO MONETARY UNION:
A STRUCTURAL VAR MODEL**

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Les Notes d'Études et de Recherche reflètent les idées personnelles de leurs auteurs et n'expriment pas nécessairement la position de la Banque de France.

Fiscal Policy in the Transition to Monetary Union : a Structural VAR Model

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Abstract

In order to assess the effect of fiscal rules in Stage Three of EMU for France and Germany, Bayoumi and Eichengreen's (1992) structural V.A.R analysis is extended by including the general government financial surplus and conditioning by external variables. This allows a distinction between fiscal and monetary shocks. During the period 1972.1-1995.4, monetary policy has a significant effect on prices in both countries. On the other hand, fiscal shocks, whose effect on the deficit provides a measure of the "structural deficit", only contribute to a significant part of the dynamics of output in Germany. For that period, they appear to have little effect in France. In addition, fiscal shocks are uncorrelated between the two countries, although it is difficult to conclude that it reflects purely idiosyncratic shocks rather than a different policy-mix.

Key words : Budget deficit, Ricardian equivalence, Structural VAR, EMU.

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1 Introduction

In the wake of the Maastricht Treaty organizing the Economic and Monetary Union (EMU), countries in the euro area are relinquishing monetary autonomy to the European Central Bank, as nominal exchange rates and short term interest rates are fixed among the participating countries. A unique feature of EMU is that fiscal policy remains decentralized with each national government keeping full responsibility for it. Against this background, European countries agreed (at the December 1996 Dublin Council) on the principles of a “Stability and Growth Pact”, in order to ensure the coordination of fiscal policies.

There are many motivations for such a proposal. Firstly, in the context of Stage Three of EMU, fiscal policy in individual countries may become more effective and national governments might be tempted to increase budget deficit, thereby endangering the stability of the euro zone.

Secondly, if there are many convincing arguments in favour of temporary budget deficits (existence of liquidity constrained agents, finite horizon, etc.), one should be cautious that the distortionary effects of fiscal policy do not more than offset the welfare gains they provide. In particular, budget deficits, by reallocating resources from investment to consumption, reduce the capital base of the economy, hence its long run growth (Ball and Mankiw, 1995). Many countries have therefore introduced constraints on their fiscal policy, in order to limit the growth of public expenditures and public deficits.

Following the distinction by Blanchard (1990) between the transmission process of fiscal policy (“fiscal impact”) and the shocks themselves (“fiscal impulse”), the assessment of the effects of fiscal constraints requires one to address two types of questions that are actually closely linked. First, it is important to investigate whether fiscal policy indeed plays a major role in the dynamics of the main macroeconomic variables, so that limitations to policy-makers’ degree of freedom would significantly reduce their ability to influence effectively the business cycle. Second, it is necessary to distinguish whether fiscal shocks are purely idiosyncratic (i.e. country specific) or correspond to common shocks (i.e. occur jointly in all countries).

Considering the first point, Barro (1974) argued that whether the budget deficit is financed with taxes or public debt is irrelevant. One crucial question is therefore whether Ricardo-Barro equivalence holds for EU countries, since it has implications regarding how binding any limit stemming from the Stability and Growth Pact would be. In addition, as the policy-mix between monetary and fiscal policy is likely to be changed, towards a greater role of the latter, a useful benchmark will be to assess the policy-mix achieved before EMU, i.e. the relative role of fiscal and monetary policy during that period. The analysis presented in the paper is therefore based on a model where fiscal and monetary policy are jointly introduced, with separate effects.

Regarding the correlation between fiscal shocks, the basic idea is that, given the high level of convergence between European countries, especially France and Germany on which we concentrate here, one may argue that there should not be any idiosyncratic fiscal shocks. Considering the various shocks affecting the economy (namely supply and demand shocks, either public or private), convergence means that private supply shocks

are correlated, due to the substantial mobility of at least two factors of production, i.e. capital and technology. Financial shocks are also likely to be correlated, due to the high degree of integration of capital markets. Private demand shocks should also exhibit some correlation, but the absence of total mobility of labour means that preferences may not be identical. Before the Union is completed, transaction costs and exchange rate risks associated with independent currencies were another reason of the persistence of demand rigidities. Finally, in the case of fiscal policy, and as indicated in Table 1, one can distinguish between two types of uncorrelated shocks: independent responses to asymmetric shocks, or purely idiosyncratic shocks. They have different implications regarding the effects of the Stability and Growth Pact.

[Insert Table 1]

The analysis presented in the paper is based on Structural VAR models estimated for France and Germany and draws extensively on the corresponding literature, reviewed in a companion paper (Bruneau and De Bandt, 1998). In particular, Bayoumi and Eichengreen's (1992) analysis is extended, by introducing a 4-variable model instead of a 2-dimensional VAR, in order to distinguish between fiscal and monetary components during the period 1972:1-1995:4.

The conclusion of the paper is that, in line with previous findings (Bayoumi and Eichengreen (1992), Melitz and Weber,1996), Germany and France appear to have significantly converged, as evidenced by the high level of correlation between the supply and demand shocks in the two countries. The innovation of this paper is to show that our measure of fiscal shocks -whose effect on the budget deficit is close to standard indicators of "structural deficit"- appear to be idiosyncratic for the whole period, although the second half of the sample provides evidence of negative correlation. This latter result seems to be due to (i) a different timing in fiscal expansions/consolidations and (ii) different responses to the business cycle. Concerning the impact of fiscal shocks, we find they had a more significant effect on output in Germany than in France for the period under review. Fiscal policy shocks appear to have little effect on the other variables considered.

The remainder of this paper is organized as follows. Section 2 introduces a stylized model of fiscal policy, that is used to identify the structural shocks in the VAR model. Section 3 describes the data. The empirical results are discussed in Section 4.

2 The model and its testable implications

Fiscal policy is traditionally investigated through IS/LM-type models. Here, a more general model is presented, so as to introduce explicitly the intertemporal dimension of fiscal policy and to encompass Ricardian neutrality as a special case. This model is used to derive the time series properties that should be expected from the data.

2.1 The model

The model is a discrete-time version of an overlapping generation model of Blanchard(1985). For an individual of age a at date t , with logarithmic utility:

$$E_t(U_{a,t}) = E_t\left(\sum_{v=0}^{\infty} \delta^v \ln(c_{a+v,t+v})\right) = \sum_{v=0}^{\infty} (\delta\gamma)^v \ln(c_{a+v,t+v}) \quad (1)$$

where $c_{a+v,t+v}$ is the consumption in period $t+v$ of an individual of age $a+v$. $E_t(\cdot)$ is the expectation operator, conditional on information at t . Uncertainty arises in the model through survival risk. Hence, budget deficits matter because agents have finite horizons: with probability γ^j consumers survive j -periods ahead. It is also assumed, for convenience, that, at each period, there is a proportion $(1-\gamma)\gamma^j$ of agents of age j ($j = 0, \dots, \infty$). Output is Y_0 at $t = 0$ and Y in the “future” periods ($t = 1, \dots, \infty$). Taxes T_0 and T at $t = 0$ and $t > 0$, respectively, are levied on private agents. From the first order conditions of utility maximisation under resources constraints, it is possible to show that the aggregate per-capita consumption is:

$$C_0 = (1 - \delta\gamma)W_0 = (1 - \delta\gamma)\left[(Y_0 - T_0) + \frac{\gamma}{R - \gamma}(Y - T) + W_0\right] \quad (2)$$

In (2), it is assumed, to simplify, that the world real interest rate is constant from $t = 0$ onward and $R = 1 + r$. The second term in the square brackets is $\sum_{t=1}^{\infty} (\frac{\gamma}{R})^t (Y - T)$. The initial level of non human wealth is W_0 . The real interest rate between $t = -1$ and $t = 0$ is written r_{-1} .

Assuming, to simplify, that public expenditures are zero, the government budget constraint is such that:

$$\sum_{v=0}^{\infty} R^{-v}(T_v - G_v) = T_0 + \frac{1}{R - 1}T = (1 + r_{-1})B_{-1}^g \quad (3)$$

where B_{-1}^g is the initial level of public debt.

To examine the role of government budget deficit it is convenient to run the following experiment : taxes are cut by dT_0 at $t = 0$, and increased later to satisfy the government solvency constraint ($dT = -(R - 1)dT_0$). Since agents have finite lifetimes ($\gamma < 1$), the public deficit at $t = 0$ means transferring the financing of the tax cut to future generations. As a consequence, private wealth rises ($dW_0 = -(1 - \gamma\frac{R-1}{R})dT_0 > 0$ for $dT_0 < 0$), hence consumption increases at $t = 0$.

In the two-country version of the model, developed by Frenkel and Razin (1992), tradable and non-tradable goods (at home and abroad) are introduced in order to study the effect of budget deficit on the real exchange rate. A thorough examination of the implications of the open economy version of the model is reserved for future work. At this point, it suffices to say that, from the theoretical standpoint, in the open economy model, the comparative statics exercises also show that, when $\gamma < 1$, $\frac{dW_0}{dT_0} < 0$, $\frac{dW_0^*}{dT_0} > 0$ and $\frac{dR}{dT_0} < 0$ (see Frenkel and Razin (1992) for details).¹

¹If the small/medium size of the countries considered imposes to introduce external variables, it should however be acknowledged that such a channel of transmission of shocks might be less relevant with EMU.

To summarize, the main conclusion of the model is that a budget deficit increases consumption and the real interest rate. If Ricardian equivalence holds ($\gamma = 1$), consumption is unaffected. These conclusions are standard in the literature. They are fully consistent with the long run implications of the stochastic rational expectations model by Clarida and Gali (1995) who builds on Obstfeld (1985).

2.2 Testable implications

To measure the effect of fiscal shocks on the dynamics of the German and French economies, and to provide the best description of the policy-mix (monetary and fiscal policy) in the two countries, it is necessary to study the time-series properties of a representative set of macroeconomic variables, including the budget deficit. The approach is multivariate and focuses on quarterly data. A 4-dimensional vector of variables X_t is introduced, including real output growth ($\Delta \ln y_t$), year-to-year inflation ($\ln p_t/p_{t-4}$), the ex post real short term interest rate (r_t) and the ratio of general government primary surplus to nominal output (S_t).

The model is therefore $X_t = [\Delta \ln y_t, \ln p_t/p_{t-4}, r_t, S_t]$. Two separate VAR models are estimated, one for France and the other one for Germany, given the need to avoid estimating a too large VAR system. Dynamic correlation between the shocks of the two models are, however, investigated.²

The main assumptions are that inflation and the real interest rate are stationary with two different regimes and the ratio of primary budget surplus is also stationary (see section 4.1 for evidence in favour of these assumptions). The system is therefore driven by a 4-dimensional vector of structural shocks ω , written as $\omega = [\omega^s, \omega^d, \omega^m, \omega^g]$, where ω^s is a supply shock, ω^d is a private demand shock, ω^m is money supply shock and ω^g is a fiscal policy shock.

Two issues require however some explanations: the existence of regime shifts as well as the role of exogenous variables measuring the external environment. Regarding the first point, we allow for regime shifts in order to be able to rely on a relatively large sample period, going back to the early 1970s. In the case of France, we distinguish between two sub-periods: until 1983:4 and from 1984.1 onwards. This break-date corresponds to the first year of implementation of the Delors Plan, which marked a major turnaround in French economic policy. For Germany we also introduce the same break-date,³ plus an-

²Ibrahim and Kumah (1996) study a 5-dimensional VAR including, among others, the structural deficit, the current account balance and the real exchange rate and conclude that fiscal deficit shocks appreciate the real exchange rate (see also Ball and Mankiw (1995)), creating a crowding out effect which may offset the direct effect on aggregate demand. However, the effect on the real exchange rate turns out to be weaker in Germany than in other countries (France is not studied). In contrast, the present paper exhibits three kinds of differences. First, inflation is included, while the real exchange rate is not explicitly introduced among the endogenous variables: the nominal exchange rate only appears as exogenous variable (see below). Second, from a methodological perspective, the consistency of the full system of variables is investigated, instead of concentrating on a subset of variables. Finally, from the technical point of view, the identification of shocks in the present paper is performed through a mixture of short and long term constraints, and not only through a Choleski decomposition.

³Juselius (1996) provides empirical evidence that the transmission mechanism of monetary policy in Germany is significantly different after the end of 1983. This coincides also with the change of

other break for the Reunification period (1991 onwards). Technically, different intercepts are introduced. The model is also conditioned by external variables, using, for Germany, the US/DM exchange rate and, for France, the French Franc price of imported oil. These variables were chosen on the basis of the previous literature providing evidence that the introduction of external variables reduces the so-called “price-puzzle” (Sims, 1992). It ensures that a restrictive monetary policy effectively reduces inflation and is not associated with higher inflation. We accommodate both types of variables within a VAR-X framework. Formally, in the case of two regimes separated by date T , the process followed by X_t is such that:

$$A(L)X_t + \mu_1 \mathbf{1}_{\{t < T\}} + \mu_2 \mathbf{1}_{\{t \geq T\}} + B(L)Z_t = \epsilon_t \quad (4)$$

where the μ 's are the intercepts for the different regimes, while the Z_t 's are the exogenous variables, $A(L)$ and $B(L)$ are two lag polynomials of possibly different order. The inversion of the VAR model of equation (4) yields, under the usual conditions of invertibility of $A(L)$:

$$X_t = A(L)^{-1}[-\mu_1 \mathbf{1}_{\{t < T\}} - \mu_2 \mathbf{1}_{\{t \geq T\}} - B(L)Z_t + \epsilon_t] \quad (5)$$

By the law of least square projections, the ϵ_t 's are orthogonal to the Z_t 's. One can therefore study the effects of the two kind of shocks independently, using the traditional methods of Structural Var modelling, namely impulse response functions and variance decomposition. We focus here on the canonical shocks ϵ_t 's, which are conditioned by the other exogenous variables. The structural shocks ω_t 's are then derived from these canonical shocks ϵ_t (see next section).

Some restrictions have to be imposed in order to structurally identify the VAR model.

First, it is important to note that the normalisation of the budget deficit by nominal output implies that S_t is not exogenous, as sometimes assumed. The stationarity of this variable is consistent with the existence of the government intertemporal budget constraint (see equation (3) in the previous subsection).⁴ It is particularly relevant during the period starting in the early 1980s for Germany and in the mid 1980s for France, where governments tried to implement, with various degree of success, fiscal policies aimed at containing any systematic divergence of this ratio. One can also decompose the deficit ratio into its cyclical and structural components:

$$S_t = A_{Ss}(L)\omega_t^s + A_{Sd}(L)\omega_t^d + A_{Sm}(L)\omega_t^m + A_{Sg}(L)\omega_t^g + \eta_t \quad (6)$$

where $\eta_t = A(L)^{-1}[-\mu_1 \mathbf{1}_{\{t < T\}} - \mu_2 \mathbf{1}_{\{t \geq T\}} - B(L)Z_t]$ and $A_{Sg}(L)\omega_t^g$ represents the structural fiscal policy impulses.

Since the real interest rate is assumed to be stationary with different regime shifts, shocks should not have a lasting effect.

$$r_{r,t} = A_{rs}(L)\omega_t^s + A_{rd}(L)\omega_t^d + A_{rm}(L)\omega_t^m + A_{rg}(L)\omega_t^g + \eta_t \quad (7)$$

government after 1982, with the departure of H. Schmidt and the beginning of H. Kohl's government.

⁴We focus here on the primary budget deficit, which excludes interest payments and is less likely to exhibit persistence and non-stationarity.

where $A_{ri}(1) = 0$, for all i .

The model of section 2.1 is augmented with a production function, where output responds to random walk technology shocks. Consequently, output is non-stationary:

$$\Delta \ln y_t = A_{yd}(L)\omega_t^d + A_{yg}(L)\omega_t^g + A_{ym}(L)\omega_t^m + A_{ys}(L)\omega_t^s + \eta_t \quad (8)$$

where $A_{ym}(1) = A_{yd}(1) = 0$ if monetary policy and private demand shocks are neutral in the long run. Regarding fiscal shocks, it is convenient to distinguish between the “strong” and the “weak” form of Ricardian equivalence. While, according to latter view, fiscal shocks have no long run effect on output ($A_{yg}(1) = 0$), as well as on inflation and real interest rates, the former view assumes that infinite-lived agents see fiscal policy as totally ineffective, once the government budget constraint holds, so that transitory dynamics are very short.

The stochastic trend of the price level is given by:

$$\tau_{\ln p_t} = A_{pd} \sum_{i=1}^t \omega_i^d + A_{pg} \sum_{i=1}^t \omega_i^g + A_{ps} \sum_{i=1}^t \omega_i^s + A_{pm} \sum_{i=1}^t \omega_i^m + \sum_{i=1}^t \eta_i \quad (9)$$

If Ricardian equivalence holds, ω_t^g does not enter equation (8) and (9).

2.3 Estimation and identification

When implementing the model of the previous section, it turns out that it is not possible to uncover stable cointegration relations for the period under review between the only two $I(1)$ variables, namely output and prices. The method suggested by Gali (1992), as an extension to Blanchard and Quah (1989), is therefore applied to the system X_t in order to identify structural shocks.⁵ The analysis proceeds in two steps: first, the canonical VAR is estimated (and the corresponding canonical errors ϵ), then, the structural model is identified, postulating the existence of a transformation matrix P , such that:

$$\epsilon = P\omega \quad (10)$$

The transformation matrix P includes the structural short and long run restrictions developed in the previous subsection. Short run constraints impose the nullity of elements of P , where $P_{ij} = 0$ means that shock ω_j has no contemporaneous effect on variable i . Long run restrictions refer to the nullity of elements of $C(1)P$, where $C(1)$ is the matrix of long run canonical multipliers (i.e. derived from the inversion of the canonical VAR), and $[C(1)P]_{ij} = 0$ means that shock ω_j has no long run effect on variable i .

In the structural VAR model, the P -matrix is just-identified using the following 16 restrictions:⁶

- 10 restrictions express the orthogonality of the structural shocks ω : $\Sigma = PP'$, where Σ denotes the covariance matrix of ϵ .

⁵With cointegration, estimation would have to be based on the common trend approach explicated by Warne (1991) and applied by Mellander, Vredin and Warne (1992), Bec and Hairault (1993), Blix (1995), among others. See Bruneau and De Bandt (1998) for more details.

⁶See Melitz-Weber (1996) for an extension to a 6×6 system.

- 6 additional structural restrictions are also imposed: The first 3 restrictions impose the absence of long run effect of demand shocks on output ($\forall j, 2 \leq j \leq 4, (C(1)P)_{1j} = 0$).

We also introduce 3 short run identification constraints. As is traditionally assumed, monetary policy has no contemporaneous effect on output ($P_{13} = 0$). The same assumption is made for fiscal policy shocks ($P_{14} = 0$). The basic intuition is that monetary and fiscal shocks have a delayed effect on output.⁷ In addition, it is assumed that fiscal policy shocks have no contemporaneous effect on real short term interest rates ($P_{34} = 0$). They are more likely to have an effect on long term interest rates, in particular through an indirect and long run contribution to aggregate demand.

To summarize, $P = \begin{pmatrix} \times & \times & 0 & 0 \\ \times & \times & \times & \times \\ \times & \times & \times & 0 \\ \times & \times & \times & \times \end{pmatrix}$ and $C(1)P = \begin{pmatrix} \times & 0 & 0 & 0 \\ \times & \times & \times & \times \\ \times & \times & \times & \times \\ \times & \times & \times & \times \end{pmatrix}$, where \times

are the elements of P that need to be estimated. The objective of the testing strategy is to check that the impact multipliers have the size and sign expected by economic theory, and as summarised in Table 2. In the different columns we indicate the short and the long run effect of each structural shock.⁸ A supply shock has a positive effect on output and a negative effect on prices and real interest rates, while a private demand shock should increase output in the short run and raise prices and real interest rates. A restrictive monetary shock reduces output and the price level. A restrictive fiscal shock (measured by an increase in the budget balance) is expected to reduce output in the short run, as well as prices and real interest rates. The effect of private demand and money shocks on the budget balance (last row, column ω^d, ω^m) depends on the complementarity vs. substitution effect between private/public expenditures as well as fiscal/monetary policy.

[Insert Table 2]

To implement these restrictions, two problems have to be addressed : first, how to compute the P matrix and, second, how to derive the appropriate standard error bands for the impulse response functions.

To compute the P matrix, two methods are available, either the method suggested by Gali (1992), that we just reviewed, based on the solution to a system of 16 (possibly) non linear equations with 16 unknown parameters, or the one suggested by Shapiro and Watson (1989) and applied by Gerlach and Smets (1995) and Smets (1996), based on the direct estimation of the Structural VAR system, where the long run identification

⁷Notice that fiscal shocks are not only public expenditure shocks, but also include shocks associated with transfers and which contribute to the public deficit. As a consequence, such an identification constraint is not in contradiction with the accounting identity expressed as the equilibrium of goods and services.

⁸[0] refers to the short run identification constraints.

constraints are included. The point estimates of the Impulse Response Functions are numerically identical.

To derive the distribution of the impulse response functions, we rely on simulations, reestimating the P matrix for each draw. Unfortunately, Monte-Carlo simulations are only easily implemented for the Choleski case (or for problems easily mapped into a Choleski decomposition, like Quah-Vahey (1995) who introduce only long-run identification constraint in a 2×2 VAR model).⁹ We rely therefore on bootstrapping as described in Hamilton (1994) to present the confidence interval. We check that, in most cases, the mean of the simulated Impulse Response Functions is sufficiently close to the point estimate based on the original data.¹⁰ We also verify that, for the Gali and the Shapiro-Watson approaches yield identical confidence intervals.¹¹

The analysis therefore focuses on Gali's (1992) approach, given its more general structure.¹² Such a method is also easier to implement.¹³

3 Data sources

To test the empirical validity of the model presented in section 2, quarterly national accounts data are used. The sample period is 1972-Q1 to 1995-Q4. All series are seasonally adjusted.

In the case of France, quarterly national accounts from Insee are used (see Figure 1A).

The source of data for the general government budget balance in Germany is OECD (Fiscal policy and business cycle database) which has the advantage of going back to the early 1970s while remaining consistent with annual figures published in the Monthly Bulletin of the Bundesbank (Table VIII.3). As shown in Figure 1B, the final series exhibits the major features of German fiscal policy during the last twenty years. In addition, we introduce a correction for the operations related to the privatization of public companies after the reunification. These operations carried out by the Treuhand

⁹See in particular the routines that are available in the Rats package.

¹⁰This need not be the case as indicated by Blanchard and Quah (1989), p. 663. For our part, there is only one case for which the point estimate is closer to the lower negative bound of the simulated impulse response functions than to the mean value of the simulation at each horizon. This is the case of the response of inflation to the money supply shock: the point estimate of the negative effect of a restrictive money supply shock on inflation is more pronounced than indicated in the charts presented below.

¹¹Notice, however, that bootstrapping includes, for each draw, an initial stage where a new data set is generated. Since the two methods rely on models with a different structure, this may have an effect on the shape of the standard deviation band when the initial series are not stationary, in particular when I(1) variables are introduced in level.

¹²To compare the two methods, we are grateful to F. Smets for providing the RATs codes used in Gerlach and Smets (1995), that we extended in Gauss. Supply shocks are directly estimated by imposing the long run restrictions in the output equation. Private demand shocks are then estimated using the assumption that money supply and fiscal policy shocks have no contemporaneous effect on output. The canonical shock to the interest rate equation is finally assumed to be a linear combination of the supply and private demand, as well as the money supply shocks.

¹³See our companion paper (Bruneau and De Bandt (1998)) for more details.

agency resulted in sizeable losses,¹⁴ which, in the end, increased total German debt without affecting the reported deficit. We corrected therefore the reported deficit by the figures published by the Bundesbank.¹⁵ This is the line “Treuhand” in Figure 1B.

The break in the German series due to Reunification is corrected by using the data published by OECD (Main Economic Indicator) that consider West Germany until 1990-Q4 and the whole Germany afterwards. Regarding output and prices, German series (in logarithm) are corrected directly by adding the gap between the two series in 1990-Q4 to the Western series. In the case of the general government financial balance, such a correction appears difficult to implement and there is no strong economic reason in favor of such a revision.¹⁶

To compute the primary balance we also use data on net interest payments on the public debt.

Interest rates are 3-month nominal interest rates from OECD (Main Economic indicators) and the real interest rates are computed by taking the difference between the nominal rate and the year-to-year inflation rate. In addition, for both countries, the deflator of household consumption is selected, rather than the consumer price index.

The external variables are the year-to-year change in the USD/DM exchange rate, $e_t^{US/DM}$, and the French Franc price of oil, $poil_t^{FF}$ (both in quarterly average). In the latter case we use the dollar price of crude oil divided by the USD/FF exchange rate (source: BIS).

4 Empirical results

4.1 Stationarity and cointegration

As shown in Tables 9 to 12 in the Appendix, our initial assumptions regarding the stationarity of the variables included in X_t are generally well supported by the data. In these Tables we report first the results of the “augmented” tests suggested by Dickey Fuller (1979), hereafter ADF. However, as it is well known, ADF tests may have low power and conclude too frequently that series are non-stationary. We also use therefore a test designed by Kwiatkowski, Phillips, Schmidt and Shin (1992), hereafter KPSS. These two tests look at different null hypothesis.¹⁷ For each variables, we first look at the series in level. When non-stationarity is accepted/ not rejected, we look at the variable in first difference. For the ADF test, we test successively models with trend, constant, and with neither constant nor trend; however we just report the first test for which stationarity is accepted and the remainder is white noise using a Box Pierce test.

Given that the two procedures provide conflicting results, we design a rule that we describe now and which is based on the prior assumption that inflation and the real

¹⁴See, in particular, Bundesbank (1994).

¹⁵See memo item in Table VIII.3. The annual losses were divided by four to get quarterly figures.

¹⁶One can argue that German reunification, characterized by the generalisation of the Social Security system of Western Germany to the Eastern Laender, can be seen as a fiscal shock in itself.

¹⁷Dickey Fuller tests are based on the null hypothesis of non-stationarity, while KPSS use stationarity as null hypothesis. One should keep this in mind when examining the results in the Appendix.

short term rate are stationary around possibly different intercepts measuring regime shifts. The rule is the following (i) we run ADF tests first on the whole sample, (ii) if ADF rejects stationarity, we run ADF on two sub-samples (before/after 1984:1),¹⁸ (iii) if stationarity is still rejected we check whether KPSS provides the same conclusion.

For France, Table 9, upper panel, shows that output growth and the budget balance ratio are stationary for the whole period. The year-to-year change in the FF price of oil ($poil_t^{FF}$) is also stationary. Inflation appears to be I(1) for the whole period. However, it is stationary for the two sub-periods (Table 9, middle and lower panel). From the inspection of Figure 1A, we also conclude that inflation is stationary for the two sub-periods. Regarding real interest rates, stationarity is rejected for the whole period, as well as for the second period by ADF tests, but the KPSS test concludes that the series is level-stationary in the second period (Table 10, lower panel). Figure 1A also tends to indicate that the real interest rate is stationary around two different levels.

In the case of Germany, ADF tests conclude that output growth, the real interest rates, the change in the USD/DM exchange rate and the budget deficit are stationary. The stationarity of inflation is rejected for the whole period, as well as for the second sub-period (11). However, the KPSS test does not reject stationarity in the latter case (see lower panel of Table 12). We take this as evidence of stationarity with a regime shift.

4.2 Impulse response functions

The results from the impulse response functions, defined as the response of the level of the variables to the different shocks, are now presented. Impulse Response Functions are derived from the inversion of the VAR models discussed above.

Concerning the number of lags introduced in the models, we follow the common practice by allowing a large number of lags of the variables. The objective is to provide a good estimate of the effects of monetary policy, for which the transmission mechanism is usually assumed to last between 2 and 3 years (see Cecchetti (1995)). We introduce therefore four lags of the variables. This is somewhat crucial for Germany, while the results are quite robust for France to changes in the number of lags (between 2 and 4).¹⁹ Regarding the exogenous variables, we introduce the current and the one period-lagged value of these variables.

Our aim is to produce shocks whose impulse response functions match the entries of Table 2. We just recall that a **restrictive** fiscal policy, measured by a **rise** in S_t –the ratio of the primary budget surplus to GDP– is expected to induce a fall in output, prices and interest rates.

Standard deviation bands are provided at the 90% confidence interval.

¹⁸Using Perron tests, N. Ponty (1997) provides empirical evidence of a break in 1984:4 in the inflation series for France.

¹⁹For a somewhat similar system Gerlach and Smets (1995) use 5 lags.

4.2.1 France

1. In the case of France, as indicated in Figure 2A, first column, supply shocks have a positive and significant effect on output, while their effect on inflation and real interest rates is less significant. On the other hand, private demand shocks have a positive effect on output in the short run for about 5 quarters (see Figure 2A, second graph from the left in the upper row). Their effect on real interest rates is also short-lived (it is only significant for 3 periods). Money supply shocks, associated with a temporary increase in real interest rates, exhibit a negative and significant impact on output and the price level (third column from the left). While, in the first case, the effect on output is transitory (as imposed by the identification scheme), with a minimum reached after 8 to 9 quarters, the impact on the price level is persistent and remains statistically significant in the long run. Fiscal shocks (increase in the budget surplus) induce almost no effect on output, inflation and interest rate, if one considers the large confidence bands that include the zero baseline.²⁰
2. To assess the effect of introducing external variables, we also show in Figure 2B the same model as before, but excluding these exogenous variables. The width of the confidence band for the effect of money supply shocks on output appears to be slightly larger. On the other hand, the effect of supply shocks on the real interest rate and the effect of private demand shocks on inflation are slightly better than in 2A. However, the overall fit of the model seems inferior to the preceding one, so that our preferred choice remains the specification of Figure 2A.

4.2.2 Germany

1. In Germany, supply and demand shocks have similar effects to the ones observed in France. There are some differences, however. First, supply shocks have a more significantly negative effect on prices and real interest rates: the 90% confidence bands are clearly distinct from the zero baseline for a few quarters. Second, private demand shocks have a more significant effect on prices and real interest rates. As indicated in Figure 3A, second column from the left, private demand shocks have a significant effect for about 7 quarters. On the other hand, money supply shocks show a very significantly negative response of prices, similar to what was observed for France. However, the negative effect of money supply shocks on output is not statistically significant. Finally, fiscal shocks appear to have a more restrictive effect on output in Germany than in France. As indicated in Figure 3A, first column from the right, first row, restrictive fiscal shocks have a negative effect on output, which is significant for about 3 quarters. The negative effect of fiscal consolidation on real interest rates also appears to be statistically significant.
2. Although our preferred model is the one that we just described in Figure 3A, it is also useful to assess the effect of our correction to the reported budget (Treuhand

²⁰This result is very robust to the indicator used to measure the deficit (total / primary deficit).

activity) and, as in the case of France, the introduction of exogenous external variables. Without these corrections, fiscal policy would appear, as indicated in Figure 3B, to have an even more significant effect on output (see first row, first column from the right). However, it seems that, in that case, monetary policy is not correctly identified (the effect of money supply shocks on prices is no longer significant at usual level) while the other shocks are unchanged. The two conclusions are that (i) the correction of the reported deficit, without conditioning by external variables, leads to a more significant effect of monetary policy on prices; and (ii) conditioning by external variables yields an even more significant effect of monetary policy, as indicated in Figure 3B.²¹

To conclude, more generally, the impulse responses functions presented here provide evidence of a significant effect of monetary policy on prices in both countries, as well as output in France. On the other hand, fiscal policy appears to have a more significant effect on output in Germany than in France. The structural fiscal policy shocks in France seem to affect mainly the fiscal balance ratio, with little effect on the other variables. The imposition of long-run identification constraints allows to recover impulse response functions that are consistent with the “weak view” of Ricardian equivalence, where fiscal policy only has short run effects on output and real interest rates.

Two additional remarks can be made. First, the less significant effect of monetary policy shocks on output in Germany may be explained, for the period under review, by a different transmission mechanism of monetary policy, in particular due to the higher credibility of the Bundesbank. The German Central Bank has traditionally relied on a strategy of preemptive response to inflationary pressures, which reduced the “sacrifice ratio”, i.e. the output loss of achieving lower inflation. This was not the case in France before the Bank of France became independent in 1993, and, according to our results, the “sacrifice ratio” was higher in France than in Germany. Second, the sensitivity analysis that we reported for Germany (subsection 4.2.2.2) indicates that the proper identification of the policy-mix seems to depend on the structure of the model, in particular regarding the measure of fiscal policy shocks. In all cases, however, fiscal policy shocks have a more significant effect in Germany than in France. One possible explanation, is that we measure here the degree of “fiscal activism”. In the case of France, apart from expansionary experiences in the first half of the 1980s, fiscal policy was passive during most of the period under review, while most of the adjustment came from monetary policy. On the other hand, Germany was characterized, at the beginning and at the end of the sample period, by major fiscal shocks (1978-1979 and German Reunification). The following section will attempt to verify these conclusions by taking closer look at the fiscal impulses, i.e. the shocks themselves.

²¹Remark (ii) is based on the analysis of a SVAR model where the deficit is corrected for the operations of the Treuhand, but without conditioning with external variables. The graph of the impulse response functions is not reported here but are available from the authors upon request.

4.3 Variance of the forecast errors and historical decomposition

We present now the contribution of the different shocks to the variance of the forecast error as well as simulations of our model (historical decomposition). From the latter exercise, it appears that fiscal shocks that we identify are very close to traditional measures of structural deficit.

The decomposition of the variance of forecast error confirms the results drawn from the previous analysis of impulse response functions. The overall picture is broadly consistent with common wisdom about economic policy in France and Germany (Tables 3 and 4). First, supply shocks have a substantial contribution to the dynamics of output and, regarding the long run effects, more significantly in Germany than in France (93.8% vs. 42.3%). Second, the contribution of private demand shocks to output in the short run is more significant in Germany than in France (80% vs 53% after five quarters). Third, the variance of inflation is mainly explained by money supply shocks (65% in the long-run for France versus 50% in Germany, where 34% is also explained by private demand shocks). On the other hand, private demand shocks have a strong impact on real interest rates in the short- and the long-run, while money shocks have also an impact in France. Finally, the ratio of budget surplus to GNP appears to be partially autonomous: ω^g contributes to 62% of the variance of S_t for France, vs 91% for Germany in the short-run, but 30% vs 62%, respectively, in the long-run.

[Insert Tables 3 and 4 here]

It is also useful to simulate the model on the basis of the 4 shocks that we identified. The historical decomposition of our initial system of variables expresses each variable as the sum of its dynamic response to the 4 different shocks: supply, demand, money, fiscal policy (see Bruneau and De Bandt (1998) for details). We concentrate here on the response of the deficit ratio S_t to fiscal policy shocks ω_t^g and compare this measure of structural fiscal shocks with indicators of “structural deficits” available in the literature. We choose the indicator published by the OECD as benchmark.²² We compute the primary structural balance by adding interest payments to the overall structural balance. Since the OECD series are defined at the annual frequency, we add up for each year the simulated response of S_t to ω_t^g in order to get annual observations. In figures 4 and 5, the solid line is the structural deficit based upon the historical decomposition derived from our SVAR, while the dotted line is the OECD indicator. The two series appear to be quite close for both countries. Indeed, the coefficient of correlation is .59 in Germany and .67 in France. All are significant at the 1% level.²³ A closer look at Figures 4 and 5 reveals, however, some differences. In the case of France, the major fiscal episodes of the last twenty years are reflected similarly by both indicators (the sto/go policy in 1980/1981, the consolidation in the mid-late 1980s), but the indicator based on SVAR exhibits less extreme variations. In particular, the OECD indicator for France is more negative in

²²A possible drawback of such an exercise is that, as it is well known, the various indicators may exhibit significant differences.

²³The standard deviation of the correlation coefficient under the null of independence is given by $1/\sqrt{T}$ where T is the length of the sample period.

the 1970's although the year-to-year fluctuations are quite correlated. In 1993-1994, the OECD indicator gives a higher weight to structural shocks in the explanation of the worsening of the fiscal deficit. Regarding Germany, the main differences appear in the early part of the sample, the OECD indicator pointing to a fiscal expansion in 1979, while the SVAR indicator only shows a slow worsening of the fiscal balance. Later, the two indicators go into the same direction, with the fiscal adjustment in the 1980s, then, the new fiscal impulse associated with German Reunification.

4.4 Correlation among shocks

To go a little further into the assessment of fiscal policy and the effect of the Stability and Growth Pact, we focus now on the cross-country correlations among shocks. As indicated before, and stressed more clearly in Table 1, different correlation structures are possible. Depending on whether supply and private demand are linked or not, the correlation between economic policy shocks requires different interpretations regarding economic convergence. In particular, uncorrelated fiscal shocks are consistent with the idea of independent fiscal shocks at the national level (“idiosyncratic fiscal shocks”), if and only if the other shocks are correlated (see the bottom-right cell of Table 1). Structural shocks derived from a VAR may, however, be somewhat volatile since they are only a linear transformation of canonical shocks that are assumed to be i.i.d. We decide therefore to use two different measures of correlation. The first one is based on the shocks themselves and measures short term correlation. The second one uses filtered residuals by applying a 4-quarter moving average of the shocks, namely $\tilde{\omega}_t^i = \sum_{k=1}^4 \omega_{t-k}^i$, for any shock i . This provides a measure of long run correlation among shocks.

Table 5 presents the correlation coefficients between the unfiltered residuals derived from the structural models. The shocks are combined with different lags, so that each column is $corr(\omega_t^F, \omega_{t+k}^G)$, considering shocks in France and Germany at t and $t+k$, respectively. Bold characters indicate coefficients that are significantly different from zero at the 5 % level. Italics are used for significance at 10%. To assess the stability of the results, we perform the same analysis splitting the sample into two subperiods (tables 6 and 7).

There is evidence of strong correlation across the two countries between supply and demand shocks (0.38 and 0.29, respectively, for contemporaneous correlation in the whole sample). It is interesting to notice that while leads and lags of supply shocks ω^s remain weakly but positively correlated, this is not the case for private demand shocks ω^d . Monetary shocks exhibit a negative correlation, due to independent changes in nominal interest rates and inflation during the period, but it is not statistically significant. Concerning fiscal shocks, the underlying fiscal shocks ω^g appear to be uncorrelated, or negatively correlated during the last subperiod (Table 7). This provides evidence in favour of idiosyncratic fiscal shocks.

Filtered shocks give a slightly different picture (see Table 8). First, supply shocks appear now to be much more significantly correlated, with reasonable sub-sample stability. The slight reduction of correlation between the two sub-periods might be explained by the absence of major external supply shocks during the second period. Private demand

shocks that were contemporaneously correlated appear to be much more independent in the medium run. German Reunification may explain this result.²⁴ Monetary policy become positively correlated, but only after 1987:1 and fail to be statistically significant. The explanation of this result is that the second subperiod experienced two examples of divergence: in 1985-1986 (increase in real interest rates in Germany) and in 1991-1992 (the real interest rates did not go down in France as in Germany).

Consistently with the results for unfiltered shocks, filtered fiscal shocks in Table 8 appear to be positively correlated for the first sub-sample, but negatively correlated in the last sub-sample. Figure 6 indicates that a more expansionary fiscal policy took place in both countries between 1976 and 1978 and that both countries operated a fiscal consolidation in the mid 1980s, starting in 1982 for Germany and in 1983 for France. Two explanations can be provided for the fact that, after 1985, fiscal shocks in the two countries are negatively correlated: (i) a different timing in fiscal expansions/consolidations and (ii) different responses to the business cycle. Regarding (i), it is clear from figure 6, as well as figures 4 and 5, that while France was reducing its fiscal deficit in 1987-1988, Germany was adopting a less restrictive fiscal policy. Later, German reunification entailed higher deficits in Germany in the early 1990s, while France was consolidating. Concerning (ii), it appears that the 1993 recession had longer lasting effects in France, while the adjustment of fiscal policy took place more rapidly in Germany (before worsening again in 1996).

Overall, it appears therefore that fiscal shocks are rather idiosyncratic and are a crucial element of economic policy at the national level.

5 Conclusion

Structural VAR models for France and Germany provide a measure of fiscal shocks, whose impact on the deficit appears to be relatively close but not exactly the same as the OECD indicators of structural deficits. These shocks are relatively uncorrelated, providing some evidence in favour of the existence of idiosyncratic fiscal shocks. This points to the importance of fiscal considerations in economic policy at the national level. In addition, fiscal shocks have a larger effect on the dynamics of output in Germany than in France. It appears that during the period 1972-1995, fiscal policy was more heavily constrained in France than in Germany, with a more significant impact of monetary policy on output in France. This difference in the policy-mix may provide an alternative explanation of why fiscal shocks are uncorrelated.

Further analysis would be necessary to confirm these conclusions. The analysis here is based on variables characterised by regime shifts. Although we do provide substantial evidence in favour of those regime changes (disinflation in France, German reunification, etc.), the results are conditional on them. It would therefore seem important, in our view, to investigate more fully the effects of those deterministic shifts on the dynamics of our system of variables.

²⁴Angeloni and Dedola (1998) on the basis of a bivariate SVAR model provide similar evidence of a reduction in correlation between demand shocks when German Reunification is included in the sample.

6 References

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7 Appendix

- 1) Figures 1A and 1B : Underlying series.
- 2) Figures 2A-2B: Impulse Response Functions : France
- 3) Figures 3A-3B: Impulses response functions : Germany
- 4) Figure 4: Primary structural Deficit: Germany
- 5) Figure 5: Primary structural Deficit: France
- 6) Figure 6: Structural Fiscal Policy shocks: France and Germany

Fiscal shocks	Private demand and supply shocks	
	uncorrelated	correlated
correlated	co-ordinated responses to asymmetric shocks	similar responses to common shocks
uncorrelated	independent responses to asymmetric shocks	idiosyncratic fiscal shocks

Table 1: Possible correlation structure among shocks

	Multipliers of Structural Shocks : short /long term			
on variables:	ω^s	ω^d	ω^m	ω^g
Output	+/+	+/0	[0]-/0	[0]-/0
Price level	-/-	+/+	-/-	-/-
Real interest rate	-/0	+/0	+/0	[0]-/0
Primary deficit	+/0	?/0	?/0	+/0

Table 2: Short and long term impact of structural shocks

FRANCE					
Forecast error variance decomposition contribution of the different shocks (%)					
variable	horizon	ω^s	ω^d	ω^m	ω^g
$\Delta \ln y_t$	1	43.3	56.7	0.0	0.0
	5	42.6	52.8	2.8	1.7
	10	41.8	52.3	3.8	2.1
	20	41.3	52.5	4.0	2.2
	∞	42.2	52.3	4.3	2.0
$\ln p_t/p_{t-4}$	1	1.6	0.4	74.3	23.7
	5	11.4	7.4	65.3	15.8
	10	10.8	8.2	67.8	13.1
	20	13.0	8.8	67.2	11.0
	∞	13.3	11.0	65.1	10.6
r_t	1	37.0	29.3	33.7	0.0
	5	26.4	36.2	31.3	6.0
	10	22.7	40.5	29.4	7.4
	20	21.6	40.9	30.0	7.5
	∞	21.6	40.2	30.9	7.3
S_t	1	0.4	9.4	27.8	62.4
	5	5.9	19.7	24.5	49.9
	10	15.5	15.1	30.1	39.2
	20	17.7	17.8	33.1	31.4
	∞	17.5	19.2	32.8	30.4

Table 3: Variance decomposition: France

GERMANY					
Forecast error variance decomposition for levels contribution of the different shocks (%)					
variable	horizon	ω^s	ω^d	ω^m	ω^g
$\Delta \ln y_t$	1	12.2	87.8	0.0	0.0
	5	15.8	79.6	0.6	4.0
	10	40.3	52.6	1.3	5.9
	20	72.4	24.1	0.7	2.8
	∞	93.8	5.4	0.2	0.7
$\ln p_t/p_{t-4}$	1	8.8	0.3	85.3	5.7
	5	23.8	2.8	72.6	0.8
	10	22.3	17.2	60.2	0.2
	20	15.0	34.3	49.6	1.1
	∞	10.1	34.7	52.6	2.5
r_t	1	54.4	13.1	32.5	0.0
	5	39.1	36.2	21.3	3.4
	10	35.8	47.3	15.7	1.2
	20	36.9	52.4	8.3	2.3
	∞	34.4	57.8	5.3	2.3
S_t	1	4.9	2.0	1.8	91.3
	5	5.4	5.3	8.7	80.6
	10	6.3	5.0	19.9	68.8
	20	8.4	2.7	28.1	60.8
	∞	7.1	0.9	29.9	62.1

Table 4: Variance decomposition: Germany

Correlations between shocks Germany/France					
$corr(\omega_t^F, \omega_{t+k}^G)$					
shocks / k	-2	-1	0	+1	+2
ω^s	0.18	0.17	0.38	-0.01	0.08
ω^d	-0.16	0.15	0.29	0.01	-0.21
ω^m	-0.04	0.05	-0.14	0.02	-0.01
ω^g	-0.15	0.14	-0.13	-0.22	0.19

Table 5: Correlation coefficients between shocks: 1974:1-1995:4

Correlations between shocks Germany/France					
$corr(\omega_t^F, \omega_{t+k}^G)$					
shocks / k	-2	-1	0	+1	+2
ω^s	0.21	0.25	0.50	-0.12	0.07
ω^d	-0.01	0.21	0.31	0.03	-0.36
ω^m	0.01	0.17	-0.15	-0.04	-0.06
ω^g	0.23	0.24	-0.11	-0.07	0.35

Table 6: Correlation coefficients between shocks: 1974:1-1983:4

Correlations between shocks Germany/France					
$corr(\omega_t^F, \omega_{t+k}^G)$					
shocks / k	-2	-1	0	+1	+2
ω^s	0.16	0.01	0.18	0.21	0.10
ω^d	-0.23	0.09	0.30	-0.02	-0.08
ω^m	-0.07	0.07	-0.15	0.10	0.05
ω^g	-0.07	0.05	-0.14	-0.35	0.08

Table 7: Correlation coefficients between shocks: 1984:1-1995:4

Correlations between filtered shocks Germany/France				
$corr(\tilde{\omega}_t^F, \tilde{\omega}_t^G)$ where $\tilde{\omega}_t^i$ is a moving average of ω_t^i				
shocks	1974:1-1995:4	1974:1-1983:4	1984:1-1995:4	1987:1-1995:4
$\tilde{\omega}^s$	0.61	0.68	0.59	0.50
$\tilde{\omega}^d$	0.23	0.32	0.14	0.06
$\tilde{\omega}^m$	-0.09	0.01	-0.18	0.13
$\tilde{\omega}^g$	-0.19	0.17	-0.45	-0.50

Table 8: Long run correlation coefficients between shocks:1974:1-1995:4

FRANCE-Dickey Fuller tests				
$\Delta x_t = \alpha + \beta t + (\rho - 1)x_{t-1} + \sum_{j=1}^k \Delta x_{t-j}$				
Model for which non-stationarity (H0: $\rho = 1$) is rejected testing level, then first-difference *: H0 is rejected at 10%, **:5%, ***:1%				
1972:1 1995:4				
Variable x_t	ADF (k : nb of lags)	Trend (Student)	Constant (Student)	Box Pierce (p-value)
$\Delta \ln y_t$	-7.36*** (0)	-	0.004 (4.67)	24.44 (0.38)
$\Delta \ln p_t/p_{t-4}$	-1.82* (12)	-	-	13.93 (0.83)
Δr_t	-8.00*** (0)	-	-	19.58 (0.67)
S_t	-3.91*** (0)	-	-	18.63 (0.72)
$\ln poil_t^{FF}/poil_{t-4}^{FF}$	-2.49** (4)	-	-	22.87 (0.41)
1972:1-1983:4				
$\Delta \ln y_t$	-5.54*** (0)	-	0.01 (3.63)	11.74 (0.38)
$\ln p_t/p_{t-4}$	-4.12*** (2)	-	0.03 (4.12)	6.50 (0.77)
r_t	-2.29** (1)	-	-	9.01 (0.62)
S_t	-3.42*** (0)	-	-	13.76 (0.25)
$\ln poil_t^{FF}/poil_{t-4}^{FF}$	-4.16*** (4)	-	0.09 (2.32)	10.36 (0.50)
1984:1-1995:4				
$\Delta \ln y_t$	-4.81*** (0)	-	0.01 (2.78)	8.17 (0.70)
$\ln p_t/p_{t-4}$	-1.91* (8)	-	-	2.77 (0.84)
Δr_t	-6.46 (0)	-	-	12.91 (0.29)
S_t	-2.01** (8)	-	-	2.79 (0.95)
$\ln poil_t^{FF}/poil_{t-4}^{FF}$	-1.99** (4)	-	-	6.81 (0.74)

Table 9: Stationarity: Dickey-Fuller test-France

FRANCE		
KPSS tests (8 lags)		
H0A: x_t is trend-stationary; H0B: x_t is level-stationary		
*: H0 is rejected at 10%, **: 5%, ***: 1%		
1972:1 1995:4		
Variable x_t	H0A (trend stat.): η_τ	H0B (level stat.): η_μ
$\Delta \ln y_t$	0.06	0.27
$\ln p_t/p_{t-4}$	0.14*	0.88***
r_t	0.12*	0.94**
S_t	0.10	0.23
$\ln poil_t^{FF}/poil_{t-4}^{FF}$	0.08	0.49**
1972:1-1983:4		
$\Delta \ln y_t$	0.08	0.33
$\ln p_t/p_{t-4}$	0.07	0.14
r_t	0.13*	0.34
S_t	0.08	0.22
$\ln poil_t^{FF}/poil_{t-4}^{FF}$	0.07	0.15
1984:1-1995:4		
$\Delta \ln y_t$	0.09	0.21
$\ln p_t/p_{t-4}$	0.15*	0.47**
r_t	0.14*	0.21
S_t	0.14*	0.31*
$\ln poil_t^{FF}/poil_{t-4}^{FF}$	0.08	0.12

Table 10: Stationarity: KPSS test-France

GERMANY-Dickey Fuller tests				
$\Delta x_t = \alpha + \beta t + (\rho - 1)x_{t-1} + \sum_{j=1}^k \Delta x_{t-j}$				
Model for which non-stationarity (H0: $\rho = 1$) is rejected				
testing level, then first-difference				
*: H0 is rejected at 10%, **:5%, ***:1%				
1972:1 1995:4				
Variable x_t	ADF (k : nb of lags)	Trend (Student)	Constant (Student)	Box Pierce (p-value)
$\Delta \ln y_t$	-13.81*** (1)	-	-	26.48 (0.28)
$\Delta \ln p_t/p_{t-4}$	-6.10* (0)	-	-	29.43 (0.17)
r_t	-1.89* (4)	-	-	16.87 (0.77)
S_t	-2.74*** (0)	-	-	26.78 (0.26)
$\ln e_t^{DM/US} / e_{t-4}^{DM/US}$	-3.71** (1)	-	-	27.62 (0.23)
1972:1-1983:4				
$\Delta \ln y_t$	-8.08*** (1)	-	-	13.49 (0.26)
$\ln p_t/p_{t-4}$	-2.73*** (8)	-	0.01 (2.56)	6.98 (0.64)
$\Delta \ln p_t/p_{t-4}$	-2.30** (1)	-	-	8.61 (0.65)
r_t	-2.78*** (1)	-	-	11.32 (0.33)
S_t	-2.27** (1)	-	-	8.15 (0.61)
$\ln e_t^{DM/US} / e_{t-4}^{DM/US}$	-2.86*** (1)	-	-	11.67 (0.39)
1984:1-1995:4				
$\Delta \ln y_t$	-11.12*** (1)	-	-	13.63 (0.25)
$\Delta \ln p_t/p_{t-4}$	-2.97*** (2)	-	-	13.63 (0.25)
Δr_t	-4.76*** (1)	-	-	14.90 (0.17)
S_t	-2.04** (0)	-	-	13.41 (0.27)
$\ln e_t^{DM/US} / e_{t-4}^{DM/US}$	-2.86** (1)	-	-	11.67 (0.39)

Table 11: Stationarity: ²⁵ Dickey-Fuller test-Germany

GERMANY		
KPSS tests (8 lags)		
H0A: x_t is trend-stationary; H0B: x_t is level-stationary		
*: H0 is rejected at 10%, **: 5%, ***: 1%		
1972:1 1995:4		
Variable x_t	H0A (trend stat.): η_τ	H0B (level stat.): η_μ
$\Delta \ln y_t$	0.05	0.05
$\ln p_t/p_{t-4}$	0.11	0.46*
r_t	0.08	0.33
S_t	0.11	0.18
$\ln e_t^{DM/US}/e_{t-4}^{DM/US}$	0.07	0.07
1972:1-1983:4		
$\Delta \ln y_t$	0.13	0.11
$\ln p_t/p_{t-4}$	0.09	0.18
r_t	0.10	0.17
S_t	0.11	0.11
$\ln e_t^{DM/US}/e_{t-4}^{DM/US}$	0.07	0.33
1984:1-1995:4		
$\Delta \ln y_t$	0.10	0.10
$\ln p_t/p_{t-4}$	0.10	0.30
r_t	0.12*	0.13
S_t	0.08	0.41*
$\ln e_t^{DM/US}/e_{t-4}^{DM/US}$	0.08	0.08

Table 12: Stationarity: KPSS test-Germany

Figure 1A : Underlying series

FRANCE

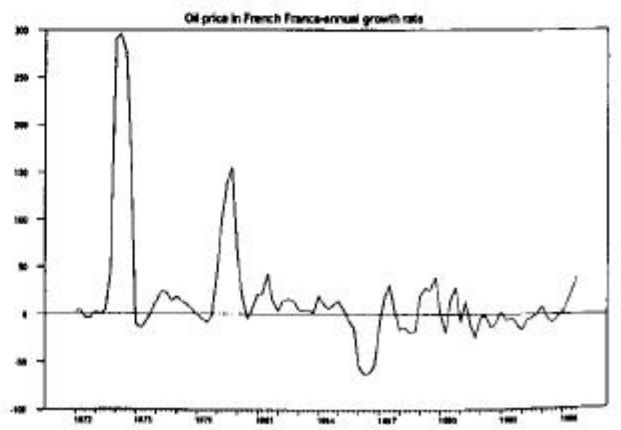
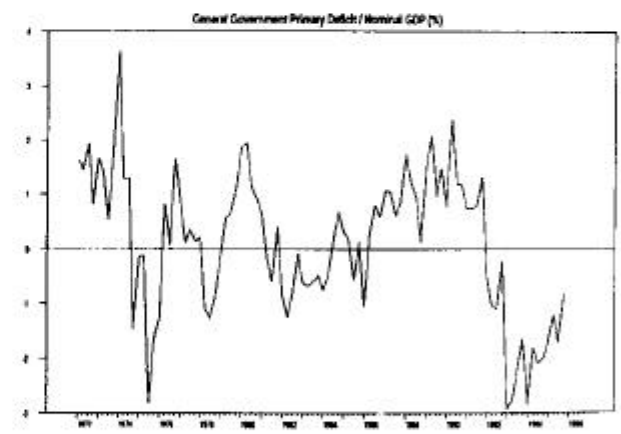
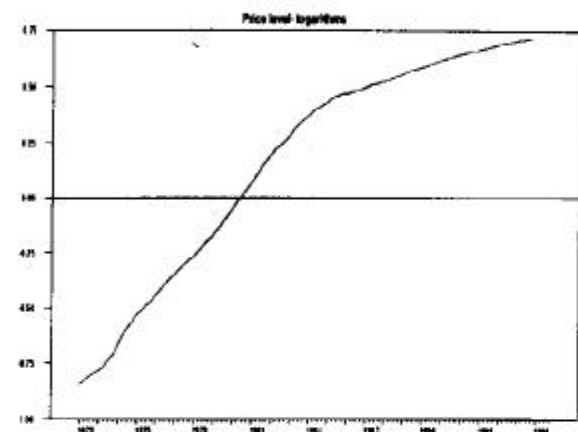
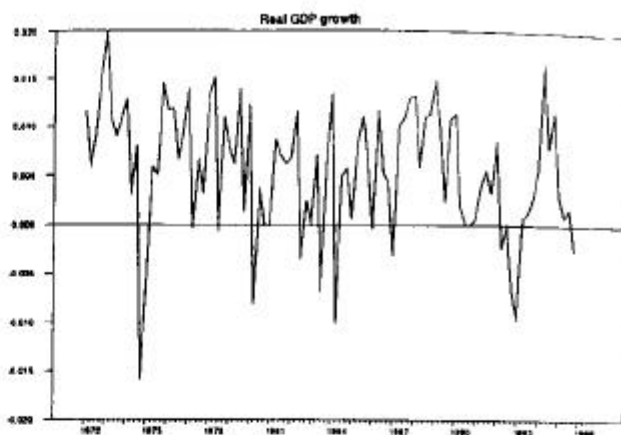


Figure 1B : Underlying series. GERMANY

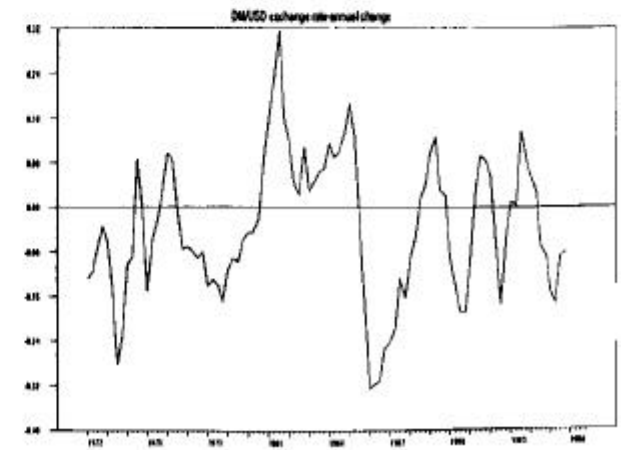
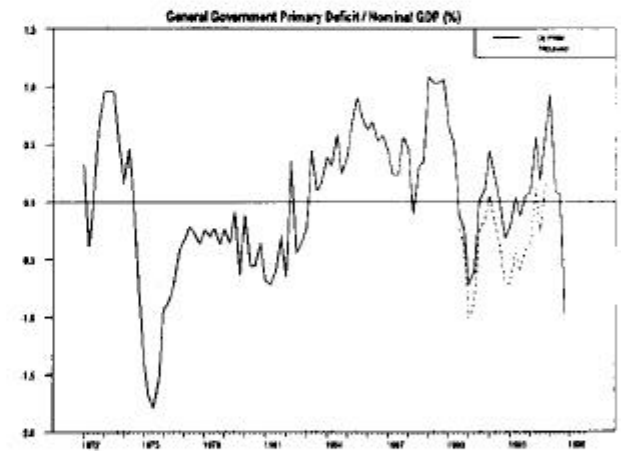
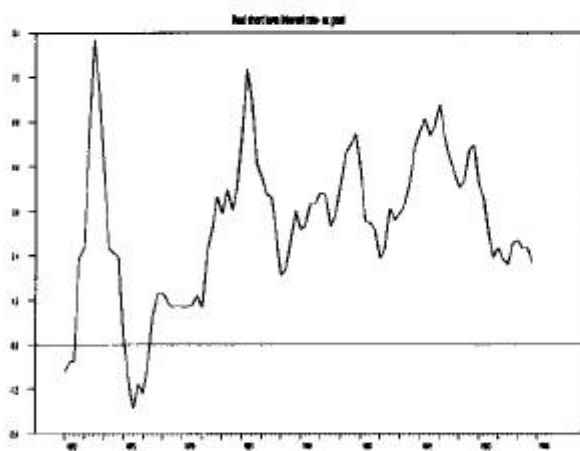
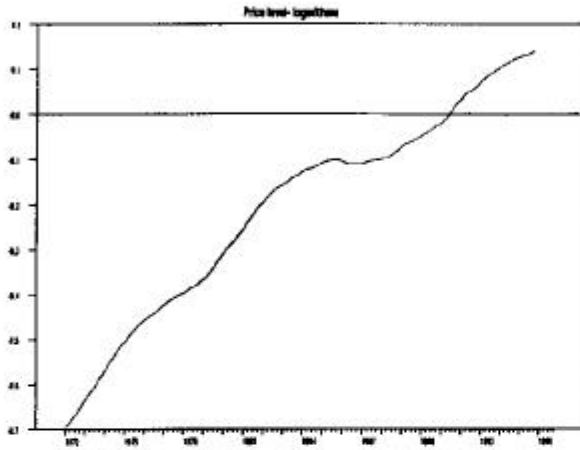
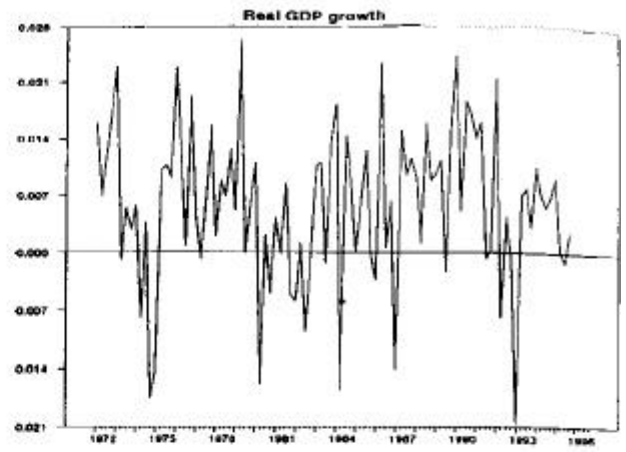


Figure 2A : Impulse Response Functions : France

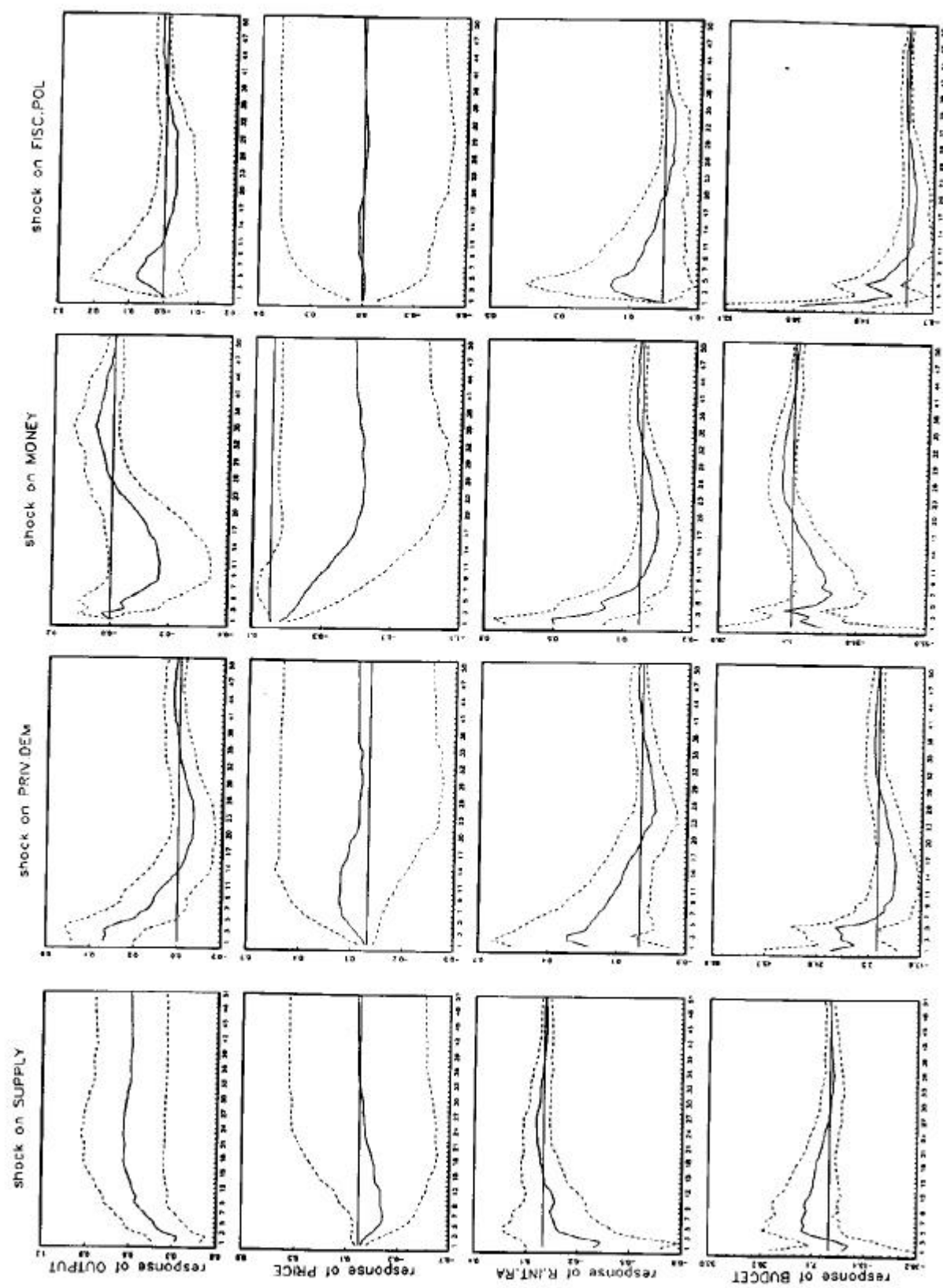


Figure 2B: Impulse Response Functions : France

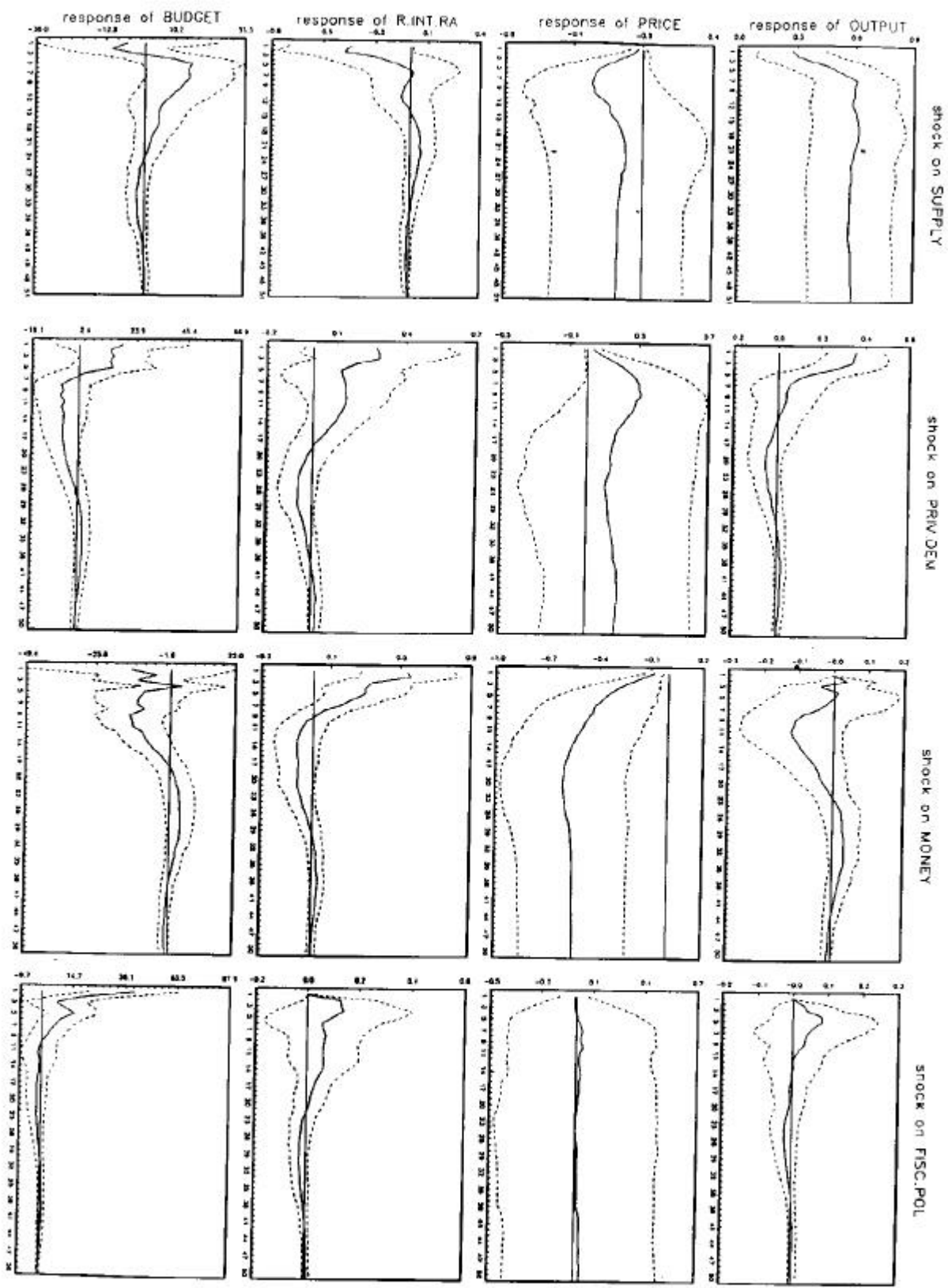


Figure 3A . Impulses response functions : Germany

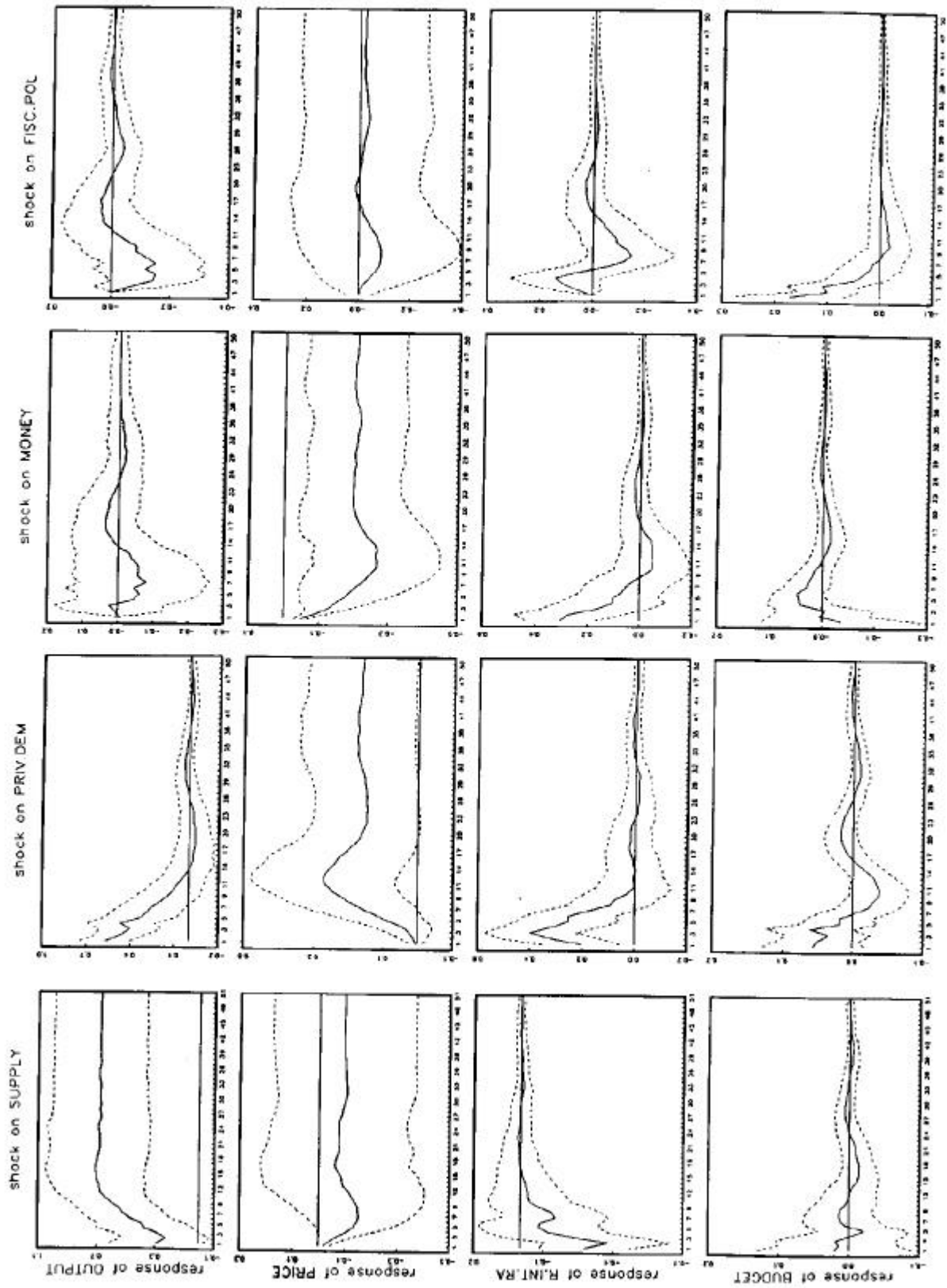


Figure 3B: Impulses response functions : Germany

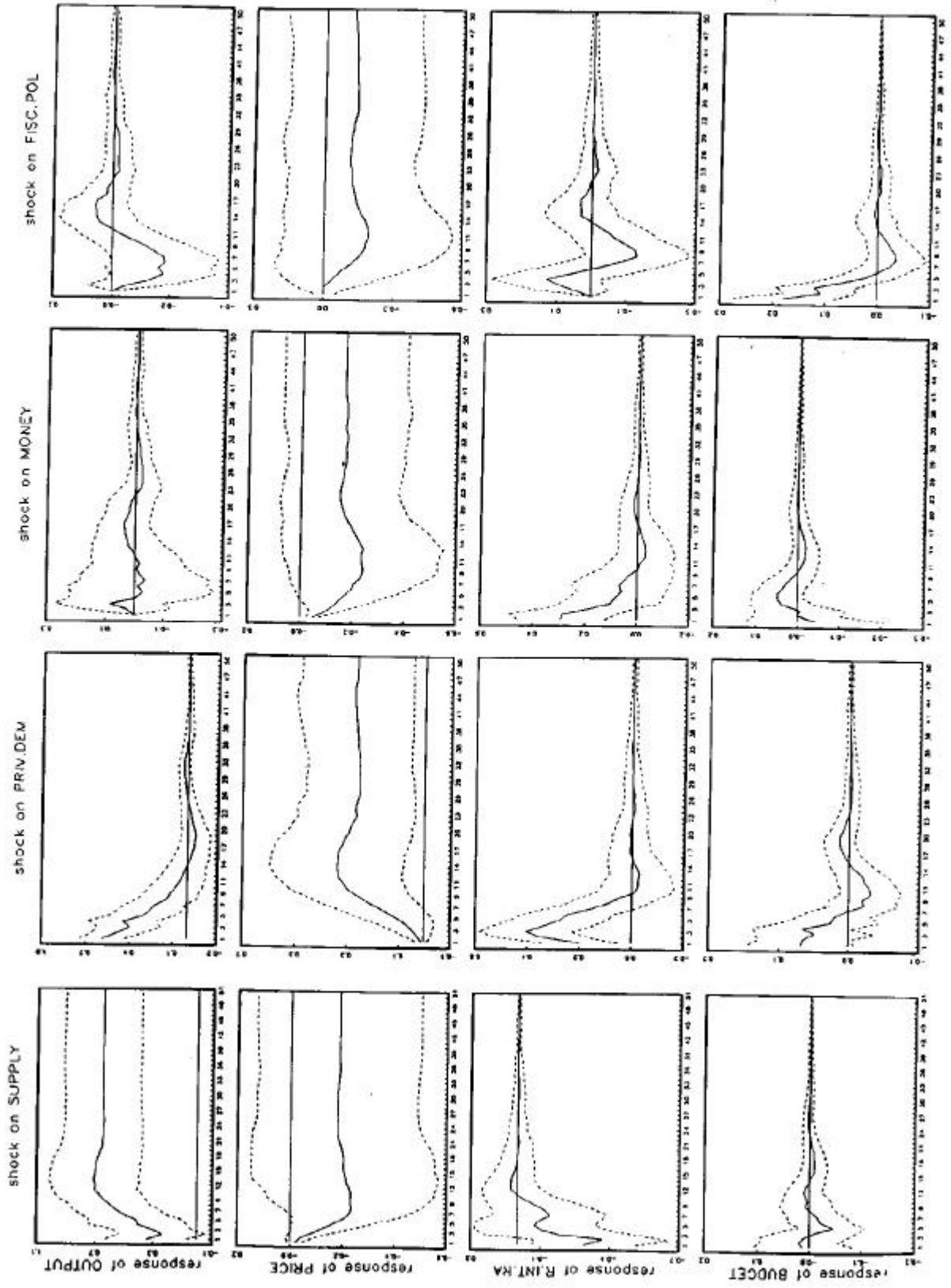


Fig 4: DE Primary Struct. defici.: SVAR (solid line) & OCDE (dotted line)

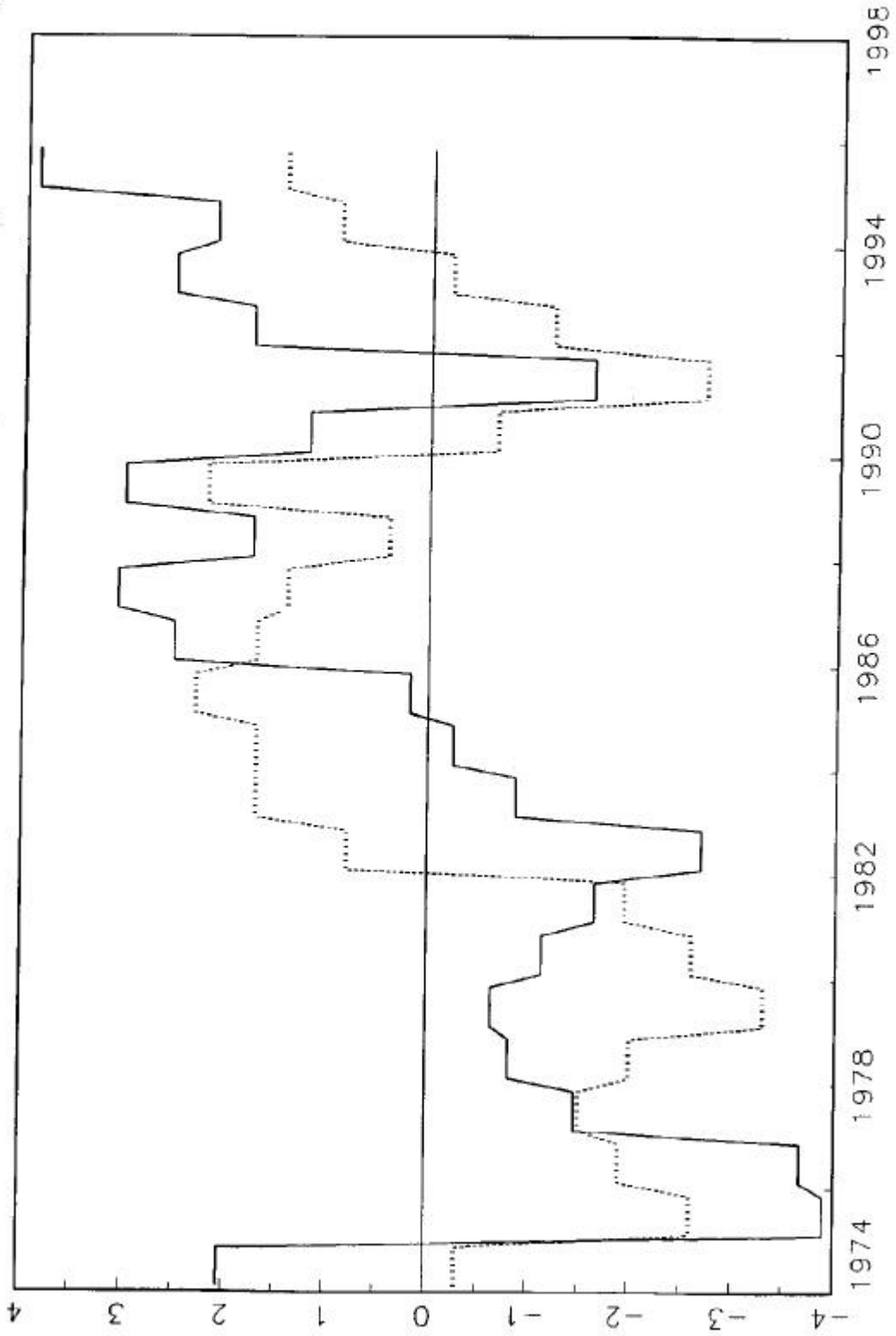


Fig.5: FR Primary Struct. defic.— SVAR (solid line) & OCDE (dotted line)

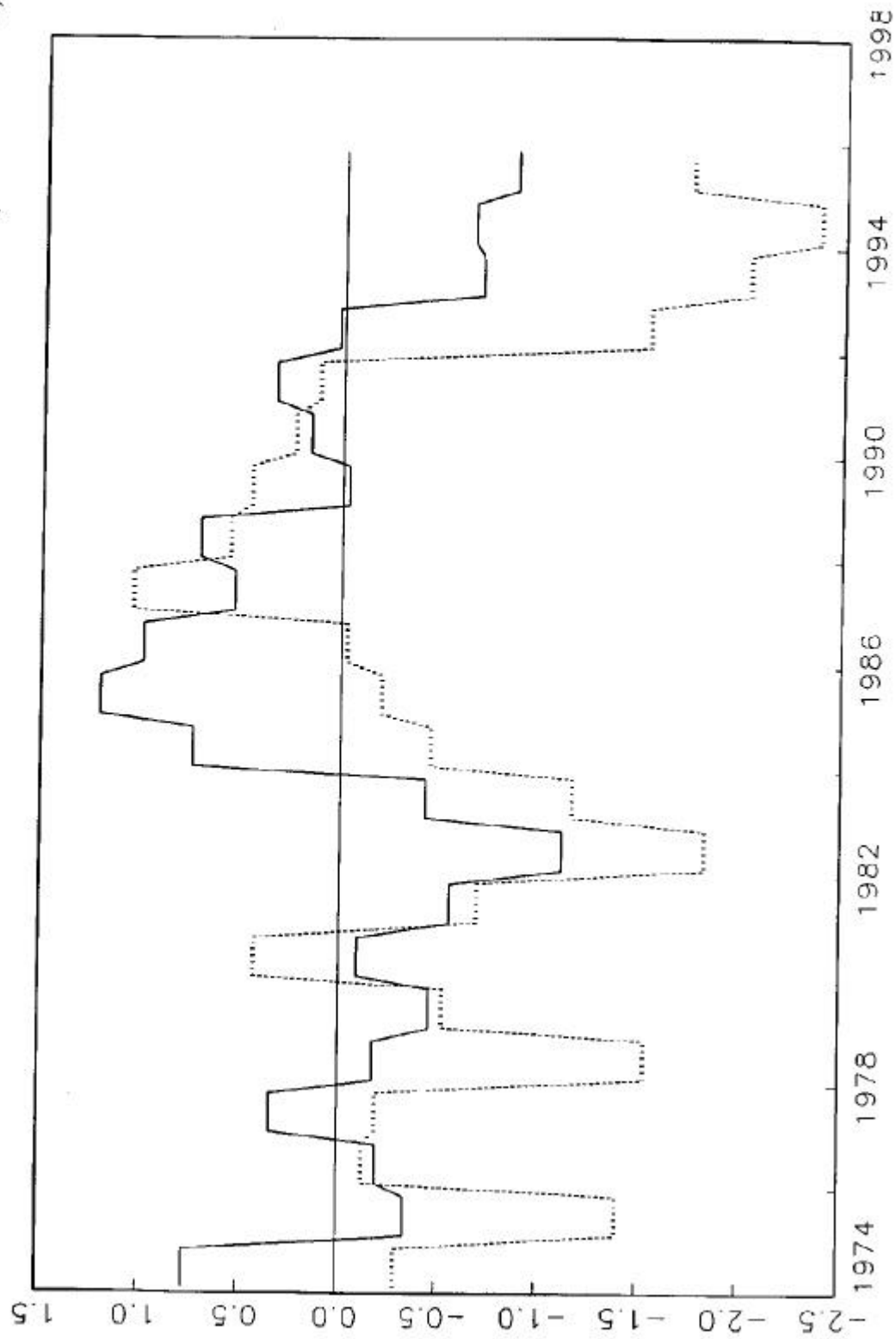
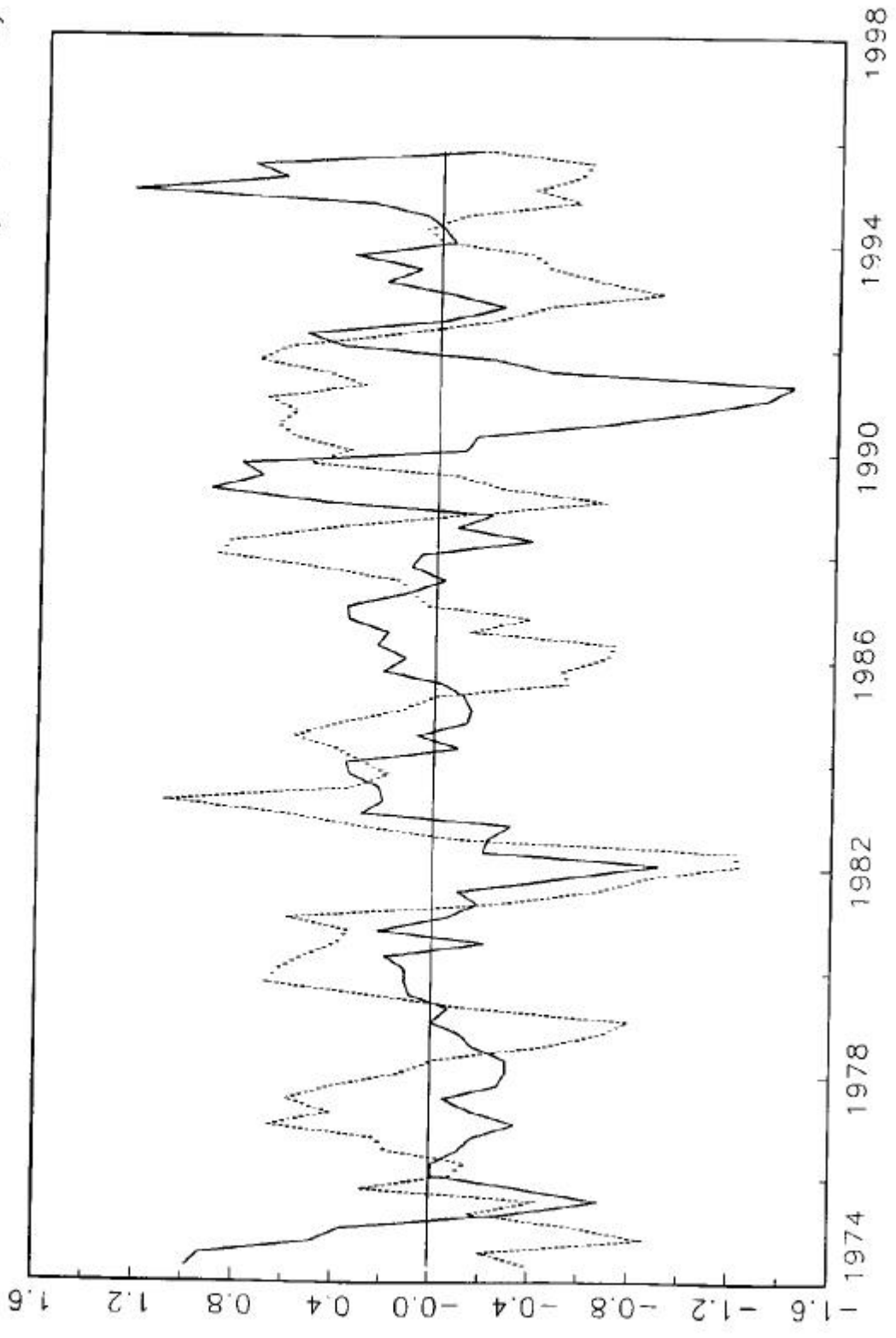


Fig.6: Fisc. pol. shocks - Germany (solid line) & France (dotted line)



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