E C O N O M I C S B U L L E T I N

Effects of Fiscal Policies in Four European Countries: A Non-linear Structural VAR Approach

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Abstract

This paper provides new estimates of the effects of fiscal policies by using a non-linear structural VAR model. This methodology is applied to Belgium, France, Germany and Netherlands cases. Results show that reactions to a fiscal shock are different according to the regime that prevails and across countries.

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1 Introduction

One of the principal challenges facing fiscal authorities in the current economic context is that of the consistency of their policies. Governments must achieve two goals: stabilisation of the activity and fiscal sustainability. This implies that fiscal policies are using a stabilizing tool, but are also subject to a structural adjustment constraint. This has an influence on the effects of these policies.

From an empirical point-of-view, the effects of fiscal policies are usually estimated using a structural VAR representation (S-VAR), in which decompose economic fluctuations into different sources of structural disturbances. The crucial step in this methodology is the identification of fiscal shock. The literature presents various approaches: a first one consists in identifying fiscal shocks by sign restrictions on the impulse response (Mountford and Uhlig, 2002); a second approach, represented by Favero (2002) uses a Choleski ordering; and a third approach, developed by Blanchard and Perotti (2002) and Perotti (2002), uses decision lags in fiscal policy and institutional information about the elasticity of fiscal variables to economic activity. The S-VAR representation assumes that the behaviour of the agents is constant in time and that they are not affected by the economic environment. Recent studies have, however, highlighted the fact that the interactions between fiscal variables and economic activity can possibly be neither symmetric nor homogenous in time. These studies have pointed out in particular the existence of non-Keynesian effects (Giavazzi et al., 2000). All these considerations can usually modify the conclusions. Indeed, the role of time changes and breaks in the structural models were highlighted by Sims and Zha (2002).

Thus, we consider that introducing non-linear elements into the S-VAR processes can significantly enhance the study of the macroeconomic effects of fiscal policy. The nonlinear S-VAR representation was established by Ehrmann (2000) to study European monetary policy and was generalised by Ehrmann et al (2003). Our contribution comes from using this method to study fiscal policymaking.

2 The econometric methodology

2.1 The database

Basic variables for studying the effects of fiscal policy are the GDP in volume and in logarithm (y) and the ratio of the primary balance to the GDP (b). We then add two financial variables: inflation (p) and interest rate (i). This addition is made as a result of Sims's criticism (1998), backed up by Perotti (2002). The data used come from the OECD Quarterly National Accounts. The study covers the period 1970-2004 and four European countries: Belgium, France, Germany and the

Netherlands. Taking the results of the stationarity tests into account, the X-variable vector includes the first difference of the series.

2.2 MS-VAR Estimation

So as to be in a nonlinear environment, the traditional VAR representation is replaced by a regime switching VAR representation (MS-VAR). The basic model estimated is therefore as follows:

$$X_t = \mu_{s_t} + \sum_{n=1}^{k} \phi_{n,s_{t-n}} + \varepsilon_t \tag{1}$$

where μ_{s_t} is an intercept, k is the lag number, ε_t represents the errors vector. The variance-covariance matrix is noted Σ_{s_t}. Parameters may switch between the s regimes, which are limited to two: expansion (regime 1) and recession (regime 2). It is assumed the regimes follow a Markov chain. The probability of staying in regime j in the next period is conditional on the current regime i which is supposed to be exogenous and constant. The conditional transition probabilities are collected in a transition matrix P. The set of unknown parameters to be estimated is labelled Ω and included into the set of related parameters for each regime: $\Omega = \left\{\mu_{s_t}, \phi_{1,s_t}, ..., \phi_{k,s_t}, P\right\}$. The model is estimated through the Expectations-Maximization algorithm (Hamilton, 1990).

2.3 Identifying restrictions

In the reduced form, the VAR errors are correlated. They cannot therefore be directly interpreted as structural shocks. Going from the reduced to the structural form which includes structural shocks u_t, is done using a linear combination between the shocks in accord with the following relationship:

$$\varepsilon_t = Z u_t \tag{2}$$

The model can be expressed in tis moving-average representation:

$$X_t = C(L)\varepsilon_t = R(L)u_t = C(L)Z u_t \tag{3}$$

Identifying the VAR model requires imposing constraints on the Z-matrix elements. Since structural shocks are orthogonal (i.e. $\Omega = ZZ'$) and we have four variables, we will have to choose six restrictions. We use the identification methodology proposed by Blanchard and Quah (1989) and Gali (1992). Blanchard and Quah (1989) propose identifying the supply shock as the only shock having a permanent effect on the level of GDP. This results in three long-term constraints: inflation,

monetary and fiscal shocks do not affect the level of GDP in the long term. These long term restrictions imply the nullity of the elements of long term matrix effects of structural shocks, i.e. $R(1)$. Gali's method proposes short-term constraints which reflect a variable's lack of instantaneous response to a structural shock and which correspond to the nullity of certain coefficients of the matrix Z. Thus, taking into account the transmission delay of economic policies, monetary and fiscal shocks should have no instantaneous effect on GDP. Furthermore, the effects of fiscal policy on interest rates go through the indirect effects of aggregate demand and are therefore shifted.

Identifying restrictions are transposed to the non-linear framework. It results that the matrix Z contains at the same time known parameters and unknown parameters; and thus depends on the regime which prevails in the economy.

2.4 Reaction function analysis

Analysing the variables' reaction to structural shocks is handled mainly by studying the impulse response functions (IRF). They show the relationships between each macroeconomic variable and each structural shock in each regime according to a given horizon. It follows that the effects of discretionary fiscal policy correspond to the fiscal shock response functions. The formalization of these functions, noted $\theta_{ni,h}$, shows the expected change in variables at time $t+h$ to one standard deviation to the n^{th} structural shock at time t, conditional on regime i:

$$\theta_{ni,h} = \frac{\partial E_t X_t}{\partial u_t} \mid s_t = ... = s_{t+h} = i \tag{4}$$

Estimation of these IRF uses the Ehrmann et al. (2003) methodology. Estimates are derived by combining the parameters estimates of the MS-VAR with the estimate of the matrix Z:

$$\widehat{\theta}_{ni,0} = \widehat{Z}_i u_0 \tag{5}$$

$$\widehat{\theta}_{ni,h} = \sum_{j=1}^{\min(k,h)} \phi_{ji}^{h-j+1} \widehat{Z}_i u_0 \tag{6}$$

3 Results

The results show a dual interaction between monetary and fiscal policies. When the economy is expanding, governments react to the monetary shock with a fiscal restriction. The response of the primary balance to a monetary shock is therefore positive. Conversely, one finds "coordination" between the monetary and fiscal

authorities when the economy is in recession. A monetary "turn of the screw" implies an expansionist response from the government to stimulate growth.

The main message of the Fiscal Theory of the Price Level (FTPL) is that there are two different mechanisms that enable the ex ante satisfaction of the government present-value budget constraint, i.e. this budget constraint is not viewed as an identify but as an equilibrium condition.. In the first case, the government adjusts its future expenditure and revenues so they respect the fiscal constraint for any value of the interest rate. In the second case, the FTPL case, the fiscal authority does not act in accordance with the fulfilment of its budget constraint, so that is the "task" of the price level to ensure equilibrium. This theory stresses the ability of price levels to evolve away from the current value of the fiscal constraint. The result of this is that an increase in the primary balance implies a decrease in prices (Creel and Sterdyniak, 2002). Our study does not confirm this result.

The GDP's reaction to fiscal shock represents the effect of the discretionary fiscal policy. A negative reaction implies a Keynesian effect (K): deficit reduction harms growth. Conversely, a positive reaction reflects an anti-Keynesian effect (AK) where deficit reduction allows stimulation of economic activity. If the fiscal shock has no significant effect on the level of GDP, then this implies a non-Keynesian effect (NK) for the fiscal policy. Therefore, discretionary fiscal policy can be understood both by the sign and by the amplitude of the GDP response to a fiscal shock (Fig. 1.).

The results of our study indicate that, except for France, the GDP reaction to fiscal shocks is different according to the regime and the country studied (Table 1).

- In Belgium and in Germany, fiscal policies have non-Keynesian effects in expansion and anti-Keynesian in recession. A characteristic of these countries is a continuous search for fiscal probity. Germany has put in place consolidations in the medium term and has imposed restrictions on the "Lander". Belgium has carried out a large-scale fiscal adjustment since 1981 (deficit at 15% of GDP, returned to balance in 2000). This adjustment was made possible in particular by creating independent institutions to prepare a diagnostic of public finances and macroeconomic forecasts.

- Conversely, the Netherlands has an anti-Keynesian effect during expansion and non-Keynesian during recession. The predominance of anti-Keynesian effects comes from the large-scale fiscal adjustment carried out: the Dutch budget balance has gone from a deficit of 6.2% of GDP in 1982, to a 2.2% of GDP surplus. This improvement comes from the fact that governments, whatever their make-up may be, have tried to reduce their deficits. This reduction, however, was not continuous, but subjected to the economic environment, hence the presence of non-Keynesian effects in recessionary periods.

- French policy appears to keep a Keynesian effect, irrespective of the current regime. It has always wanted to play an expansive role on activity, while trying to keep to European constraints.

Table 1. Asymmetrical effects of fiscal policy

	Belgium	France	Germany	Netherlands
$s_t = 1$	NK	K	NK	AK
$s_t = 2$	AK	K	AK	NK

Note: Type of fiscal effect: Keynesian (K), non-Keynesian (NK), anti-Keynesian (AK) according to the prevalent regime.

Moreover, the amplitude of the GDP response to a fiscal shock varies country-by-country (Table 2). Most of them reach their maximum within the 6 quarters following the shock. It should be noted that these timescales are shorter in the case of an economy in recession.

Table 2. Maximum amplitude of GDP response to a fiscal shock

	Belgium	France	Germany	Netherlands
$s_t = 1$	-0.098 (9)	-0.140 (6)	0.091 (4)	0.612 (6)
$s_t = 2$	0.056 (6)	-0.222 (1)	-0.356 (11)	-0.237 (2)

Note: The values shown are those of the response functions estimated by the model. The numbers in brackets represent the number of the quarter in which the absolute value of the response amplitude is greatest.

4 Conclusion

This paper offers a new estimate of the effects of fiscal policy in four European countries. The method used makes it possible to highlight, firstly, the effects of economic growth differentiated by the state and, secondly, the discrepancies within the Euro zone. The results of the study show different reactions from the economic growth to a fiscal shock according to the economic regime. In addition, responses amplitudes of activity to a fiscal shock varie according to countries'. The results can be made more complete by using a larger sample of countries and by using the economic regimes' different control modes.

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Fig. 1. Impulse reaction functions of GDP to a fiscal shock. Solid red lines: baseline estimates, dashed lines: 95% confidence bands.