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by Fabrizio Balassone and Maura Francese

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CYCLICAL ASYMMETRY IN FISCAL POLICY, DEBT ACCUMULATION AND THE TREATY OF MAASTRICHT

by Fabrizio Balassone* and Maura Francese**

Abstract

In this paper we present a stylised framework of fiscal policy determination that considers both structural targets and cyclical factors. Applying this framework to a sample of 16 OECD countries, we find evidence of significant asymmetry in the reaction of fiscal policy to positive and negative cyclical conditions, with budgetary balances deteriorating in contractions and not improving in expansions. This asymmetry appears to have contributed significantly to debt accumulation. We find no evidence that EU fiscal rules have reduced the ability of governments to conduct stabilisation policy between 1992 and 2000.

JEL classification: E62, H6.

Keywords: stabilisation, fiscal policy, government debt, fiscal rules.

Contents

* International Monetary Fund, Fiscal Affairs Department and Banca d'Italia, Economic Research Department.

** Banca d'Italia, Economic Research Department.

1. Introduction[1]

The aim of this paper is twofold. On the one hand, we are interested in assessing whether fiscal policy reacts asymmetrically to positive and negative cyclical conditions. An asymmetric reaction is not consistent with a strategy aimed at stabilising the economy and might contribute to debt accumulation. On the other hand, we intend to analyse the effects of fiscal rules introduced in view of the Monetary Union on the conduct of fiscal policy in EU countries.

According to the European Commission (2001) between 1970 and 2000 "… [in the EU] deficits did not fall during periods of high economic growth, implying that countries offset the working of the automatic stabilisers via discretionary tax cuts or, more frequently, expenditure increases; such fiscal relaxation in good times in turn necessitated a tightening during economic downturns" [p. 54].[2]

If discretionary tightening in bad times exactly matches discretionary loosening in good times (i.e., if fiscal policy, though pro-cyclical, reacts symmetrically to the cycle) then this tendency, though negative for the stability of the economic environment, would not imply that fiscal activism per se contributes to debt accumulation.

Some evidence of asymmetric behaviour is provided by Buti, Franco and Ongena (1998) for high-debt EU countries where, between 1970 and 1990, deficit to GDP ratios are

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[1] This research was completed while Fabrizio Balassone was working at the Bank of Italy. We gratefully acknowledge helpful comments from Alan Auerbach, Riccardo Faini, Elena Gennari, Martin Larch, Carlos Martinez Mongay, Sandro Momigliano, Patrizio Pagano, Roberto Perotti, Stefano Siviero, Stefania Zotteri, two anonymous referees and participants in seminars held at the Bank of Italy and the IMF, the ILPES/CEPAL 2004 Santiago seminar, the ESPC 2004 Berlin conference, the EcoMod2004 Paris conference and the IIPF 2004 Milan conference. All remaining errors are ours. The views expressed are those of the authors and do not necessarily reflect those of the Bank of Italy or the IMF. e-mail: FBalassone@imf.org; maura.francese@bancaditalia.it

[2] See also Buti, Franco and Ongena (1997). Von Hagen (2002) finds similar evidence for the 1998-2001 period. He argues that in this period "the tendency to behave in a pro-cyclical way may indeed be a result of fiscal policy that relaxes in times of strong economic growth and tightens in times of recession for fear of hitting the limits set by […] the Stability and Growth Pact" [p. 7]. The persistence of the tendency to run pro-cyclical policies is also seen as evidence that fiscal rules devised for monetary union are inadequate to enforce virtuous fiscal discipline (see, e.g., Buti and Martinot, 2000; Korkman, 2001).

around 6 per cent of GDP when output is close to or above its trend value, while the imbalance increases up to 8 per cent when output falls below its trend level.

Buti and Sapir (1998) also find that in the same period, for the average of EU countries, "when there is a moderately negative output gap […] the actual deficit gradually increases" (even though the reaction to larger negative output gaps is not stronger) while "when there is a moderately positive output gap […] the actual deficit remains stable" and it is only "when there is a strongly positive output gap [that] the actual deficit improves" [p. 87-88].

However, these results are not uncontroversial. Melitz (2002) finds that "…[in EU countries] fiscal policy responded in a stabilising manner in all phases of the cycle but only mildly so" and points out that "…under expansion, the divergence [with Buti and Sapir, (1998)] is important".

Melitz (2002) also concludes that "…the explosion of debt/output ratios in the EU, and the OECD as a whole, must be explained independently of the cycle" [p. 235].

In this paper we present a stylised framework of fiscal policy determination that considers both structural targets and cyclical factors.[3] We use this framework to test the presence of asymmetry in the conduct of fiscal policy over the cycle in a sample of 16 OECD countries and to assess whether and to what extent asymmetric fiscal policy has contributed to the growth of public debt as a share of GDP.

To our knowledge, while a number of papers have tried to estimate the cyclical sensitivity of fiscal policy in OECD countries,[4] none has tried to account separately for reactions to positive and negative phases of the cycle. Also no estimate is available of the impact of fiscal policy asymmetries on debt.

Within this framework we also test for the presence of structural breaks in fiscal policy in EU countries in connection with the Treaty of Maastricht. A popular view in the recent policy debate is that EU fiscal rules have reduced the ability of governments to conduct

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[3] This builds upon Hercowitz and Strawczynski (2002), who investigate public expenditure behaviour over the cycle.

[4] See, for example, Melitz (1997), Arreaza *et al.* (1999), Wyplosz (1999) and Galì and Perotti (2003).

stabilisation policy. Galì and Perotti (2003) test the same hypothesis in a different context and find no evidence of such a break.

Our results suggest that fiscal policy reacts asymmetrically to cyclical conditions as a downturn is usually accompanied by a deterioration in the budget balance (the estimated elasticity is about 0.4[5]) while an upturn does not entail an improvement in the balance.

This asymmetry has significantly contributed to debt accumulation. The average debt to GDP ratio in our sample grew from about 34.5 per cent in 1977[6] to about 68.1 in 2000. We estimate that almost one third of the increase is due to asymmetric budgetary behaviour.

As to European fiscal rules, we find that while they seem to have increased the relevance of the debt level in the definition of budgetary targets, they have had no impact on the reaction to cyclical conditions.

The paper is structured as follows. Section 2 describes the stylised framework underlying the empirical tests. Section 3 reports the results of tests for the presence of cyclical asymmetry in the conduct of fiscal policy and for structural breaks in connection with the Treaty of Maastricht. Section 4 is devoted to the analysis of the implications for government debt dynamics. Section 5 concludes.

2. The stylised framework

We split the ratio of the budget balance to GDP (b_t, with $b_t>0$ indicating a deficit) into a long-run component (b^l_t) and a cyclical component (b^c_t)

(1) $$b_t = b^l_t + b^c_t$$

We assume that the long-run component is determined by a linear adjustment process towards the government's preferred balance (b^*) and debt (d^*) ratios to GDP:[7]

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5 Technically, we estimate the semi-elasticity of the budget although it is common in the literature to refer to this indicator as budget elasticity.

6 1977 is the first year in which data on government debt are available for all the countries included in our sample.

7 These can be thought of as the result of the optimisation of an objective function linking electoral support (or consistency with one's "ideology" or both) to a number of macroeconomic variables subject to the

(2) $$b^l_t = b_{t-1} + \alpha\,(b^* - b_{t-1}) + \beta\,(d^* - d_{t-1}) + u_t \qquad \alpha,\beta>0;\ u_t \sim NID(0,\sigma_u)$$

Note that in the long run $d^*=b^*/g$, where g is the equilibrium nominal GDP growth.

The cyclical component, instead, is proportional to the expected difference between actual and trend GDP (i.e., the output gap, ω):

(3) $$b^c_t = \eta E[\omega_t] + v_t \qquad v_t \sim NID(0,\sigma_v)$$ [8]

The η coefficient in (3) includes both the automatic reaction of the budget to the cyclical conditions (i.e., to what is usually called the budget elasticity to the cycle) and the discretionary action undertaken by fiscal authorities in response to such conditions.[9] In other words, we model policy decision as the outcome of a process that takes into account the automatic response of the budget to the cycle.[10]

We assume that the cyclical component can be asymmetric, i.e., that η can be different depending on whether ω_t is positive or negative, and consequently rewrite (3) as

(3) $$b^c_t = \eta_p\, E[\omega_t^P] + \eta_n\, E[\omega_t^N] + v_t$$

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constraint posed by one's preferred model of the economy (along the lines of the literature on the political business cycle; see, e.g., Nordhaus (1975) and Alesina (1987)). Alternatively, b* and d* may be seen as the government's preferred solution to satisfy the present value budget constraint (Blanchard *et al*., 1990). Artis and Marcellino (1998) provide a review of studies testing the hypothesis that governments actually behave so as to satisfy the present value budget constraint. A debt stabilisation motive in modelling budgetary decisions has been adopted in empirical analyses by several authors defining "simple" fiscal rules in analogy to the Taylor rule for monetary policy (see, e.g., Bohn, 1998; Ballabriga and Martinez-Mongay, 2002; and Galì and Perotti, 2003).

[8] We are thus assuming that there is no systematic error in output gap forecasts by the government. In contrast to this assumption, Larch and Salto (2003) find that there is a tendency to overestimate growth, especially during slowdowns. However, this applies to official forecasts which do not necessarily fully reflect government expectations.

[9] It may be argued that both the automatic and the discretionary component of the fiscal reaction to the cycle should reflect not only expected but also past output gap values. However, the impact of lagged output gap on current budget should not be overemphasised. Concerning the automatic component: (a) on the expenditure side the inertial effect of programmes unrelated to the cycle outweighs the impact of employment-related outlays; (b) on the revenue side, only some direct taxes (and only in part) are assessed with reference to lagged tax bases. As to the discretionary component, it is true that decisions taken in the past owing to the macroeconomic conditions prevailing at the time affect the current budget irrespective of present macroeconomic conditions; however, in our framework, this effect should, at least partly, be taken care of by the linear adjustment process governing the dynamics of the long-term deficit component.

[10] As well as expected interest outlays, given that we consider the overall balance a target variable. To check what contribution interest outlays make to fluctuations in the overall balance, in Section 3 we also estimate an equation where the policy variable is the primary balance.

where $\eta_p \neq \eta_n$ (the suffixes p and n indicate whether the coefficient applies to positive or negative output gaps) and $E[\omega_t^P] = m_t E[\omega_t]$, $E[\omega_t^N] = (1-m_t)E[\omega_t]$, where m_t is a dummy variable identifying positive and negative output gaps, such that $m_t=1$ if $E[\omega_t]>0$, $m_t=0$ if $E[\omega_t]<0$.

Substituting (2) and (3) in (1) we get:

(4) $$b_t = \alpha_0 + \alpha_1 d_{t-1} + \alpha_2 b_{t-1} + \eta_p E[\omega_t^P] + \eta_n E[\omega_t^N] + \varepsilon_t$$

where $\alpha_0 = (\alpha + \beta/k)b^*$, $\alpha_1 = -\beta$ and $\alpha_2 = (1-\alpha)$ and $\varepsilon_t = (u_t + v_t) \sim NID(0, \sigma_\varepsilon)$.

A consistent stabilisation policy would require $\eta_n, \eta_p < 0$, i.e., an expected slowdown in economic activity, implying $E[\omega_t]<0$, determines a worsening of the budget while an expected expansion, implying $E[\omega_t]>0$, determines an improvement of the budget.

We define an index of asymmetry in the conduct of fiscal policy as:

(5) $$\phi = \eta_n - \eta_p$$

$\phi<0$ indicates that the impact of a downturn implies a deterioration of budget balances that is stronger than the improvement, if any, caused by an upturn. An upward impulse to debt accumulation follows. If $\phi=0$ (i.e. $\eta_p=\eta_n$), then fiscal behaviour is symmetric with respect to the cycle.

Figure 1 provides a graphical illustration of the implications for debt dynamics of symmetric and asymmetric fiscal behaviour; constant GDP growth is assumed throughout ($g_t = g\ \forall t$).

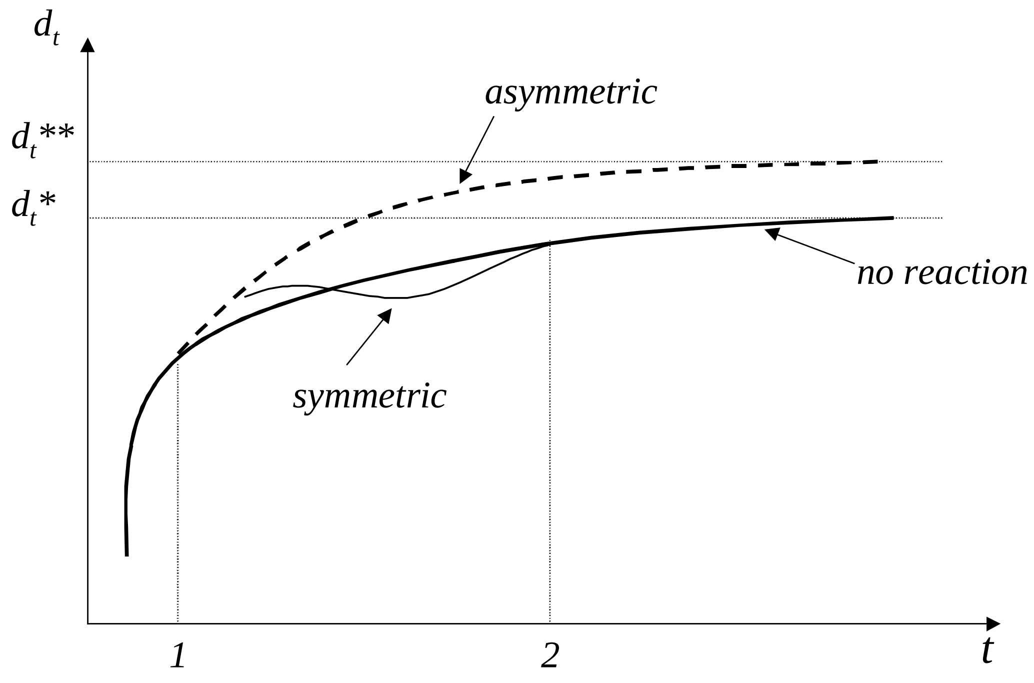
The continuous bold line indicates the growth path of the debt to GDP ratio in the absence of reactions to cyclical fluctuations ($\eta_p=\eta_n=0 \Rightarrow b^c_t=0\ \forall t$) and under the simplifying assumptions that $b^l_t=b>0\ \forall t$ so that also $b_t=b>0\ \forall t$: d_t smoothly converges to its equilibrium value $d^*=b/g$[11]. The continuous thin line shows what happens if reactions to cyclical

[11] We are assuming that there is no stock-flow adjustment, i.e., that the nominal deficit coincides with the change in debt. See also Section 4 below.

fluctuations are symmetric,[12] i.e., if $\eta_p=\eta_n=\eta \neq 0$, so that $b_t=b + \eta\ E[\omega_t]$: following a negative shock at time 1 the deficit increases above b; consequently, the debt ratio grows at a faster pace than under the assumption of no reaction to the cycle (the thin line is above the bold line). However, as cyclical conditions improve and the economy actually reaches a positive output gap, the deficit gradually decreases to reach levels below b and debt growth slows; at the end of the cycle (time 2) the debt ratio is back on its original path. Finally, the dotted line shows what happens if $\eta_p \neq \eta_n$ (specifically, we assume $\eta_n<0$ and $\eta_p=0$): the increase in the deficit above b following a negative shock at time 1 is not matched by a corresponding deficit decrease when the economy recovers, so that the debt to GDP equilibrium level shifts to d**. If this pattern repeats at every shock a significant debt accumulation follows.

Figure 1

DEBT TO GDP DYNAMICS UNDER DIFFERENT RESPONSES TO THE CYCLE



[12] For the sake of simplicity we also assume that cyclical fluctuations are symmetric.

3. The estimation

For our estimation we used European Commission data. The countries included in our sample are EU member states (all but Luxembourg) plus Japan and the USA. Data coverage for debt and deficit ranges between 1969-2002 and 1977-2002.

The budget balance (b_t) is defined as general government net borrowing/lending, the debt (d_t) is measured by the nominal value of general government gross financial liabilities.[13]

Our estimating equation is

$$b_t = \alpha_0 + \alpha_1 d_{t-1} + \alpha_2 b_{t-1} + \eta_p \, \omega_t^P + \eta_n \, \omega_t^N + \varepsilon_t \tag{6}$$

where ω_t^P and ω_t^N are ex-post evaluations of the output gap[14] rather than expected values as in eq. (4).

Taken at face value, this specification implies perfect forecast on the part of the government, which is perhaps too restrictive an assumption. Lacking a model of the formation of government forecasts,[15] a feasible option would have been to use actual government forecasts. However, this solution has two major shortcomings: first, as already pointed out, there may be a systematic bias in published government forecasts; second, long, homogeneous time series of government forecasts are simply not available.[16]

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[13] Net borrowing/net lending does not include net acquisitions of financial assets, which is instead included among the determinants of changes in gross debt. To the extent that these transactions respond to the cycle too, a comprehensive analysis of fiscal policy sensitivity to the cycle and its contribution to debt accumulation should take them into account. However, transactions in financial assets are likely to be undertaken following considerations other than the cyclical conditions of the economy.

[14] These are obtained by means of the Hodrick-Prescott filter applied to GDP series covering the 1960-2004 period (we used Commission forecasts for 2003 and 2004). By construction, there are about as many positive as negative gaps in the sample. To avoid the end-point bias affecting the output gap estimates, in the deficit regressions we dropped the observations following the year 2000. We tried different values for the smoothing parameter λ and found that results from the estimation of (6) are robust to different choices. For the regressions we used output gap estimates obtained by setting λ=30. See Bouthevillain *et al.* (2001) for a discussion of the issues involved in the use of the HP filter.

[15] An adaptive expectation model based on past output gaps would have a strong ad hoc flavour and would not therefore represent a suitable solution.

[16] A further possibility would be to use forecasts produced by international organisations. However, in this case too there is no guarantee that the forecasts fully reflect the government's information set and data availability is limited. The informational problems associated with the analysis of policy rules have been analysed in the context of monetary policy (see, e.g., Orphanides, 2001) but have received much less attention

A less demanding interpretation of eq. (6) is to look at it as an instrument for assessing whether *de facto* budgetary fluctuations have been asymmetric with respect to the cycle, regardless of the government's intention in that respect.

Turning to the estimation strategy, given the presence of the lagged dependent variable among the regressors, we applied the Arellano-Bond procedure for the estimation of fixed-effects panel models.[17] The results are very close to those obtained with OLS.[18]

For the whole sample the estimated coefficient of lagged deficit is 0.88, significantly different from zero and lower than 1, as expected and consistent with long-run convergence of the equation.

The estimated coefficient of lagged debt is –0.02, significantly different from zero and negative as expected.

We found a significant asymmetry in the conduct of fiscal policy. While η_n=-0.41 (significant at the 1% level), η_p=-0.05 (not significantly different from zero). The difference between the two coefficients is statistically different from zero, implying an asymmetry coefficient of about ϕ=-0.36 (Table 1).

As the Arellano-Bond procedure is based on first differencing of the estimating equation, in order to get an estimate of the constant term and obtain an evaluation of b* from the restrictions induced by our model on the parameters in (6), we used standard OLS fixed-effect panel estimation (which turned out to be extremely close to the Arellano-Bond one). We found that, assuming g=0.05, the estimated government preferred deficit (b*) is about 2.40 per cent of GDP.

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with reference to fiscal policy. See Forni and Momigliano (2004) for an analysis of fiscal policy reaction functions using real time indicators.

[17] The test for second order autocorrelation does not reject the validity of the procedure. The Sargan test for over-identifying restrictions (χ^2_{734}=505.99) does not signal any problem with the chosen instruments (lagged explanatory variables only).

[18] Results are strongly robust to changes in the composition of the sample. Single-country regressions, though statistically not as reliable as full-sample ones, provide results in line with those obtained with the full sample in 9 cases (Germany, Spain, Italy, the Netherlands, Portugal, Finland, Sweden, United Kingdom and United States of America).

Similar results are obtained if the analysis is restricted to the 14 EU countries of our sample (Table 2). The estimated coefficient of lagged deficit is 0.89, the estimated coefficient of lagged debt is –0.02. The conduct of fiscal policy is significantly asymmetric: η_n=-0.41, η_p=-0.04 (not significantly different from zero), ϕ=-0.37. The estimated government preferred deficit, using OLS fixed-effect estimates, is 2.37 per cent of GDP.

It should be noted that, since estimates by international organisations of automatic budgetary elasticity to the cycle average about 0.5 for EU countries,[19] our results may be taken to suggest that, on average, while automatic stabilisers are left free to operate during downturns, during expansions their effect is compensated by discretionary loosening.

In order to test for the presence of structural breaks in connection with the Treaty of Maastricht we introduced dummy variables for both the constant term and the slope coefficients.

The estimates do not suggest any change in the ηs between the pre-1992 and the post-1992 years (Table 2).[20]

The only significant dummy is the one interacted with lagged debt. Dropping the other dummies, the pre-1992 lagged debt coefficient is estimated at –0.01 while the post-1992 one is –0.03; the estimates are both significantly different from zero and so is their difference.

The estimated government preferred deficit (b*), using OLS estimation, drops from 3.21 per cent of GDP in the pre-1992 period to 1.78 per cent in the post-1992 period.[21]

The results described above are substantially confirmed by the estimation of a version of eq. (6) in which the primary balance is used rather than the overall deficit (Table 3). Parameter signs are unaltered and their magnitudes do not change much with respect to those obtained using the overall deficit (with the exception of the coefficient of positive output gaps). However, the index of asymmetry turns out to be smaller, and statistically significant at the 10% level only. Interest outlays thus seem to enhance the asymmetry of budgetary variations over the cycle, a feature that could be linked to the cyclical behaviour of monetary policy.

4. Debt dynamics

Based on OLS estimates in the previous section we computed predicted values of the debt to GDP ratios for the year 2000 for each country in the sample by substituting the predicted values of the overall deficit in the following dynamic debt equation:

(7) $$d_t = d_{t-1}/(1+k_t) + b_t + s_t$$

where k_t is nominal GDP growth and s_t is the actual value of stock-flow adjustments in each year.[22] In most cases the predicted values of debt come reasonably close to the actual ones (Table 4).

We then computed the debt ratios that would have occurred if fiscal policy had been conducted symmetrically. Symmetry may be simulated in different ways, as a benchmark we restrict all ηs to zero,[23] this is equivalent to considering either a case in which the cyclical component of b_t does not exist or that the economy grows along its trend path without cyclical fluctuations.

The difference between the two computations provides an estimate of the effect exerted by asymmetric fiscal policy on debt accumulation. This is equivalent to estimating the distance between the dotted line and the continuous bold line in Figure 1 above.

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[19] See Bouthevillain *et al.* (2001).

[20] By construction, positive and negative output gaps are almost equally represented in the full sample (the output gap is positive in 340 cases and negative in 316). Positive and negative output gaps are both sufficiently represented also in the 1992-2000 sub-sample (84 positive gaps and 60 negative ones).

[21] Table 4 provides country estimates of b*.

[22] Nominal deficits do not coincide with changes in nominal debt. The difference, usually referred to as "stock-flow adjustment", reflects differences in the definitions of the two indicators both with respect to the relevant transactions (the debt measure is gross of financial assets, whereas the deficit corresponds to a net flow of liabilities) and with respect to the valuation criteria adopted (e.g., nominal values versus accrual). See Balassone, Franco and Zotteri (2002) for a discussion of these differences in the context of EMU fiscal rules.

[23] In doing so we assume that the other coefficients are invariant to the actual value of η.

Assuming different values of ηs in simulating the conduct of symmetric fiscal policy would amount to estimating the distance between the dotted line and the thin continuous line.

For the benchmark case the effect amounts on average to 9.8 percentage points of GDP, about one third of the increase observed in the average debt to GDP ratio. It is always sizeable for all countries and usually close to average, the main exception being Finland (19.8).

Table 5 reports the effects of asymmetric budget reaction computed under different assumptions[24]. The results confirm that debt accumulation induced by asymmetric fiscal policy is sizeable; on average for the overall sample the effect varies between 18 (for ηs=-1.0) and 42 (for ηs=1.0) per cent of the observed average variation in the debt to GDP ratio.

5. Conclusions

In this paper we have presented a stylised framework of fiscal policy determination which considers both structural targets and cyclical factors.

Applying this framework to a sample of 16 OECD countries we have found evidence of significant asymmetry in the conduct of fiscal policy over the cycle. Our computations suggest that this feature has provided a sizeable contribution to debt accumulation.

Possible extensions of our work include the analysis of revenues and expenditure and the expansion of our stylised framework for policy determination to allow distinct consideration of the automatic and discretionary reactions to the cycle.

A full research agenda should also consider the inclusion of control variables, accounting for, say, different governments and institutional settings both among countries and within each of them, and different measures of expected output gaps.

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[24] Table 5 reports the results obtained assuming values for symmetric ηs ranging from –1.0 and 1.0. ηs<0 imply counter-cyclical symmetric fiscal policy, ηs>0 a symmetric pro-cyclical one.

Tables

Table 1

ESTIMATION RESULTS

(Sample: EU countries (excluding Luxembourg), USA and Japan; period 1970-2000)

Variable	Coeff.	Fixed effect model - OLS	Arellano-Bond estimation
Constant	α_0	**1.310**	-0.006
		(0.246)	(0.013)
Lagged Debt (d_{t-1})	α_1	**-0.022**	**-0.020**
		(0.004)	(0.006)
Lagged Balance (b_{t-1})	α_2	**0.884**	**0.883**
		(0.027)	(0.026)
Current Positive Cycle $\omega_t\, m_t$	η_p	-0.052	-0.054
		(0.078)	(0.074)
Current Negative Cycle $\omega_t\,(1-m_t)$	η_n	**-0.416**	**-0.414**
		(0.080)	(0.075)
Observations		466	450
Asymmetry index $\phi=\eta_n-\eta_p$		**-0.364**	**-0.360**
test: ϕ =0 (p-value in brackets)		-2.69 (0.007)	8.01 (0.005)
Model parameters:			
$\alpha=1-\alpha_2$		0.116	0.117
$\beta=-\alpha_1$		0.022	0.020
$b^*=\alpha_0/[(1-\alpha_2)-(\alpha_1/k)]$ with k=0.05		2.396	
Sargan (max lag of dep v.ble=18)			505.99 (0.450)
Autocorrelation (2nd order)			-0.78 (0.434)
$\alpha_2=1$		4.30 (0.000)	21.04 (0.000)

Note: Bold figures indicate significance at 5% confidence level (standard errors in brackets).

Table 2

ESTIMATION RESULTS
(Sample: EU countries (excluding Luxembourg))

Variable	Coeff.	Arellano-Bond estimation - restricted= $\eta_n=\eta_p$	Fixed effect model - OLS - restricted= $\eta_n=\eta_p$	Arellano-Bond estimation - unrestricted - no dummies	Fixed effect model - OLS - unrestricted - no dummies	Arellano-Bond estimation - unrestricted - dummies on all variables	Arellano-Bond estimation - unrestricted - dummies only on debt	Fixed effect model - OLS - unrestricted - dummies only on debt
Constant	α_0	**-0.013**	**1.744**	0.011	**1.399**	0.051	0.026	**1.045**
		(0.014)	(0.226)	(0.014)	(0.262)	(0.019)	(0.016)	(0.271)
Dummy after Maastricht	α_{0a92}					-0.197		
						(0.672)		
Lagged Debt (d_{t-1})	α_1	**-0.021**	**-0.026**	**-0.021**	**-0.024**			
		(0.006)	(0.004)	(0.006)	(0.004)			
Lagged Debt (d_{t-1}) before Maastricht	α_{1b92}					**-0.015**	**-0.013**	-0.008
						(0.007)	(0.006)	(0.006)
Lagged Debt (d_{t-1}) after Maastricht	α_{1a92}					**-0.039**	**-0.029**	**-0.022**
						(0.008)	(0.006)	(0.004)
Lagged Balance (b_{t-1})	α_2	**0.891**	**0.895**	**0.891**	**0.894**	**0.789**	**0.841**	**0.844**
		(0.027)	(0.029)	(0.027)	(0.028)	(0.034)	(0.028)	(0.030)
Lagged Balance (b_{t-1}) after Maastricht	α_{2a92}					0.126		
						(0.066)		
Current Cycle ω_t m_t	η	**-0.216**	**-0.216**					
		(0.041)	(0.450)					
Current Positive Cycle ω_t m_t	η_p			-0.036	-0.032		-0.129	-0.118
				(0.079)	(0.084)		(0.791)	(0.085)
Current Positive Cycle ω_t m_t before Maastricht	η_{pb92}					-0.152		
						(0.082)		
Current Positive Cycle ω_t m_t after Maastricht	η_{pa92}					-0.645		
						(0.325)		
Current Negative Cycle ω_t $(1-m_t)$	η_n			**-0.405**	**-0.409**		**-0.416**	**-0.408**
				(0.081)	(0.087)		(0.079)	(0.085)
Current Neg. Cycle ω_t $(1-m_t)$ before Maastricht	η_{nb92}					**-0.333**		
						(0.092)		
Current Neg. Cycle ω_t $(1-m_t)$ after Maastricht	η_{na92}					**-0.485**		
						(0.152)		

Table 2 cont.

ESTIMATION RESULTS
(Sample: EU countries (excluding Luxembourg))

	Arellano-Bond estimation - restricted= $\eta_n=\eta_p$	Fixed effec model - OLS - restricted= $\eta_n=\eta_p$	Arellano-Bond estimation - unrestricted - no dummies	Fixed effect model - OLS - unrestricted - no dummies	Arellano-Bond estimation - unrestricted - dummies on all variables	Arellano-Bond estimation - unrestricted - dummies only on debt	Fixed effect model - OLS - unrestricted - dummies only on debt
Observations	391	405	391	405	391	391	405
Asymmetry index $\phi=\eta_n-\eta_p$			**-0.370**	**-0.376**		**-0.287**	**-0.290**
test: ϕ =0 (p-value in brackets)			7.35 (0.007)	2.58 (0.010)		4.58 (0.032)	-2.00 (0.046)
Model parameters:							
$\alpha=1-\alpha_2$	0.109	0.105	0.109	0.106		0.159	0.156
$\beta=-\alpha_1$	0.021	0.026	0.021	0.024			
$\beta_{b92}=-\alpha_{1b92}$						0.013	0.008
$\beta_{a92}=-\alpha_{1a92}$						0.029	0.022
$b^*=\alpha_0/[(1-\alpha_2)-(\alpha_1/k)]$ with k=0.05		2.832		2.372			
$b^*=\alpha_0/[(1-\alpha_2)-(\alpha_1/k)]$ with k=0.05 - before Maastricht							3.212
$b^*=\alpha_0/[(1-\alpha_2)-(\alpha_1/k)]$ with k=0.05 - after Maastricht							1.776
test: $\alpha_{1a92}-\alpha_{1b92}$ =0 (p-value in brackets)					8.24 (0.004)	21.54 (0.000)	4.10 (0.000)
test: η_{pb92} -η_{pb92}=0 (p-value in brackets)					2.22 (0.137)		
test: η_{nb92}-η_{nb92} =0 (p-value in brackets)					0.74 (0.390)		
Sargan (max lag of dep v.ble=16)	457.43 (0.928)		443.71 (0.675)		441.46 (0.702)	445.52 (0.653)	
Autocorrelation (2nd order)	-1.16 (0.247)		-1.2 (0.231)		-1.00 (0.320)	-1.11 (0.269)	
α_2=1	16.61 (0.000)		16.45 (0.000)		38.74 (0.000)	31.51 (0.000)	

Note: Bold figures indicate significance at 5% confidence level (standard errors in brackets).

Table 3

ESTIMATION RESULTS FOR EQUATION WITH PRIMARY DEFICIT

(Sample: EU countries (excluding Luxembourg), USA and Japan; period 1970-2000)

Variable	Coeff.	Sample: EU countries (excluding Luxembourg), USA and Japan		Sample: EU countries (excluding Luxembourg)	
		Fixed effect model - OLS	Arellano-Bond estimation	Fixed effect model - OLS	Arellano-Bond estimation
Constant	α_0	**1.252**	0.002	**1.256**	-0.001
		(0.225)	(0.012)	(0.242)	(0.013)
Lagged Debt (d_{t-1})	α_1	**-0.032**	**-0.033**	**-0.032**	**-0.031**
		(0.003)	(0.005)	(0.004)	(0.005)
Lagged Primary Balance (b_{t-1})	α_2	**0.759**	**0.759**	**0.766**	**0.765**
		(0.026)	(0.025)	(0.028)	(0.026)
Current Positive Cycle $\omega_t\, m_t$	η_p	-0.139	**-0.142**	-0.122	-0.124
		(0.071)	(0.066)	(0.078)	(0.072)
Current Negative Cycle $\omega_t\,(1\text{-}m_t)$	η_n	**-0.347**	**-0.345**	**-0.334**	**-0.333**
		(0.072)	(0.067)	(0.079)	(0.074)
Observations		452	436	405	391
Asymmetry index $\phi=\eta_n-\eta_p$		-0.208	-0.203	-0.212	-0.208
test: ϕ =0 (p-value in brackets)		-1.70 (0.090)	3.18 (0.075)	-1.59 (0.113)	2.79 (0.095)
Sargan (max lag of dep v.ble= 18, 16)			503.50 (0.485)		446.79 (0.637)
Autocorrelation (2nd order)			-0.68 (0.495)		-0.66 (0.512)
α_2=1			96.04 (0.000)		80.03 (0.000)

Note: Bold figures indicate significance at 5% confidence level (standard errors in brackets).

Table 4

ACTUAL AND SIMULATED DEBT ACCUMULATION

Sample: EU countries (excluding Luxembourg), USA and Japan

		BE	DK	DE	EL	ES	FR	IE	IT	NL	AT	PT	FI	SE	UK	Average EU countries	USA	JP	Average 16 countries
Initial government debt	a	67.93	12.08	18.57	19.84	14.97	20.14	53.58	37.92	40.79	18.88	15.32	11.70	27.42	78.69	33.73	49.30	11.22	34.51
(initial year in brackets)		*(1969)*	*(1971)*	*(1970)*	*(1970)*	*(1970)*	*(1977)*	*(1970)*	*(1970)*	*(1975)*	*(1970)*	*(1973)*	*(1970)*	*(1970)*	*(1970)*	*(1977)*	*(1969)*	*(1970)*	*(1977)*
Actual Government debt in 2000	b	109.60	47.38	60.19	106.21	60.55	57.32	39.32	110.62	55.77	66.84	53.27	44.53	52.80	42.11	64.75	59.88	123.56	68.12
Observed variation	c=b-a	41.67	35.31	41.62	86.37	45.58	37.18	-14.26	72.69	14.99	47.97	37.95	32.83	25.38	-36.58	31.02	10.58	112.35	33.61
With break in 1992 for EU countries																			
Simulated debt in 2000 with asymmetric fiscal policy	d	106.18	42.27	51.16	92.48	50.50	52.32	55.35	105.59	47.97	56.24	55.71	26.44	40.16	44.93	59.09	59.78	98.41	61.59
Simulated debt in 2000 with symmetric fiscal policy	e	97.89	34.29	41.88	84.25	39.57	43.27	45.58	98.90	40.20	49.16	41.85	6.66	29.30	35.48	49.16	51.93	87.79	51.75
Debt accumulation due to asymmetric fiscal policy	f=d-e	8.29	7.98	9.28	8.22	10.93	9.05	9.77	6.69	7.77	7.08	13.86	19.79	10.86	9.46	9.93	7.85	10.62	9.84
observed variation-accumulation due to asymmetric fiscal policy	g=f-c	*33.38*	*27.33*	*32.33*	*78.14*	*34.65*	*28.13*	*-24.03*	*66.01*	*7.21*	*40.89*	*24.09*	*13.04*	*14.52*	*-46.03*	*21.09*	*2.73*	*101.72*	*23.77*
$b^*=\alpha_0/[(1-\alpha_2)-(\alpha_1/k)]$ with k=0.05																	2.47	2.76	2.40
$b^*=\alpha_0/[(1-\alpha_2)-(\alpha_{1b92}/k)]$ with k=0.05		6.47	1.87	1.93	5.22	2.53	2.60	4.13	6.70	2.87	2.89	3.86	-1.10	1.97	2.48	3.21			
$b^*=\alpha_0/[(1-\alpha_2)-(\alpha_{1a92}/k)]$ with k=0.05		3.58	1.03	1.07	2.89	1.40	1.44	2.28	3.70	1.59	1.60	2.13	-0.61	1.09	1.37	1.78			

Table 5

DEBT ACCUMULATION DUE TO ASYMMETRIC FISCAL POLICY
Sample: EU countries (excluding Luxembourg), USA and Japan

		BE	DK	DE	EL	ES	FR	IE	IT	NL	AT	PT	FI	SE	UK	Average EU countries	USA	JP	Average 16 countries
Initial government debt *(in brackets initial year)*	a	67.93 *(1969)*	12.08 *(1971)*	18.57 *(1970)*	19.84 *(1970)*	14.97 *(1970)*	20.14 *(1977)*	53.58 *(1970)*	37.92 *(1970)*	40.79 *(1975)*	18.88 *(1970)*	15.32 *(1973)*	11.70 *(1970)*	27.42 *(1970)*	78.69 *(1970)*	33.73 *(1977)*	49.30 *(1969)*	11.22 *(1970)*	34.51 *(1977)*
Actual Government debt in 2000	b	109.60	47.38	60.19	106.21	60.55	57.32	39.32	110.62	55.77	66.84	53.27	44.53	52.80	42.11	64.75	59.88	123.56	68.12
Observed variation	c=b-a	41.67	35.31	41.62	86.37	45.58	37.18	-14.26	72.69	14.99	47.97	37.95	32.83	25.38	-36.58	31.02	10.58	112.35	33.61
Debt accumulation due to asymmetric fiscal policy																			
Assumption on output gap elasticities:																			
$\eta_p=\eta_n=-1.0$		5.46	4.03	9.57	3.18	5.91	4.97	4.97	4.16	4.02	5.88	8.92	7.32	4.01	6.79	5.33	5.09	17.09	6.05
$\eta_p=\eta_n=-0.8$		6.03	4.82	9.51	4.59	6.92	5.79	5.79	4.67	4.77	6.12	9.91	9.99	5.38	7.32	6.29	5.64	15.79	6.84
η_p= estimated η_n (about -0.4)		7.14	6.37	9.40	5.32	8.88	7.39	5.92	5.66	6.24	6.59	11.84	14.71	8.06	8.37	7.99	6.70	13.31	8.24
$\eta_p=\eta_n=-0.2$		7.72	7.19	9.34	8.81	9.93	8.24	7.88	6.18	7.02	6.84	12.87	18.01	9.49	8.92	9.17	7.30	11.92	9.23
$\eta_p=\eta_n=0$ (benchmark)		8.29	7.98	9.28	8.22	10.93	9.05	9.77	6.69	7.77	7.08	13.86	19.79	10.86	9.46	9.93	7.85	10.62	9.84
$\eta_p=\eta_n=0.2$		8.85	8.77	9.23	11.62	11.94	9.87	11.66	7.19	8.52	7.32	14.84	23.35	12.23	9.99	11.10	8.41	9.33	10.82
η_p= - estimated η_n (about 0.4)		9.44	9.59	9.17	13.08	12.98	10.72	13.62	7.72	9.30	7.57	15.87	26.12	13.65	10.55	12.10	9.00	7.94	11.65
$\eta_p=\eta_n=0.8$		10.55	11.14	9.06	15.83	14.95	12.32	17.32	8.71	10.77	8.04	17.80	31.36	16.34	11.59	13.98	10.07	5.45	13.21
$\eta_p=\eta_n=1.0$		11.11	11.93	9.00	17.24	15.95	13.14	19.21	9.21	11.52	8.28	18.79	34.03	17.71	12.13	14.95	10.62	4.16	14.00

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