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Public deficits and borrowing costs: the missing half of market discipline

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Non-technical Summary

After the start of EMU life has become easier for finance ministers in some countries of the Euro area. Particularly the former high inflation countries have experienced a marked reduction of government bond yields in comparison to the early nineties. How will budgetary policy react to this change in the fiscal environment? A normal reaction - a negative elasticity of public deficits to the costs of borrowing - could counteract the objectives of the Pact for Stability and Growth calling for balanced budgets. However, little is known about the way governments in industrial countries react to changing borrowing conditions. Although this issue is of importance in the debate on whether financial markets effectively impose fiscal discipline, the empirical literature is remarkably silent.

Facing these open questions the papers offers theoretical modelling and empirical tests. The theoretical basis is set by adapting the Hettich-Winer model. This model explains the determination of level and structure of the government budget from a political-economic perspective. The original set-up is extended in order to include the decision on the optimum deficit. The basic idea of this extension is: Political costs of deficit finance depend negatively on sustainability. If sustainability of public debt is in danger this increases the likelihood of debt crisis and at the same time the marginal political costs of the deficit. The model allows to derive some testable hypotheses for the determination of the deficit. In addition it is helpful to understand that the decision on the deficit is part of a multidimensional optimisation.

The descriptive analysis for fiscal performance in OECD countries since 1970 allows to draw first conclusions concerning fiscal reactions to changing borrowing costs (defined as the difference between real interest and growth rates): There is some evidence for the existence of a normal reaction in the sense that higher borrowing costs lead to falling primary surpluses. Nevertheless, this reaction has been to weak to neutralise the debt service effect (rising interest rates induce larger interest payments on the stock of outstanding debt). As a consequence debt levels have grown for decades after the borrowing costs shock had occurred in the seventies.

The econometric evidence based on pooled and single country regressions for OECD countries confirms the existence of a normal reaction of deficits. In addition, these results reveal an important asymmetry. Reactions in times of rising borrowing costs are more pronounced than in times of falling costs. Thus, the problem with deficits and borrowing costs is not that government immediately jump to high deficits as soon as market conditions relax. The problem is that governments need too much time and react too slowly to rising interest and falling growth rates. The good news for the medium-term fiscal outlook in EMU countries is that even after the strong decline of real interest rates a fast return of large deficits has not to be expected.

Public Deficits and Borrowing Costs: The Missing Half of Market Discipline

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Abstract: EMU driven interest rate convergence has led to a significant reduction of borrowing costs for some European governments in the second half of the nineties. The paper deals with the possible consequences for deficit behaviour. Although the impact of interest rates on deficits is a crucial element of the market discipline hypothesis it has widely been neglected in the literature. In the theoretical part, a standard political economic model of budgetary policy (Hettich-Winer) is adapted. It turns out that borrowing costs, measured as the interest-growth-differential, and the level of public debt should be important determinants for public deficits. The econometric part tests these predictions for a panel of OECD countries. The results indicate that there is indeed a significant impact of borrowing costs on the primary surplus. This impact is characterised by a robust asymmetry: Reactions in times of increasing borrowing costs are more pronounced than in times of relaxing conditions.

***JEL-Classification**: H 62*
***Keywords:** market discipline, borrowing costs, EMU, public debt, government deficits*

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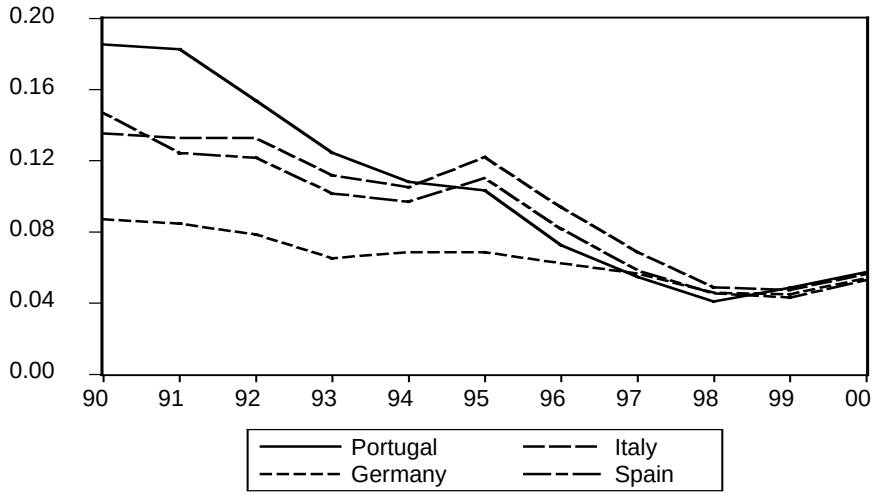
1 Introduction

After the start of EMU life has become easier for finance ministers in some countries of the Euro area. Particularly the former high inflation countries have experienced a marked reduction of government bond yields in comparison to the early nineties (figure 1). Also real interest rates declined substantially improving conditions for financing high levels of public debt.

Figure 1: Long-term government bond yields



Source: IMF International Financial Statistics

How will budgetary policy react to this change in the fiscal environment? A normal reaction - a negative elasticity of public deficits to the costs of borrowing - could counteract the objectives of the Pact for Stability and Growth calling for balanced budgets. However, little is known about the way governments in industrial countries react to changing borrowing conditions. Although this issue is of importance in the debate on whether financial markets effectively impose fiscal discipline, the empirical literature is remarkably silent. From theoretical reasoning it cannot be taken for granted that reactions are similar to that of private actors since public choice mechanisms complicate the reaction process.

With this background, this study is to shed light on the budgetary reactions of industrial countries faced with changing borrowing costs. For that purpose, after a short survey of the literature (section 2) a theoretical framework is presented based on the positive approach to government finance by HETTICH and WINER (section 3). This model lays the ground for the application of descriptive and econometric analysis (sections 4 and 5). The results indicate that governments indeed react to

changing borrowing costs although there is a significant asymmetry between rising and falling borrowing costs.

2 Borrower Reaction: The Missing Half of Market Discipline

The literature on market discipline (BISHOP ET AL., 1989; FRENKEL AND GOLDSTEIN, 1991; LANE 1993) has identified the circumstances under that financial market effectively restrict public borrowers' ability to raise debt. Apart from conditions like the absence of bailout-provisions, independence of the central bank and a stable financial system, two further conditions are crucial: First, open markets and sufficient information must allow for a reaction of the risk premium to an increasing sovereign risk. Second, there must be a borrower response in the sense that the sovereign borrower reacts smoothly to the increasing risk premium. A smooth reaction is required in order to avoid the likelihood of a debt crisis where credit rationing occurs cutting a public borrower suddenly off from any new credit supply.

There are numerous studies in regard to the first condition – reaction of default risk premium - in the context of industrial countries: Within federal unions like Canada and the U.S. there are clear differences in borrowing conditions for the states according to their individual creditworthiness (LANE, 1993; BAYOUMI ET AL., 1995). EICHENGREEN AND BAYOUMI (1994) and POTERBA AND RUEBEN (1999) present evidence that restrictive fiscal rules reduce default risk premia.

For sovereign borrowing in different currencies, studies face the difficulty to differentiate between the default risk premium component and other components of interest rate differentials (exchange rate expectations, exchange rate risk premium). Given this difficulty, ALESINA ET AL. (1992) take the difference between domestic public and private bond returns as an indicator of public default risk premium and thus find for highly indebted countries a positive though small impact of the stock of debt on the premium. FAVERO ET AL. (1996) use cointegration analysis for the decomposition of interest rate differentials. They find yield differentials between Germany and European high interest countries largely determined by exchange rate factors and low default risk premia. For Italy the result of low default risk premia and large exchange rate related interest rate differentials is supported by COTTARELLI AND MECAGNI (1990) and GIOVANNINI AND PIGA (1992). Furthermore, MONGELLI (1997) cites an unpublished study by MASSON, AND SYMANSKY (1995) for EU countries that also indicates that risk premia are small and never exceed 50 basis points even in highly indebted countries. ZIEGENHORN (1999) detects significant risk premia which are lower for EU countries possibly due to bailout expectations. Experience since the start of EMU has confirmed these results: After the elimination of exchange rate risk government bond yields of EMU member countries are trading in a very narrow range. The BANK FOR INTERNATIONAL SETTLEMENTS (2000) reports that yield spreads within the Euro zone are typically

contained within 40 basis points or less at any point of the yield curve. In addition, a significant portion of these yield differentials reflect technical and liquidity factors rather than sovereign risk.

Much less is known about the fulfilment of the second precondition for an effective market discipline – the smooth reaction of public borrowers. While there are some papers touching the fiscal reaction of U.S. states and cities to varying risk premia (CAPECI, 1992; METCALF, 1993), studies for industrial countries are lacking so that authors like FRENKEL AND GOLDSTEIN (1991) AND BAYOUMI ET AL. (1995) are complaining about the incomplete research: "The missing half is evidence that higher borrowing costs induce governments to correct fiscal policy excesses" (FRENKEL AND GOLDSTEIN, 1991, p. 370) – a judgement still valid today. Also the large number of studies that look into strategic, political-economic and institutional determinants of government debt (for a survey see ALESINA AND PEROTTI, 1995) largely abstracts from capital market conditions in general and variations in borrowing conditions in particular.

Given these deficits of the literature, *this study consequently concentrates on the missing half of the market discipline hypothesis, the borrower reactions*. Due to the small extent and low variability of default risk premia for industrial countries it seems, however, not promising to look for fiscal reactions to this variable. Instead reactions to changes in the borrowing costs will be the focus of this study. As shown below, *public borrowing costs are most appropriately described by the differential between real government bond yields and real growth rates* since this variable is crucial in the sustainability context. Borrowing costs defined in this way have some advantages for the empirical analysis compared to the default risk premium: there is considerably more cross-section and time-series variability. Apart from that, endogeneity problems are still present but less severe, since the impact of deficits on the interest rate-growth-differential is less important than its impact on the risk premium.

3 The theoretical framework

In a number of papers, HETTICH and WINER (1984, 1988, 1997) have developed a modelling approach explaining the level and structure of public revenues from a positive perspective. Grounded on the probabilistic voting theory (MUELLER 1989, ch. 11), politicians are assumed to set the level of the budget and to design the revenue structure in a way that maximises voters' support – given the budget constraint and a set of relevant exogenous variables.

The Hettich-Winer model is also helpful to study the political-economic determination of public deficits. In particular, the impact of changing borrowing costs on the deficit decision can be illustrated. This framework also helps to clarify

that the partial focus of this paper is only one aspect of an optimisation context which has many dimensions.

Starting point of the model is a political cost function (usual properties: continuous, twice differentiable) being minimised by the government. In the context of probabilistic voting this can be interpreted as the negative of expected votes which depend on the choice of policy instruments and exogenous variables.

(1) $\min C(t, s, exp, x)$

t, *s* and *exp* stand for tax revenues, the public primary surplus and public expenditures net of interest payments, all three variables in relation to GDP. *x* is a vector of relevant exogenous variables – among the borrowing costs as will be explained below. The cost function is increasing in taxes and the deficit (-*s*), it is decreasing in public expenditure.

The minimisation of (1) is subject to the budget constraint:

(2) $-s = exp - t$

First order conditions for a cost minimum are:

(3) $$\frac{\partial C}{\partial t}(x) = -\frac{\partial C}{\partial s}(x) = -\frac{\partial C}{\partial exp}(x)$$

Condition (3) describes the simultaneous optimisation of both the level of the budget and the revenue structure. Marginal political costs of tax revenues and deficit are equalised. At the same time these marginal costs of raising revenues are equalised to the marginal political benefit of public spending.

All derivatives are influenced by exogenous variables. Here, the focus is on the relevant exogenous variables affecting the marginal political costs of deficits. In principle, all variables discussed in the political-economic literature (ALESINA AND PEROTTI, 1995) on deficit determination are part of the *x* vector: political stability, degree of polarisation, characteristics of fiscal institutions etc.

Besides these variables, the sustainability situation has to be taken into account by the optimising government. Since the government will at least be partially blamed for a debt crisis an increasing likelihood of such a crisis will shift the marginal political costs of deficit finance upwards: Expected marginal vote losses of a deficit increase are larger in a situation where sustainability indicators signal the acute threat of a debt crisis than in a situation where no such danger is realistic.

Turning now to a specification of the x-vector, an established concept of sustainability can be used (BLANCHARD ET AL., 1990) which is the difference between the primary surplus *s**, necessary to stabilise the debt-income-ratio *d*, and the actual primary surplus *s*. Large values of (*s**-*s*) indicate sustainability problems. The evolution of the debt level is driven by the differential equation below with *r* the real interest rate paid for government debt and *n* the real growth rate:

$$\frac{\partial d}{\partial t} = -s + (r - n)d \tag{4}$$

With the solution of the differential equation given by

$$d(t) = \left[d(0) - \frac{s}{(r-n)} \right] e^{(r-n)t} + \frac{s}{r-n}, \tag{5}$$

the debt stabilising surplus *s** is

$$s^* = d\,(r - n). \tag{6}$$

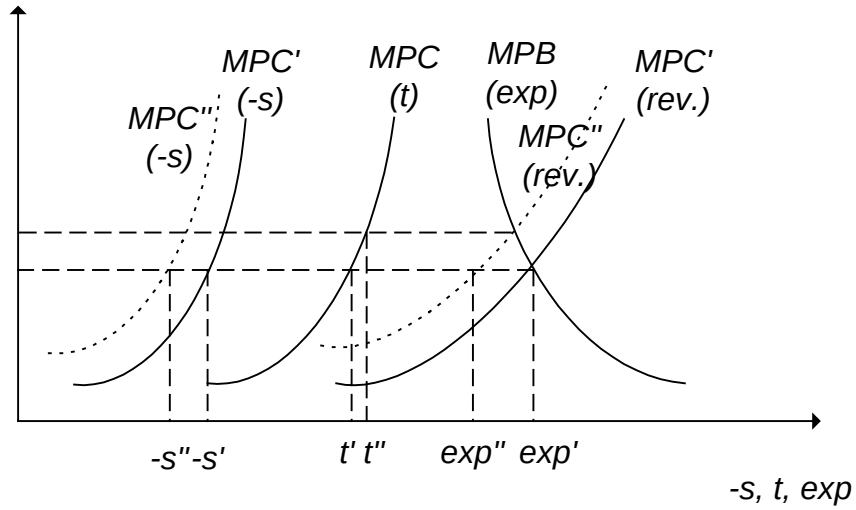
Stabilisation of the debt-income-ratio and thus the spirit of this indicator has the character of a sufficient though not necessary condition for the fulfilment of the government's intertemporal budget constraint (see BLANCHARD ET AL., 1990 for the relationship between this indicator and the government budget constraint). The difference equation clarifies the crucial role of the borrowing costs measured as the difference between the real interest rate and growth rate for sustainability. If the growth rate exceeds the interest rate, the debt level will for any permanent primary deficit always converge to the constant level of the debt-income-ratio *s*/(*r*-*n*). Only with the interest rate exceeding the growth rate, the government is forced to generate primary surpluses in order to respect its intertemporal budget constraint. The surpluses have to be the higher the higher borrowing costs.

In terms of the marginal cost function $-\partial C/\partial s\,(x)$, *s** is part of the *x* vector: Marginal political costs of deficits depend positively on *s** - and thus borrowing costs. In addition, the debt level *d* is part of the *x* vector: The inclusion of the debt level besides the debt stabilising surplus is motivated by the fact that a rising debt level is more serious with high than with low debt levels.

Figure 2 illustrates the comparative static of the model (this graph implies the assumption of the cost function being separable in *s*, *t* and *exp*): In the initial equilibrium marginal political benefits of expenditures *MPB'(exp)* are equalised to marginal political costs of revenues *MPC'(rev)* – the latter is the horizontal addition of the curves representing the marginal political costs of the deficit (-*s*) and taxes (*t*). In the initial equilibrium political optimisation leads to *–s'*, *t'* and *exp'*.

Now borrowing costs increase and shift *s** and thus the *MPC(-s)* curve upwards to *MPC''(-s)*. Consequently both the initial level of expenditures and the revenue structure are left in a non-optimum situation. Expected votes can be augmented by reducing the deficit at the cost of higher taxes and lower expenditures. Consequently, the new equilibrium is: *–s''*, *t''* and *exp''*.

Figure 2: The impact of increasing borrowing costs on fiscal optimisation



In the empirical part of the analysis, the following equation is tested:

(7) $s = s(s^*, d, ...)$

(7) can be regarded a reduced form equation of this broader model. The theoretical framework clearly shows: If governments react to an exogenous deterioration of debt sustainability by reducing deficit this is only one aspect of an adjustment comprising many dimensions.

4 Description of borrowing costs and resulting fiscal developments

The differential equation (4) is a helpful starting point for a descriptive analysis of changing borrowing costs' impact on debt and deficits. A change in borrowing costs measured as the difference between real interest rates and real growth (*r*-*n*) influences the evolution of a debt level. With $\dot{d}$ denoting $\partial d / \partial t$, the impact of changing borrowing conditions on debt dynamics can be described by the corresponding derivative of equation (4):

(8) $$\frac{\partial \dot{d}}{\partial (r-n)} = -\frac{\partial s}{\partial (r-n)} + d$$

The right hand side of the equation allows for a decomposition into two different effects. The first effect ("*debt service effect*") is necessarily positive (right term): Since the outstanding debt has to be serviced an increase in borrowing costs speeds up debt accumulation. The second effect ("*primary surplus effect*") concerns the reaction of the primary surplus to increasing borrowing costs (left term). The "normal" reaction which would be expected in the framework of the HETTICH-WINER model would be a lower demand for credit if it becomes more expensive.

However, even a normal reaction of the government would not safeguard a neutralisation of the cost push. Only if the primary surplus effect would balance the debt service effect the increase in borrowing costs would have no impact on debt accumulation.

Thus, in the descriptive analysis it is required to pose two different questions. First, was the primary surplus effect normal? And second, was this effect sufficient to neutralise the debt service effect?

Variable definitions

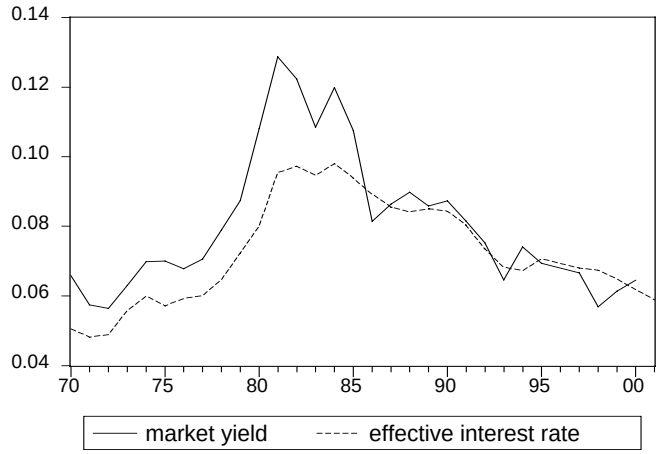
Before looking at the data the relevant variable have to be specified. Concerning the primary surplus, a cyclically adjusted variable is preferable since this corresponds best to the underlying long-run concept of sustainability. Therefore, the cyclically adjusted primary surplus as calculated by the OECD (source: OECD economic outlook, Fiscal Positions and Business Cycles database) is used.

In order to quantify borrowing costs, a definition of real growth and interest rates is necessary. The growth rate is calculated on the basis of real potential output (source: OECD) since potential growth corresponds best to the concept of long-run sustainability. Real interest rates are defined on an ex post base as the difference between long term government bond yields (source: IMF International Financial Statistics) and inflation where inflation is based on the government consumption deflator (source: OECD).

Concerning the choice of the interest rate it has to be stressed that changes in market yields only affect interest payments after outstanding long-term bonds mature and are refinanced at new market conditions. Thus the effectively paid interest rates are determined by a moving average of past market rates which is depicted for the US example in figure 3. Here government bond yields are contrasted by the effective interest rate which is calculated as the ratio of government interest payments and

outstanding public debt. The effective rate shows typical moving average properties with much lower fluctuations than the market rate.

Figure 3: Long term government bond yields and effective public debt interest rate USA



Some descriptive statistics

Figure 4 plots the average (19 OECD countries[1], unweighted average) of borrowing costs together with its driving forces real interest and growth rate defined as described. The following facts emerge: Borrowing costs are largely driven by real interest rates which show much more variation than potential growth. Furthermore, there is a strong rise in borrowing costs between 1974 and 1983 ending the times of negative borrowing costs that had guaranteed long-run sustainability even with permanent high primary deficits. After that borrowing costs have remained quite stable in the positive range and have only in recent years been driven down – partially caused by falling real interest rates in former European high inflation countries in the context of EMU.

[1] The countries included are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Japan, New Zealand, Netherlands, Norway, Portugal, Spain, Sweden, UK and USA.

Figure 4: Borrowing costs, real interest rates and real growth rates, OECD average

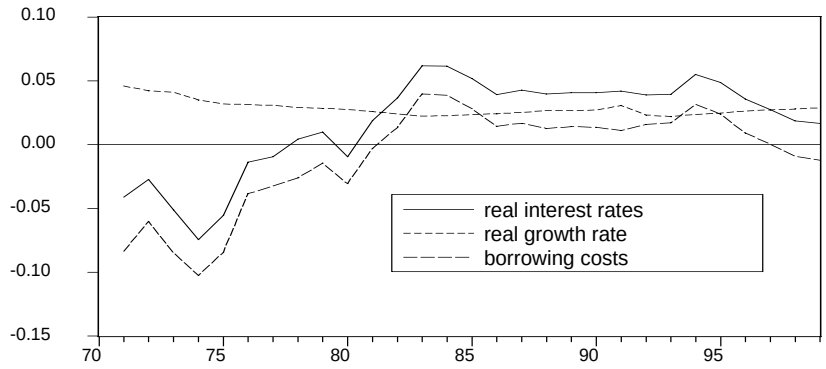


Figure 5 summarises the dynamics along equation (8) for the OECD average, depicting borrowing costs, the primary surplus (cyclically adjusted) and the annual change in the debt-GDP-ratio. It can be seen that the deficits were not only slow to react to the strong increase in borrowing costs, in the first years of the cost push primary deficits even climbed further. It took almost ten years after the rising borrowing costs were followed by shrinking deficits. As a consequence of this slow reaction the speed of debt accumulation measured by the increasing debt-GDP-ratio increased. Only since the mid-nineties primary balances have clearly turned positive thus allowing for a slowdown of debt accumulation. Of course, this descriptive analysis based on OECD average does only give a first hint while it conceals substantial differences between countries. In the appendix there are country plots describing the adjustment profiles on a country specific basis.

Figure 5: Borrowing costs, primary surplus and debt changes – average OECD

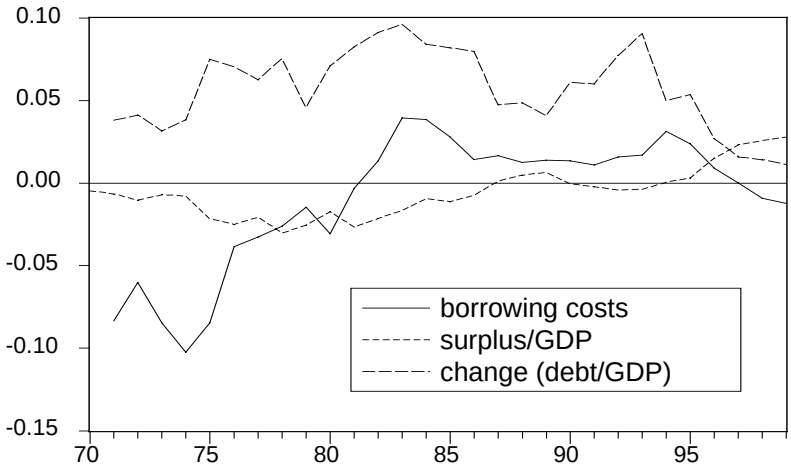


Figure 6 shows average cross correlations between the primary surplus and lagged borrowing costs. This indicates normal reactions in the sense that increasing borrowing costs are on average followed by increasing surpluses where the correlation reaches a maximum at lag 4. More formal testing, however, does not allow this correlation to be interpreted in a causal way. Table 1 summarises results of Granger causality tests. Only in 3 out of 15 countries for which data availability allows for an analysis, the test indicates that borrowing costs Granger- cause the surplus.

Figure 6: Average cross correlations between surplus and lagged borrowing costs (unweighted means of cross correlations in 19 OECD countries)

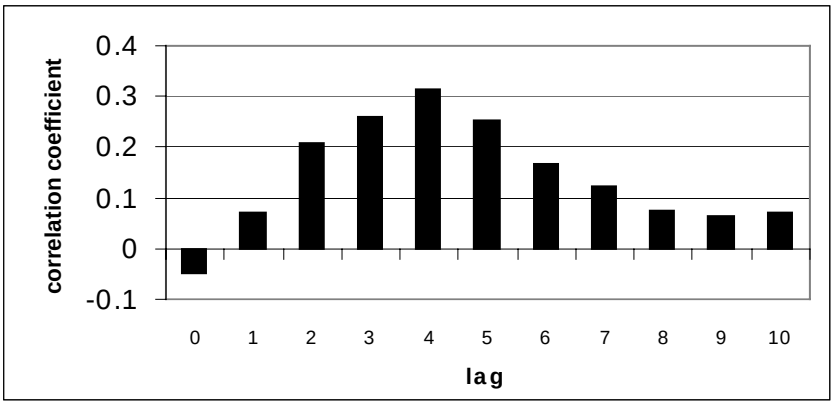


Table 1: Granger causality test of hypothesis: borrowing costs do not Granger cause surplus

Hypothesis rejected **(*/**/***: 10/5/1% level of significance)**	**hypothesis not rejected**	**test not possible due to limited number of observations**
Austria* Canada*** Ireland**	Australia, Belgium, Germany, Spain, Finland, France, Italy, Japan, Netherlands, Norway, Portugal, USA	Denmark, United Kingdom, Sweden, New Zealand

Due to limited number of observations the test was based on a lag length of six periods although information criteria recommended to include a larger number of lags.

The descriptive analysis allows some first conclusions for OECD countries as a whole: First, there is some weak evidence on the existence of a normal primary surplus effect. Second, in the eighties and the first half of the nineties this effect was to weak to balance the debt service effect. As a consequence it took about twenty years before the debt accumulation caused by strongly rising borrowing costs could be stopped.

5 Econometric analysis

The reduced form equation (7) of the adapted HETTICH WINER is the starting point for the econometric analysis. The surplus should react to borrowing costs (equal to the difference between interest rate and growth rate), the debt level and further exogenous variables with an impact on the political costs of deficits.

As motivated in the descriptive part above the (dependent) surplus variable is the cyclically adjusted primary surplus (in relation to trend GDP). Besides borrowing costs (difference between real interest and real growth rate) and the debt-GDP-level (lagged by one period due to obvious endogeneity) two further independent variables are included:

EOC (election or cabinet reshuffle) is a variable counting general elections and significant changes in the government which can also be a cabinet reshuffle. The source is KEESING'S RECORD OF WORLD EVENTS. The EOC variable is an indicator for political instability being a standard explanation for high deficits. It should therefore have a negative impact on the surplus.

The Maastricht dummy is 1 for EU countries from 1991 onwards and 0 else. This dummy is to measure the impact of the Maastricht treaty which was negotiated in 1991 (in a broad sense: EMU convergence criteria and later on the disciplining pressure of the Pact for Stability and Growth) on fiscal performance of EU countries in the nineties.

As usual the estimations have to take account for the possibility of unit roots in the time series which can not be excluded a priori for the following variables: surplus, debt-GDP-ratio, real interest and growth rates and the resulting borrowing costs. For all these series standard ADF unit root testing along the procedure described in ENDERS (1995, 257) was applied with the following results (5 per cent significance level): For most countries, the null of at least one unit root could be rejected for real interest rates, real growth rates and borrowing costs. Thus, these series can be regarded as stationary, whereas the existence of one unit root could for no country be rejected in the case of the debt ratio. The surplus variable showed mixed results for different countries. Therefore, generally first differences of the debt and surplus

ratio are used. Only in the single country estimation of Austria levels of the surplus variable are used since for this country the unit root hypothesis could be rejected.

The regression results might be influenced by simultaneity problems, since the surplus could have an impact on interest rates and thus borrowing costs (first half of the market discipline hypothesis). However, if this is relevant, this would imply a negative correlation between interest rates and the disturbance in the equation explaining the surplus: a higher surplus would be expected to lead to lower interest rates. As a result, an OLS estimate of the interest rate coefficient is biased downwards. Thus, the finding of a significant impact of interest rates on the surplus in the presence of such a simultaneity cannot be the consequence of a simultaneity bias. If present, this bias would indicate an impact smaller than the true one.

5.1 Panel estimation

Table 2 presents the results of a fixed effects panel estimation for 17 countries (the countries of footnote 1 less Portugal and Spain that had to be excluded due to missing data). Three specifications are estimated in order to test for two different kinds of asymmetries.

First, the column 1 specification allows to detect a possible asymmetry between the impact of interest rates and growth rates. These two variables determine borrowing costs. According to the theoretical considerations above it should make no difference whether a change in borrowing costs is caused by changing growth rates or interests rates. The empirical validity of this model implication can be tested by the appropriate Wald test on the equality of (absolute) values of both coefficients.

Second, the column 3 specification explores a possible asymmetry between increasing and decreasing borrowing costs. For this purpose, the borrowing costs variable is replaced by two variables – one variable representing borrowing costs if these costs have increased in comparison to the previous period and one variable for the opposite case. Again, a Wald test is applied in order to test whether this differentiated specification is more appropriate.

Table 2: Fixed Effects Pooled Cross Section Time Series: First Difference of Primary Surplus (1972 – 1998, 17 countries, 302 unbalanced observations)

	1.	2.	3.
a. real interest rate	3.89 (0.06)*		
b. real growth rate	-4.49 (0.57)		
c. borrowing costs		3.94 (0.04)**	
d. borrowing costs if Δ borrowing costs > 0			9.17(0.00)***
e. borrowing costs if Δ borrowing costs < 0			-0.46(0.85)
g. L(1-L) debt ratio	4.17 (0.07)*	4.18 (0.07)*	3.56(0.10)*
h. EOC	-0.14 (0.23)	-0.15 (0.22)	-0.14(0.24)
h. Maastricht dummy	0.35 (0.08)*	0.35 (0.08)*	0.34(0.09)*
Wald test on restriction	a=-b (0.94)		d=e (0.01)***
Joint F-Test	6.14 (0.00)	8.22 (0.00)	8.26 (0.00)
Durbin-Watson	1.84	1.84	1.80

p-values in parenthesis (Significance Level ***/**/* = 1/5/10%), L denotes the lag-operator

The first column shows that there is no indication of a first type asymmetry. The equality of magnitude hypothesis for coefficients a and b (with opposite sign) can not be rejected. The lacking significance of the real growth rate variable alone should not come as a surprise given its low time series variance. Time series variance is crucial in a fixed effect estimation to produce significant results.

The third column specification, however, clearly indicates the second type asymmetry. The highly significant difference between coefficients d and e and the insignificance of e show that the reaction of surpluses is restricted to times of rising borrowing costs. As a whole, the results of the panel estimation clearly back the theoretical considerations. Borrowing costs and the debt ratio have a positive and significant impact on the surplus. In addition, both the EOC variable and the Maastricht variable have the correct sign. However, of these two variables only the Maastricht dummy is significant.

1.2 Times series analyses for selected countries

Since the pooled estimation might conceal different fiscal behaviour in OECD countries it is worthwhile to add separate estimations for individual countries. Full data availability (1970-1998) allows to include Austria, Canada, Germany, Italy, and Japan into this analytical step (tables 3 to 7) . Estimation specifications follow the same approach as in the preceding pooled analysis.

The following tests were applied in order to check for misspecifications: the Ramsey-Reset misspecification test (null: no misspecification), the LM-White test on heteroscedasticity (null: homoscedasticity) and the LM test on autocorrelation (null: no autocorrelation). The Reset test uses 2 fitted terms, the LM-White test contains only second order polynomials without cross terms due to limited degrees of freedom, and the autocorrelation test is performed up to 2 lags. In case of heteroskedasticity a White heteroskedasticity consistent covariance matrix estimator is used. In case of autocorrelation lagged endogeneous variables are added (this concerns only Japan).

Table 3: Austria Surplus in Level

	1.	**2.**	**3.**
a. real interest rate	24.81 (0.00)***		
b. real growth rate	-14.94 (0.20)		
c. borrowing costs		22.91 (0.00)***	
d. borrowing costs if Δ borrowing costs > 0			29.73 (0.02)**
e. borrowing costs if Δ borrowing costs < 0			1.59 (0.93)
f. L(1-L) debt ratio	-30.17 (0.00)***	-25.97 (0.00)***	4.56 (0.62)
g. EOC	-0.06 (0.08)*	-0.51 (0.10)*	-0.92 (0.04)**
h. Maastricht dummy	0.43 (0.26)	0.56 (0.10)*	0.28 (0.57)
Wald test on restrictions	a=-b (0.48)		d=f (0.21)
adjusted R^2	0.46	0.47	0.25
reset test	(0.90)	(0.73)	(0.26)
LM autocorrelation test	(0.36)	(0.32)	(0.39)
LM White test heterosced.	(0.93)	(0.99)	(0.35)

tables 3-7: p-values in parenthesis (Significance Level ***/**/* = 1/5/10%)

Table 4: Difference of Canada's Surplus

	1.	2.	3.
a. L real interest rate	17.15 (0.03)**		
b. L real growth rate	-9.69 (0.29)		
c. L borrowing costs		14.52 (0.03)**	
d. borrowing costs if Δ borrowing costs > 0			9.87 (0.34)
e. borrowing costs if Δ borrowing costs < 0			0.19 (0.98)
f. L(1-L) debt ratio	-7.61 (0.46)***	-4.10 (0.65)	3.74 (0.74)
g. EOC	-0.04 (0.93)	-0.16 (0.66)	0.12 (0.76)
Wald test on restrictions	a=-b (0.46)		d=e (0.39)
adjusted R^2	0.17	0.18	-0.016
reset test	(0.79)	(0.64)	(0.16)
LM autocorrelation test	(0.95)	(0.93)	(0.70)
LM White test heterosced.	(0.67)	(0.50)	(0.17)

Table 5: Difference of Germany's Surplus

	1.	2.	3.
a. L real interest rate	7.84 (0.20)		
b. L real growth rate	-5.32 (0.60)		
c. L borrowing costs		9.98 (0.18)	
d. borrowing costs if Δ borrowing costs > 0			9.96 (0.26)
e. borrowing costs if Δ borrowing costs < 0			-10.54(0.09)*
f. L(1-L) debt ratio	17.03 (0.08)*	-16.35 (0.08)*	16.64 (0.19)
g. EOC	-0.18 (0.66)	-0.13 (0.74)	-0.15 (0.74)
h. Maastricht dummy	-0.17 (0.77)	-0.08 (0.88)	-0.25 (0.40)
Wald test on restrictions	a=-b (0.74)		d=e (0.07)*
adjusted R^2	0.08	0.12	0.08
reset test	(0.16)	(0.15)	(0.14)
LM autocorrelation test	(0.70)	(0.64)	(0.70)
LM White test heterosced.	(0.11)	(0.12)	(0.13)

Table 6: Difference of Italy's Surplus

	1.	2.	3.
a. L real interest rate	2.88 (0.67)		
b. L real growth rate	-11.91 (0.62)		
c. L borrowing costs		4.31 (0.46)	
d. borrowing costs if Δ borrowing costs > 0			26.40(0.00)***
e. borrowing costs if Δ borrowing costs < 0			-7.02 (0.19)**
f. L(1-L) debt ratio	1.86 (0.88)	-0.44 (0.96)	-12.61 (0.20)
g. EOC	0.40 (0.34)	0.33 (0.37)	0.39 (0.19)
h. Maastricht dummy	1.06 (0.18)	0.97(0.22)	0.77(0.26)
Wald test on restrictions	a=-b (0.74)		d=e (0.00)***
adjusted R^2	0.06	0.09	0.28
reset test	(0.38)	(0.25)	(0.89)
LM autocorrelation test	(0.34)	(0.28)	(0.12)
LM White test heterosced.	(0.15)	(0.21)	(0.18)

Table 7: Difference of Japan's Surplus

	1.	2.	3.
L(1-L) surplus	0.31 (0.10)*	0.35 (0.09)*	0.48 (0.00)***
a. L real interest rate	6.49 (0.10)*		
b. L real growth rate	0.31 (0.98)		
c. L borrowing costs		5.15 (0.09)	
d. borrowing costs if Δ borrowing costs > 0			27.64 (0.00)***
e. borrowing costs if Δ borrowing costs < 0			-3.37 (0.00)***
f. L(1-L) debt ratio	4.91 (0.54)	7.58 (0.25)	5.78 (0.29)
g. EOC	-0.13 (0.68)	-0.03 (0.92)	-0.13 (0.54)
Wald test on restrictions	a=-b (0.57)		d=e (0.00)***
adjusted R^2	0.12	0.15	0.36
reset test	(0.66)	(0.86)	(0.65)
LM autocorrelation test	(0.78)	(0.93)	(0.88)
LM White test heterosced.	(0.13)	(0.29)	(0.54)

In Austria and Canada borrowing costs have a positive and significant impact on the surplus and asymmetries are not significant. Germany, Italy and Japan all show significant asymmetries: The deficit reactions to the level of borrowing costs depend on whether borrowing cost increase or decrease. As in the panel estimation, times of increasing borrowing costs correspond to the model: the surplus is positively affected by borrowing costs. With decreasing borrowing costs, however, no significant deficit increases can be detected. On the contrary, for these three countries the sign of the coefficient e is even negative – implying higher surpluses in times of low borrowing costs.

The debt level variable does not perform in line with theoretical predictions in these single country regressions. Apart from the specification 1 for Germany it is always either insignificant or has the wrong sign. Also the EOC and Maastricht variables perform worse than in the panel – they are largely insignificant and/or show counter-theoretical signs. One possible explanation for the poor performance of these variables in comparison to the panel is that in the separate estimations no cross section information can be exploited.

Nevertheless, like the panel also these country regressions show one robust result: With one exception (Germany) there is always a positive impact of borrowing costs on the surplus – at least in times of increasing borrowing costs.

6 Conclusion

What do the results tell in regard to the "missing half" of evidence on the market discipline hypothesis? One clear answer is: Governments in industrial countries react to borrowing costs in a significant way. Even if it is not easy for a government to push up the primary surplus this seems nevertheless to be in line with political optimisation in a situation of increasing borrowing costs.

However, in spite of this result there is no reason to expect market discipline to prevent governments from piling up large debt mountains. The primary surplus reactions are too slow and to small for a compensation of the debt service effect. This has clearly been demonstrated by the descriptive analysis of fiscal policy of the eighties and the first half of the nineties.

The fundamental asymmetry between times of increasing and decreasing borrowing cost deserves attention. In the EMU context this is comforting where a number of countries have experienced a strong reduction of borrowing costs. According to the econometric evidence above (both the panel and the single country regression for Italy) this development is no reason to expect a fast increase of primary deficits.

Thus, the problem with deficits and borrowing cost is not that governments always immediately jump to high deficits as soon as borrowing conditions relax. The increasing debt levels between 1970 and 1995 have rather been caused by the fact that governments need too much time and react too slowly to rising interest and falling growth rates.

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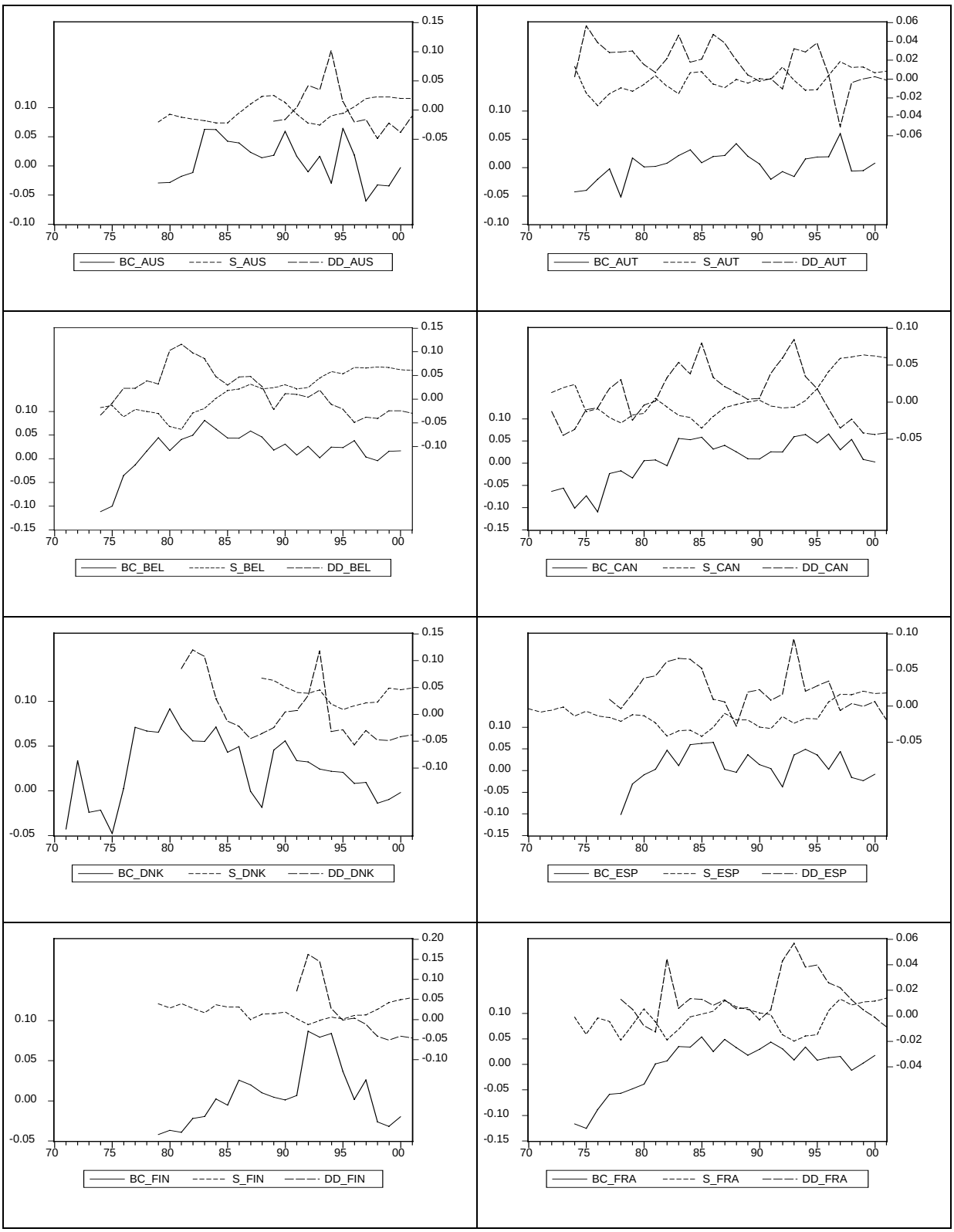
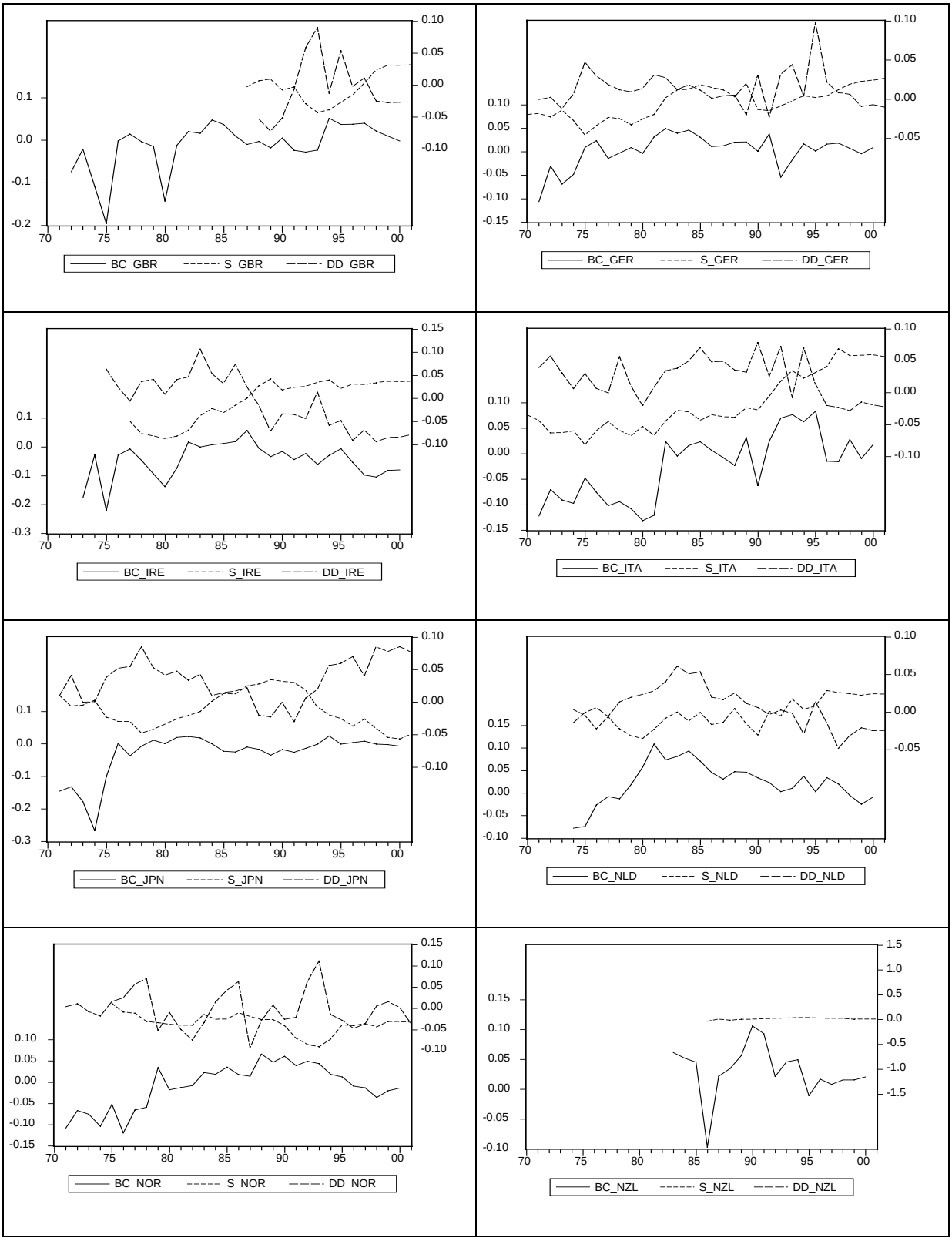
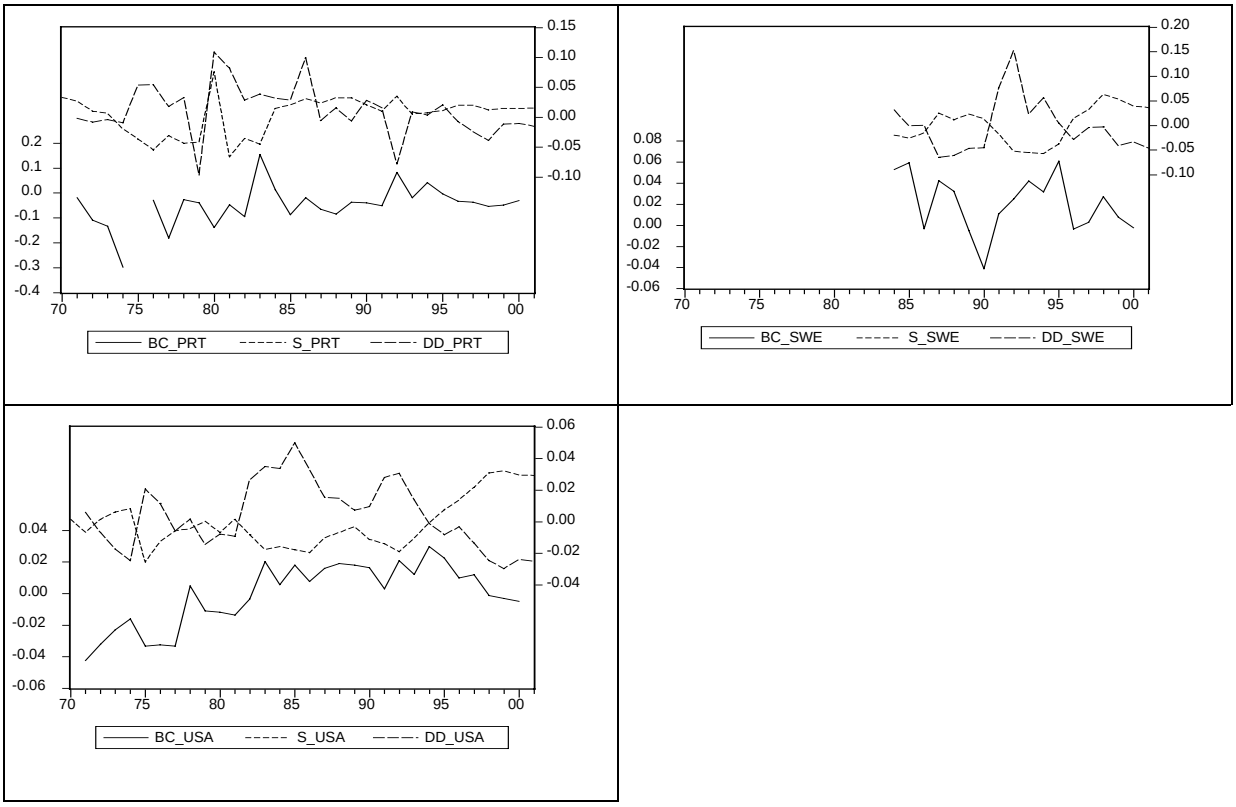
Appendix II: Borrowing costs (BC, left axis), Change of debt-GDP-ratio (DD, right axis) and adjusted primary surplus (S, right axis) for 19 OECD countries




BC_GBR S_GBR DD_GBR
BC_GER S_GER DD_GER
BC_IRE S_IRE DD_IRE
BC_ITA S_ITA DD_ITA
BC_JPN S_JPN DD_JPN
BC_NLD S_NLD DD_NLD
BC_NOR S_NOR DD_NOR
BC_NZL S_NZL DD_NZL


0.15
0.10
0.05
0.00
-0.05
-0.10
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
70
75
80
85
90
95
00
BC_PRT
S_PRT
DD_PRT
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
0.08
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
BC_SWE
S_SWE
DD_SWE
0.06
0.04
0.02
0.00
-0.02
-0.04
BC_USA
S_USA
DD_USA