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The impact of the EU fiscal framework on economic activity

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Abstract

This paper provides an analysis of the impact on economic activity of the fiscal discipline provided by the EU's fiscal framework. A comparison based on fiscal rules estimated before and after 1994 shows that there have been significant changes in behaviour of the fiscal authorities after the introduction of the EU fiscal framework. The changes in fiscal behaviour observed after 1994 on average amounted to a reduction in deficits of almost 1 per cent of GDP. In a counterfactual absence-of-fiscal-discipline scenario simulated with the QUEST model, this would have led to a sizeable build-up of government debt. Considering the significant effects of deficits and debt on interest rates, we conclude that the EU fiscal framework has only had a temporarily negative impact on growth in the short run, but has helped to avoid a situation in which accumulating public debt would have crowded-out private investment and reduced potential growth in the medium and long term.

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1. Introduction

It is a common view that the EU fiscal framework, provided by the Maastricht Treaty and the Stability and Growth Pact, has strongly influenced budgetary policies in EU countries, not only in the run-up to EMU, but also after the introduction of the single currency. However, there is no general agreement on the quantitative impact that the presence of the EU fiscal framework exerted on budget balances in EU countries[1], nor is there widespread agreement on the implications it has had for growth. There is evidence that in the past decades budget deficits in EU countries may have crowded-out private investment via debt accumulation and increased interest rates. The question is whether the fiscal consolidations that emanated from the EU rules-based framework for fiscal discipline, resulted into a contraction in output via traditional Keynesian channels, or whether it contributed to growth by limiting the crowding out effect associated with high and persistent deficits.[2] This paper provides an analysis of the impact the fiscal framework has had on economic activity.

There are two major difficulties with such an analysis. First, there is the necessity of assessing what would have been the level of budget balances in EU countries in the absence of the EU rules for fiscal discipline. In particular, it is necessary to distinguish to what extent the reduction in budget deficits that occurred in the second half of the 1990s in many EU countries was the effect of the requirements of fiscal discipline in the Maastricht Treaty and the SGP or to what extent it was instead a response to high debt levels and would have occurred in any case. Second, a general equilibrium analytical setting is required to analyse the impact of such counterfactual budget balances on aggregate demand components, debt and interest rates. Taking into account the above analytical requirements, the strategy followed to perform the analysis is as follows. In a first step 'fiscal rules' are estimated (similar as in, e.g., Gali and Perotti (2003)) describing the reaction of fiscal authorities (in terms of chosen levels of budget balances) to major macroeconomic variables, such as the cyclical position and the level of debt. Such fiscal rules are estimated for two different sub-periods: before and after the start of phase II of EMU. It is shown that the reaction of EU fiscal authorities in the two sub-periods changes quite significantly, with a greater weight put on the debt stabilisation motive

[1] See e.g. Gali and Perotti (2003), Von Hagen et al.(2001), Ballabriga and Martinez-Mongay (2003).

[2] Recent literature has considered so-called "Non-Keynesian" effects of fiscal consolidations, leading to increases in consumption and investment (see, e.g., Giavazzi and Pagano (1990), Alesina *et al.* (2002)). For a discussion of Non-Keynesian effects in EU countries, see e.g. Giudice et al (2003).

after the start of phase II of EMU. The estimated change in the parameters for the fiscal rules (summarising the behaviour of fiscal authorities) is interpreted as resulting from the introduction of the EU fiscal framework. Counterfactual budget balances in absence of the Treaty and SGP provisions are then obtained from predictions using the fiscal rules for the period before EMU phase II. In the second step of the analysis, these counterfactual levels of budget balances are used in simulations with the European Commission's QUEST model to analyse what would have been the performance of the economies in terms of aggregate output in absence of the EU fiscal framework. In order to work on a sample of countries which is sufficiently homogenous from the viewpoint of the working of the major macroeconomic relations (among which those relating to monetary policies and exchange rates) only euro area countries are considered for the analysis.

What would have been the impact on economic activity of an absence of the fiscal discipline provided by the EU's fiscal framework? According to our analysis, the changes in fiscal behaviour observed after 1994 on average amounted to a reduction in deficits of almost 1 per cent of GDP. In a counterfactual scenario of an absence-of-fiscal-discipline simulated with the QUEST model, this would have led to a sizeable build-up of government debt. In the most optimistic case, a scenario ignoring an additional risk premium effect of higher government debt on interest rates, the short run gains of an absence of fiscal discipline would not have exceeded half a percent of GDP and would have faded away quickly. When risk premia effects of higher public debt on interest rates are included, the gains from an absence of fiscal discipline over the last decade would have been even smaller in the short run, and would have become negative in the medium term.

The paper is structured as follows. The next section discusses our estimates of fiscal policy rules before and after 1994 and the changes we attribute to the Maastricht Treaty and SGP. These form the input into our counterfactual model scenario with the QUEST model, described in section 3. Section 4 discusses empirical evidence of effects of deficits and debt on interest rates and risk premia and describes simulations which take such effects into account. Section 5 concludes.

2. DETERMINING COUNTER-FACTUAL BUDGET BALANCES IN ABSENCE OF THE EU FISCAL FRAMEWORK

The first necessary step in our analysis of the economic impact is the estimation of counterfactual budget balances in the absence of the EU fiscal framework. This amounts to answering the following question: which values for budget balances would have been recorded in the absence of the EU rules-based framework but allowing for the 'normal' budgetary response of budget balances to output gaps and debt levels? In order to answer this question, fiscal rules are estimated for each of the euro area countries before and after 1994. This also allows us to assess to what extent the behaviour of the fiscal authorities has been changed by the EU fiscal framework.

It has become common practice in the applied analysis of budgetary policies to estimate fiscal rules that summarise the behaviour of fiscal authorities on the basis of a limited set of macroeconomic determinants that explain developments in budget balances (see e.g. Von Hagen et al, 2001, Gali and Perotti 2003). Most of the fiscal rules estimated in existing work can be derived as the outcome of a problem in which fiscal authorities choose budget balances in such a way as to minimise a loss function which is a function of the output gap and the deviation of the actual debt level from a target level. The underlying notion is that fiscal authorities are motivated by an objective of output stabilisation (so that budget balances should respond positively to expected output gaps) and by a debt stabilisation motive (so that a positive response of budget balances to the existing stock of debt is expected). The budget measures employed in the empirical estimation of fiscal rules is generally net of interest payments, given that this budget item is not directly under the control of fiscal authorities. In some analyses, like in Gali and Perotti (2003), the dependent variable employed in estimating fiscal rules is the cyclically adjusted primary balance. Using such a measure of countries' fiscal position presupposes that fiscal authorities decide about the level of the budget anticipating the impact of the cycle on the cyclical components of revenues and expenditures and permits to analyse the macroeconomic determinants of 'discretionary' fiscal policy. Concerning the explanatory variables that have been included in existing empirical work on fiscal rules, the output gap is generally used as a measure for the cycle, while the lagged debt-to-GDP ratio is normally used to capture the debt stabilisation motive of fiscal authorities. The lagged dependent variable (e.g., the primary budget balance) is quite often included in the empirical specification to allow for a role of inertia in budgetary policy.

Table 1 below reports the results for panel data estimation of fiscal rules across the 11 EU member states. Annual data for the period 1970-2003 are taken from the AMECO database. The specification chosen follows that in Gali and Perotti (2003). Two alternative dependent variables have been considered: the primary balance and the primary cyclically adjusted budget balance. The explanatory variables included are the output gap, the 1 year lagged debt-to-GDP ratio and the lagged dependent variable.[3]

Primary balance = a + b * *output gap* + c * *debt(-1)* + d * *primary balance(-1)* + *error*

To account for the endogeneity of the output gap (i.e. the fact that not only the output gap affects budget variables but also that budgetary policy has an impact on the cycle) it has been instrumented with its own 1 year lag and the US lagged output gap.[4] The chosen specification has been estimated separately for the sub-sample 1970-1993 (before the EU fiscal framework) and the 1994-2003 sub-period (after the introduction of the EU fiscal framework).

Several results of interest emerge from the estimation of fiscal rules.

- A first finding is that while before the introduction of the EU fiscal framework budget measures (both primary budget balances and primary cyclically-adjusted budget balances) were not significantly affected by the output gap, after phase II of EMU the output gap has a significantly positive impact of primary balances, while the coefficient for the primary cyclically budget balance remains non-significant but turns from negative to positive. This finding refutes the view that the introduction of the EU fiscal framework has resulted into a less counter-cyclical stance for fiscal policy in EU countries. [5]
- A second major result is that both primary and primary cyclically-adjusted budget balances react positively to debt levels. The regression coefficient for the lagged debt-to-GDP ratio is positive and significant in both sub-periods irrespective of the budget

3 The results reported in table 1 refer to output gap data obtained as the percentage difference between actual and trend (HP-filtered) output. Estimates have also been performed using potential output computed through the European Commission production function approach (see, Denis, McMorrow and Roeger (2002)) and very similar results have been obtained.

4 More generally, the use of the lagged dependent variable in panel data analysis raises an issue of inconsistency of estimates, generally addressed by relying on GMM estimators. However, given the purpose of the present analysis (understanding how fiscal rules changed after the introduction of the EU fiscal framework) and the relatively small sample used this issue of inconsistency is likely to be of small relevance.

5 The same result is obtained in Gali and Perotti (2003).

measure used as dependent variable. This supports the view that fiscal authorities pursue debt stabilisation objective when deciding about budgetary policy.

- Moreover, it is worth noting that the magnitude of the coefficient of the debt variable increases after the introduction of the EU fiscal framework, meaning that such debt stabilisation objective has become more relevant after phase II of EMU.
- Finally, results show that the degree of inertia in budget balances has diminished after the introduction of the EU fiscal framework. The regression coefficient for the lagged dependent variable drops from about 0.7 to about 0.45 after phase II of EMU.

Table 1 The EU fiscal framework and budgetary behaviour (EU-11)

Dependent variable	Primary budget balance		Primary cyclically adjusted budget balance	
	1970-1993	1994-2003	1970-1993	1994-2003
Output gap	-0.066	0.363***	-0.086	0.097
	(-1)	(-3.93)	(-1.5)	(1.39)
Lagged debt/GDP ratio	0.027***	0.085***	0.03***	0.067***
	(4.5)	(5.03)	(5.4)	(4.04)
Lagged dependent variable	0.74***	0.47***	0.69***	0.45***
	(14.9)	(6.31)	(15.46)	(5.78)
Constant term	-1.37***	-4.85***	-1.5***	-3.51***
	(-4.3)	(-3.95)	(-5)	(-2.99)
Number of observations	238	110	238	110
R square within groups	0.57	0.63	0.62	0.47
Wald Chi square	319.4	875.61	371.76	916.5

Note: Z statistics reported in parenthesis. ***, **, * denote statistical significance at, respectively, 1, 5, and 10% level. Estimation method: instrumental variables fixed effects panel regression. The output gap variable is instrumented using its own lag and the lagged US output gap. All variables are expressed as a percentage of trend output.

In summary, the estimated fiscal rules indicate that the introduction of the EU fiscal framework resulted into an enhanced debt stabilisation motive for fiscal authorities and a reduced degree of inertia in budgetary policy. As for the reaction of budgets to cyclical conditions, there is no evidence that it became more pro-cyclical. Overall, the results from

panel data estimation reported in Table 1 suggest that the introduction of the EU fiscal framework led to an improvement in budget balances. Primary budget balances (both nominal and cyclically adjusted) became in fact more sensitive to debt levels and easier to adjust over time.

The estimation of fiscal rules as reported in Table 1 permits the construction of counterfactual budget balance values in absence of the EU fiscal framework. In other words, they permit to obtain an estimation of which value for budget balances would have prevailed in absence of the EU fiscal framework but allowing fiscal authorities to follow their output and debt stabilisation motives. Calculation of such counterfactual values for budget balances is a necessary first step to assess the impact of the EU fiscal framework on economic activity. The computation of counterfactual budget balances requires using the fiscal rules estimated before the introduction of the EU fiscal framework to predict values for the budget balances for the following period. Results show that in the 1994-2003 period, primary budget balances for the euro-area aggregate would have been higher by 0.88 percentage point of GDP on average in the absence of the EU fiscal framework.[6] These differences between counterfactual and actual values for primary budget balances for the euro area have been given as shocks to the European Commission's QUEST model to simulate what consequences the absence of the rules for fiscal discipline of the Maastricht Treaty and SGP would have had on euro area economies.

3. SIMULATING THE ECONOMIC EFFECTS OF THE EU FISCAL FRAMEWORK WITH THE QUEST MODEL

3.1 Brief description of the QUEST model

The European Commission's QUEST model is a macroeconomic model whose foundations can be characterised as a New Neoclassical synthesis model. Behavioural equations in the

6 Such predictions have been obtained after estimating fiscal rules as in Table 1 separately for each country (see annex). The counterfactual primary budget balance for a given country in the 1994-2003 period, $b_{t\in[1994,2003]}$, is constructed as follows:

$$b_{t\in[1994,2003]} = \alpha_{1974\text{-}1993} * X_{t\in[1994,2003]} + \varepsilon_{t\in[1994,2003]}$$

where $\alpha_{1974\text{-}1993}$ is the vector of the estimated coefficients for the 1970-1993 period, $X_{t\in[1994,2003]}$ the vector of explanatory variables and $\varepsilon_{t\in[1994,2003]}$ the estimated regression residuals for the 1994-2003 period.

model are based on intertemporal optimisation of households and firms with forward-looking expectations.[7] Prices adjust sluggishly and the nominal wages response is delayed because of overlapping wage contracts. The model has Keynesian features in the short run, but the effectiveness of fiscal policy is more limited than in the traditional econometric models because of the built-in intertemporal budget constraints. Since planning horizons are finite there is no complete tax discounting and Ricardian equivalence does not hold. Moreover, total consumption is represented as the aggregation of the responses of two groups of households, one forward-looking group that follows the optimal consumption rule given by the life cycle/permanent income hypothesis and a liquidity-constrained group whose consumption depends on current disposable income.

$$C_t = (1-\lambda) * \delta [H_t + F_t] + \lambda * Ydis_t$$

where λ is the share of liquidity constrained consumption, H human wealth, F financial wealth and *Ydis* current real disposable income.

Consumption and saving behaviour of the first group is based on the concept of intertemporal utility maximisation of households under a finite planning horizon. Consumers decide how much to consume and how much to save each period by maximising the present discounted expected utility from the consumption stream subject to their intertemporal budget constraint. Human wealth H is the present discounted value of the entire future stream of after-tax income (including unemployment benefits *U.ben*)

$$H_t = E_t \sum_{j=0}^{\infty} b_{tj} \left[(1-t_l) L_{t+j} w_{t+j} + U_{t+j} ben_{t+j} \right]$$

and financial wealth F equals the sum of total equity wealth V, bonds and money holdings and net foreign assets *NFA*

$$F_t = V + B + M + NFA$$

7 The model has a richer theoretical structure than traditional macroeconometric models. Moreover, compared with standard computable dynamic general equilibrium models it allows for adjustment costs and nominal rigidities. For more details, see Roeger and in 't Veld (1997,2002).

As expected future taxes affect permanent income, the expansionary effects of an increase in fiscal spending will be weakened if it leads to an increase in expected future tax liabilities.

The second group of consumers is 'liquidity constrained' and cannot achieve intertemporal optimisation. Hence, their consumption is represented as a function of current real disposable income ('rule-of-thumb' consumers).

The investment specification in the QUEST model is based on profit maximisation by firms, assuming that investment is subject to adjustment costs, which are a convex function of the rate of change of the firm's capital stock. The optimisation problem yields the following investment rule

$$I_t = \frac{1}{\phi}\left(\frac{q_t}{(PI_t / P_t)} - 1\right)K_t$$

where ϕ is the adjustment cost parameter, K the capital stock and PI_t/P_t denotes the relative price of investment goods relative to the GDP deflator. The shadow price of capital q is equal to the marginal product of capital plus any anticipated future events which are expected to influence the marginal product after period t. It is a function of current and discounted future expected profitability, including adjustment costs, and adjusted for profit taxes tc and monopoly rents. This dependency of Q on corporate taxes tc is another channel through which expected future tax liabilities could dampen the expansionary effects of an increase in fiscal spending.

In another paper (Giudice *et al.*, 2003), we have analysed non-Keynesian effects of fiscal consolidations in the EU. There the QUEST model was used to analyse under which circumstances and under what conditions such effects are most likely to appear in the model. Some of the factors that have been put forward to rationalise non-Keynesian effects are in theory present in the model specification. A reduction in government expenditure in QUEST affects consumption of the liquidity-constrained households who see their current disposable income decline if wages and employment are falling. However, the non-liquidity-constrained households could increase their consumption as interest rates fall and if they anticipate higher disposable incomes in the future. The removal of distortions that this entails could boost employment and output and already affect life-time income in the short run. However,

expansionary effects through the consumption channel may occur in the medium term, but if a sizeable share of households is liquidity constrained, the boost to consumers' spending that might result from lower future tax liabilities is not strong enough to offset the negative impact of the reduction in government spending on impact.

Besides the consumption channel, QUEST allows for the working of non-Keynesian effects through the investment channel. A reduction in public expenditure, in particular public employment, will raise unemployment and exert downward pressure on wages. This in turn tends to boost profits and raise investment spending. This is the investment channel emphasised, for instance, in Alesina *et al.* (2002). This mechanism operates in the model through the wage setting specification which states that the real wage negotiated each period is the outcome of a Nash bargaining solution and depends on the reservation wage (value of leisure, unemployment benefits), labour productivity and a measure of labour market tightness (unemployment). If a fiscal expansion affects the latter and puts upward pressure on wages, it will have a negative effect on investment by lowering expected profitability.

In general, the Keynesian effects of fiscal policy dominate in the model, at least in the short run, but, as shown in Giudice *et al.* (2003), under certain conditions these effects become so small that non-Keynesian effects soon become to dominate.

The monetary policy assumption in the scenarios described below is based on a forward looking Taylor-type rule. The monetary authorities are assumed to set short-term interest rates at a level that depends both on the deviation of the forecast of inflation from the target inflation rate and on the magnitude of the output gap. The target equilibrium real interest rate is left unchanged in the first simulation reported here, and adjusted for an effect of higher public debt on interest rates in the second simulations.

3.2 Counterfactual model simulation

To assess the effect of the EU fiscal framework on the EU economy, the counterfactual budget balances calculated as residuals from the fiscal rules described in section 2, are given as shocks to the model. To focus the simulation analysis on the effects of the size of the

budget deficits rather than on those of the composition of budgetary adjustment, such shocks to budget balances have been equally split between revenues and expenditures in the model.[8]

This counterfactual "absence of fiscal discipline" scenario is simulated to come fully into effect in 1994. Table 2 shows the results of this simulation for the euro area average. The fiscal loosening implied by the estimated counterfactual rules amounts to an increase in the deficit-to-GDP ratios of roughly 1 percentage points on average for the euro area as a whole (ex post).

In this counterfactual simulation, the fiscal loosening has a positive impact on GDP but the effects of a lasting fiscal expansion are relatively small. GDP is around 0.3 per cent higher in the first year, but gradually declines in following years. Permanent increases in fiscal spending have a much smaller impact multiplier than temporary fiscal expansions in the model. Besides the conventional import leakage channel, another reason for this smaller impact multiplier is that it is assumed that economic agents know the size and duration of the fiscal expansion and immediately adjust their behaviour to it. Anticipation of increasing future tax liabilities partly offsets the stimulus from higher current government transfers to households and lower taxes. Consumers' expenditure is boosted by higher transfer payments, but those consumers that are not liquidity-constrained anticipate a higher tax burden in the future and this suppresses their consumption growth to some extent. Private investment, however, is more strongly crowded-out by the increase in fiscal spending and investment falls by up to 2 per cent below base. The fiscal relaxation leads to a build-up of government debt over the years and by 2004, the debt-to-GDP ratio is more than 8 percentage points higher. There is a small effect on interest rates in this counterfactual scenario, with long rates 0.11 percentage points higher and real short term rates up by 0.06 percentage points on impact [9]. It is assumed that there is no change in the behaviour of the fiscal authorities and the fiscal expansion continues in the years after 2003, with a further accumulation of debt. The demand expansion at home is accompanied by a jump appreciation of the exchange rate, followed by a

8 More precisely, the shock to primary budget balances is equally split between taxes and expenditures. Shocks to taxes are in turn equally divided among three tax rates (labour income tax, corporate profit tax and value added taxes) and shocks to expenditures equally divided between transfers to households and government consumption.

9 Nominal short term interest rates are determined by a monetary policy rule which targets expected inflation and the output gap and assumes no change in the equilibrium real interest rate. The fiscal expansion simulated here has a small positive effect on inflation and output and interest rates rise.

gradual depreciation in following years. The loss in competitiveness leads to a worsening of the trade balance.

Table 2: Counterfactual simulation of "no fiscal discipline" (EU-12, no impact of debt on interest rates risk premium)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	*2010*
GDP (perct. diff)	0.26	0.18	0.18	0.17	0.16	0.15	0.11	0.09	0.08	0.06	0.04	*-0.11*
Consumption (perct.diff)	0.53	0.51	0.54	0.56	0.58	0.58	0.59	0.59	0.60	0.61	0.62	*0.62*
Investment (perct. diff)	-0.86	-1.01	-1.08	-1.16	-1.25	-1.34	-1.45	-1.64	-1.85	-2.00	-2.11	*-3.16*
Short-term interest rate	0.11	0.11	0.11	0.11	0.11	0.10	0.09	0.10	0.11	0.12	0.13	*0.10*
Long-term interest rate	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.08	*-0.16*
Real short-term int. rate	0.06	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	*0.04*
Euro-Dollar exchange rate	-0.46	-0.34	-0.22	-0.12	-0.02	0.09	0.18	0.26	0.36	0.47	0.59	*1.32*
Trade balance/GDP	-0.09	-0.11	-0.11	-0.11	-0.10	-0.09	-0.09	-0.08	-0.07	-0.06	-0.05	*0.03*
Deficit/GDP	0.89	0.95	0.96	0.96	0.94	0.92	0.98	0.97	0.93	0.90	0.94	*0.94*
Debt/GDP	0.25	1.16	2.03	2.88	3.69	4.49	5.26	6.07	6.90	7.61	8.28	*12.1*

Note : differences from baseline

In this counterfactual scenario, the effect of the increase in deficits and debt on interest rates is limited and the target equilibrium real interest rate in the monetary policy targeting equation is left unchanged. In the following section we analyse the potential effects an increase in public deficits and debt can have on interest rates.

4. Deficits and interest rates

Persistent deficits as simulated in the previous section reduce national savings and increase over time the stock of government bonds. New issues of debt can be absorbed by the public only if they yield higher real returns. This increase in government bonds' real returns shifts savings away from productive capital and reduces capital accumulation. In this section we first look at the empirical evidence on the effects of deficits and debt on interest rates and on risk premia in particular. We then add a risk premium shock to the counterfactual model simulations to take into account the effect of higher public debt on interest rates.

4.1 Empirical estimates of effect of public deficits and debt on interest rates

Empirical estimates of the effects of public deficits and debt on interest rates vary widely, depending on the data and methodology used, but many studies find significant effects of public deficits and/or public debt on interest rates. There is a large body of literature, many

focusing on the US, but some also on European countries. Most of these studies indicate that an increase in the deficit of 1 percent of GDP raises real interest rates by between 20 to 60 basis points. Estimates using debt measures as explanatory variable tend to find smaller impacts on interest rates. These can be reconciled with the estimates found for deficits as a reflection of expected persistence.

Laubach (2003) studies the relationship between long-horizon expected government debt and deficits, as measured by official US projections, and expected future long term real interest rates. He finds that a 1 percentage point increase in the projected deficit-to-GDP ratio increases the 10 year bond rate expected to prevail 5 years into the future by 25 basis points. A 1 percentage point increase in the projected debt-to-GDP ratio raises future interest rates by 4 to 5 basis points. Estimates using nominal yields, and including expected inflation as an additional regressor, are somewhat smaller. For these estimates of the effects of deficits and debt to be consistent which each other, it implies that investors view the increases in projected deficit-to-GDP ratios as highly persistent, but not strictly permanent.

Tanzi and Chalk (2000) find that a stable relationship exists for the EU panel as a group between the level of debt and real interest rates. A pooled random effects regression on interest rates on debt over the sample 1970-98 suggest that an increase in the average EU debt to GDP ratio of 10 percentage points leads to an increase in real interest rates of 0.6 percentage points. However, for the 1980-98 sub-sample they find the effect to be only 0.1 percentage points. Both estimates are highly significant. Several other studies, many focussing on the US, have found much larger effects than reported in these two studies, in particular from budget deficits.[10]

[10] Laubach(2003) and Elmendorf and Mankiw(1999) sketch what, under plausible assumptions, theory tells us about the effect of deficits on interest rates and output. In the neoclassical growth model, the real interest rate is determined by the capital-output ratio, and the effect on interest rates crucially depends on how capital is affected by an increase in debt. If factors earn their marginal product, the share of capital in income α equals the marginal product of capital *MPK* times the capital output ratio *k*. The marginal product of capital α/k equals the real interest rate *r* plus the depreciation rate *d*, hence $r = \alpha/k - d$. Assuming a Cobb-Douglas production function $Y = K^{\alpha} L^{(1-\alpha)}$, the effect of an increase in the debt to GDP ratio on *r* is then given by the derivative of *r* with respect to *D* : $\partial r/\partial D = \partial r/\partial k * \partial k/\partial K * \partial K/\partial D$. The first derivative is $-\alpha/k^2$. Assuming for the EU a capital share in income of 1/3 and a capital output ratio of 3, this equals -0.037. The second term equals $(1-\alpha)/Y$, or 0.67/Y. The third term, $\partial K/\partial D$, is crucial. Elmendorf and Mankiw cite several studies that show that the increase in private savings in response to a change in interest rates is low, or close to zero. The Feldstein and Horioka (1980) finding that roughly two-thirds of savings is retained for domestic investment, implies that capital inflow from abroad offsets roughly one-third of the increase in debt, and Laubach assumes a value for $\partial K/\partial D$ of -0.6. Combining all this leads to the result that a 1 percent of GDP increase in debt raises the real interest rate by 1.5 basis points. This compares to a value of 2.1 basis points that Laubach calibrates for the US based on k=2.5.

In Table 3 below estimates are shown of the relationship between expected deficits and the term structure of government bond interest rates. The methodology followed is akin to that in Canzoneri, Cumby and Diba (2002) on the US case. The dependent variable employed is the interest rate spread between long and short-term bonds (i.e., between 10 year government bonds and 3 month bills). This approach permits to assess the impact of expected budget outcomes on financial asset returns without modelling the determinants of interest rate levels. The hypothesis is that an expectation of higher public deficits in the future induces an expectation of lower aggregate savings and increased interest rates. Arbitrage in bond markets will equate returns on long terms bonds with average expected future returns on short term bonds. This will translate in turn into a steepening of the yield curve, i.e., an immediate increase in the spread between long and short-run interest rates.

Several measures of budget balances are used as explanatory factors. A first measure simply consists of the current budget balance implicitly assuming static expectations by agents. A more direct measure of agents' expectations employed is the one year ahead budget balance forecast produced by the European Commission. A third measure used, aimed at capturing agents' expectations of budget balances over a longer time frame, is the simple average of the values recorded in the cyclically-adjusted budget balance over a time horizon of three years. The data-set comprises of yearly data for all EMU countries (except Luxemburg) for the 1990-2002 period. In order to account for a possible impact of the different institutional regimes included in the sample on the term structure of interest rates, two dummy variables have been included. One dummy takes value 1 for all the years following phase II of EMU (i.e., all years from 1994 on) and the purpose of it is to capture the impact on interest rate expectations associated with the start of the convergence process. The other dummy employed takes value 1 for all the years following phase III of EMU (i.e., all years from 1998 on) and the reason for its inclusion is to account for the effect of the introduction of the single currency.

Since the expectations on interest rates are to a large extent driven by the perception of economic agents on cyclical developments, the output gap is also included as a further explanatory factor for the interest rate spread. To the extent that a low value of the current

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These calculations obviously depend on the assumed values but they also ignore second round effects, leading Laubach (2003) to argue it is a conservative estimate and a lower bound.

output gap is associated with expectations of a forthcoming upturn in the cycle, while high output gaps tend to be associated with expectations of downturns, the coefficient of the output gap is expected to be negative in the regressions.

The empirical analysis shows that expected deficits have a statistically significant impact on interest rates. Moreover, results appear to be fairly robust both with respect to the measure of expected deficit used and the specification of the equation estimated. The analysis shows that an increase in the deficit-to-GDP ratio of one percentage point raises long term interest rates by about 15-20 basis points. The estimated impact is consistent with that reported in other studies. It can be reconciled with the reported effect of one percentage point increase in the debt-to-GDP ratio of 1 to 6 basis points in Tanzi and Chalk (2000), if investors view the deficit projections as highly persistent.

Table 3: The relation between interest rate and public budget balances (EMU-11, 1990-2002)

Specifications Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Budget balance	-0.21*** (-3.59)			-0.16** (-2.44)		
1 year ahead budget balance forecast		-0.16** (-2.02)			-0.1 (-1.26)	
3 years ahead CAB			-0.2** (-2.09)			-0.19** (-2.03)
Output gap				-0.11 (-1.6)	-0.165** (-2.34)	-0.17*** (-3.21)
EMU phase II dummy	2.82*** (8.28)	2.78*** (7.45)	3.23*** (9.54)	2.74*** (7.99)	2.55*** (6.7)	3.02*** (9.12)
EMU phase III dummy	0.82** (2.76)	0.62** (2.02)	-0.01 (-0.06)	0.94*** (3.10)	0.89*** (2.79)	0.5 (1.66)
Constant term	-1.48*** (-5.62)	-1.33*** (-4.46)	-1.87*** (-4.89)	-1.38*** (-5.2)	-1.13*** (-3.93)	-1.78*** (-4.97)
Number of observations	123	121	107	123	121	107
R square within groups	0.42	0.37	0.57	0.43	0.39	0.59
Estimated error auto-regression coefficient	0.38	0.38	0.5	0.39	0.41	0.2
F statistic	26.31	21.51	42	20.39	17	34.25

NB: Dependent variable: difference between yearly average nominal interest rates between 10 year government notes and 3 moth bills.
Estimation method: within-panel regression correcting for error order one serial correlation.
***, **, * denote statistical significance at, respectively, 1, 5, and 10% level.

The discussion above looked at the relationship between deficits, debt and interest rates in a broad sense. This did not distinguish between the effects of budget balances on national

savings in general and the issue of risk premia on government bonds more specifically. Another strand of the literature focuses more directly on the effect governments' fiscal positions have had on risk premia. A series of studies have attempted to estimate the impact of government debt on credit risk premia. Bayoumi, Goldstein, and Woglom (1995) analyse credit risk determinants of US municipal bonds. The measure of credit-risk used is the difference between yields on 20 year general obligation bonds of 39 US states and that of New Jersey and find that debt ratio differences have a significant, large and non-linear effect on yield spreads. A similar approach has been applied in Bernoth, Von Hagen and Schuknecht (2003) who analyse differences between bond yields on government bonds of different EU countries and comparable bonds issued by Germany in the same currency over the period 1991-2002. Their findings are that an additional GDP point of debt raises yield spreads significantly but by much less than found for the case of US municipal bonds (by a bit more than 1 basis point).[11] In Alesina et al. (1992) the difference between government and private sector bonds denominated in the same currency is used as a proxy of credit risk premia and employed as dependent variable in regression analysis on a panel of 12 OECD countries over the period 1974-89. The study estimates an average impact of 1.6 basis points of each additional GDP point of debt when limiting the sample to high-debt countries.[12] The proxy used in Alesina et al. (1992) to measure credit risk has the main limitation of not being able to control for changes in private risk. A further limitation is that differences in liquidity risk are also not taken into account. In subsequent studies this issue has been addressed by measuring as a proxy of credit risk the difference between the interest rate on government bonds and the returns on swaps (with same maturity and denominated in the same currency). Since there is no principal at risk in swap contracts, such measure permits to control for differences in private risk. Adopting such measure for credit risk, Lemmen and Goodhart (1999) estimate an impact of 1.5 basis point for each additional percentage point of the debt-to-GDP ratio in a panel of EU countries. Codogno, Favero and Missale (2003) disentangle the credit risk component from the liquidity premia component in interest rate swaps and find that debt ratios are not significant in explaining interest rate swap spreads in most EU countries, with the exception of Spain, Italy and Austria, where debt has been found to be a significant and quantitatively relevant explanatory factor.

[11] Balassone, Franco and Giordano (2004) also find a high and significant impact of changes in the debt/GDP ratio, and overall and primary deficits on interest rate spreads with Germany in a regression across euro area countries.

[12] A similar result is found in Caselli, Giovannini, and Lane (1998).

4.2 Counterfactual simulations with risk premia effects

Given the strong evidence of a significant effect of governments' fiscal positions on interest rates, the counterfactual simulation described in section 3.2 is repeated here to include a risk premium effect in line with this evidence. As estimates based on (projected) deficits depend on the expected persistence of such deficits, the first scenario (reported in Table 4.a) incorporate an additional risk premium effect of 1 basis point per 1 percentage point increase in government debt, corresponding to a risk premium of 10 basis points when the debt-to-GDP ratio has increased by 10 percentage points[13]. This roughly corresponds to the estimates in Tanzi and Chalk (2000) for the EU in the later sample 1980-98 and is also in line with estimates found of risk premia on governments bonds. Compared to some of the other estimates found in the literature, it is however on the low side, and an alternative scenario with a risk premium of 2 basispoint for a 1 percentage point increase in the debt-to-GDP ratio is also shown (Table 4.b).

The results when risk premia are taken into account are markedly different from the scenario described in Table 2. The positive GDP effects of a fiscal expansion are now short-lived and have almost disappeared after a few years. The risk premium leads to higher interest rates and crowding out of private spending. The stimulus to private consumption is in this case about half as large, while private investment falls further below base. With a larger risk premium (Table 4.b) the increase in interest rates more or less offsets the boost the fiscal expansion gives to private consumption and spending falls back to levels around base. In this case the crowding out of private investment is much stronger and it illustrates the large effect public debt can have on capital accumulation. The exchange rate depreciates, by 1.5 and 3.5 per cent respectively, and the gains in competitiveness and lower demand in later years is associated with an improvement of the trade balance. But the increase in net exports is not enough to offset the decline in private demand and GDP falls below base in the medium run.

Hence, when effects of persistent deficits and rising debt on interest rates are taken into account, the results under a scenario of absence of fiscal discipline turn out to be only temporarily positive, but with larger adverse effects in the medium term. According to these

13 Technically, in this simulation a risk premium is added to the uncovered interest parity condition in the model, which links expected exchange rate changes to interest rate differentials. The risk premium is a function of the differences in the debt-to-GDP ratio from that in the baseline.

simulations, the EU rules-based fiscal framework has only had a temporarily negative impact on growth in the short run, but it has helped to avoid a situation in which accumulating public debt would have crowded-out private investment and reduced potential growth in the medium and long term.

Table 4a: Counterfactual simulation of "no fiscal discipline" with risk premium (EU-12, 10bp increase in risk premium for 10%p increase in debt/GDP)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	*2010*
GDP (perct. diff)	0.20	0.13	0.09	0.07	0.04	0.00	-0.03	-0.05	-0.08	-0.11	-0.14	*-0.28*
Consumption (perct.diff)	0.36	0.11	0.22	0.22	0.23	0.24	0.25	0.27	0.29	0.30	0.32	*0.38*
Investment (perct. diff)	-1.62	-2.03	-2.21	-2.41	-2.57	-2.73	-2.93	-3.15	-3.35	-3.49	-3.59	*-4.09*
Short-term interest rate	0.11	0.10	0.10	0.11	0.11	0.12	0.15	0.17	0.18	0.19	0.21	*0.20*
Long-term interest rate	0.13	0.14	0.16	0.17	0.18	0.19	0.20	0.21	0.21	0.20	0.17	*-0.08*
Real short-term int. rate	0.06	0.04	0.04	0.04	0.05	0.05	0.06	0.07	0.07	0.08	0.08	*0.08*
Euro-Dollar exchange rate	1.42	1.53	1.59	1.65	1.70	1.74	1.79	1.85	1.91	1.97	2.04	*2.41*
Trade balance/GDP	0.00	0.10	0.10	0.13	0.14	0.15	0.18	0.18	0.18	0.19	0.19	*0.16*
Deficit/GDP	0.92	1.00	1.00	1.01	0.98	0.96	1.04	1.02	0.99	0.96	1.00	*1.01*
Debt/GDP	0.30	1.25	2.20	3.10	3.94	4.79	5.57	6.40	7.26	7.99	8.67	*12.58*

Note : differences from baseline

Table 4b: Counterfactual simulation of "no fiscal discipline" with risk premium (EU-12, 20bp increase in risk premium for 10%p increase in debt/GDP)

	1994	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2010*
GDP (perct. diff)	0.15	0.08	0.00	-0.04	-0.09	-0.17	-0.17	-0.20	-0.24	-0.29	-0.33	*-0.47*
Consumption (perct.diff)	0.17	-0.11	-0.13	-0.14	-0.14	-0.13	-0.12	-0.08	-0.05	-0.03	0.00	*0.13*
Investment (perct. diff)	-2.46	-3.16	-3.44	-3.77	-3.99	-4.22	-4.53	-4.77	-4.96	-5.05	-5.08	*-5.18*
Short-term interest rate	0.12	0.10	0.08	0.12	0.11	0.13	0.21	0.24	0.25	0.27	0.30	*0.30*
Long-term interest rate	0.17	0.18	0.20	0.23	0.25	0.27	0.29	0.30	0.30	0.30	0.27	*0.00*
Real short-term int. rate	0.05	0.04	0.03	0.05	0.05	0.05	0.08	0.10	0.10	0.11	0.12	*0.12*
Euro-Dollar exchange rate	3.51	3.59	3.59	3.59	3.59	3.54	3.55	3.58	3.59	3.60	3.62	*3.59*
Trade balance/GDP	0.09	0.34	0.34	0.38	0.41	0.42	0.47	0.47	0.45	0.45	0.44	*0.30*
Deficit/GDP	0.96	1.05	1.05	1.05	1.01	0.99	1.10	1.09	1.05	1.02	1.07	*1.08*
Debt/GDP	0.36	1.35	2.39	3.33	4.22	5.12	5.90	6.76	7.65	8.40	9.10	*13.06*

Note : differences from baseline

5. CONCLUSIONS

It is often claimed that the discipline enforced by the Maastricht Treaty changed fiscal policy fundamentally in the mid 1990s. A comparison based on fiscal rules estimated before and after 1994 show that the changes in behaviour of the fiscal authorities were quite significant. In many countries fiscal adjustment had already commenced before 1994 but the changes observed after 1994 on average amounted to a reduction in deficits of around 0.9 per cent of GDP. In an absence-of-fiscal-discipline scenario, simulated as a counterfactual scenario here starting in 1994, this would have led to a sizeable build-up of government debt. The adverse consequences of such an increase in public debt could be significant, as studies show it can give rise to a significant increase in interest rates and lead to a consequent crowding-out of investment.

A scenario ignoring the impact of debt on risk-premia on interest rates shows the gains of no-fiscal-discipline would not have exceeded half a percent of GDP and would have turned negative in the medium term. When the effects of higher public debt on interest rates are taken into account, the gains from an absence of fiscal discipline over the last decade would have been even smaller in the short run, and would have become negative already after some years. In that case, GDP would have been lower at present and, in the absence of fiscal discipline, continue to decline further. The most marked effect would have been on private investment, which would have been strongly crowded-out by higher deficits and haven fallen by 3 to 5 per cent below base.

Hence, this analysis suggests that the EU fiscal framework as provided by the Treaty and the SGP has not had long-term negative consequences, but instead has helped to avoid a situation in which accumulating public debt would have crowded-out private investment and reduced potential growth.

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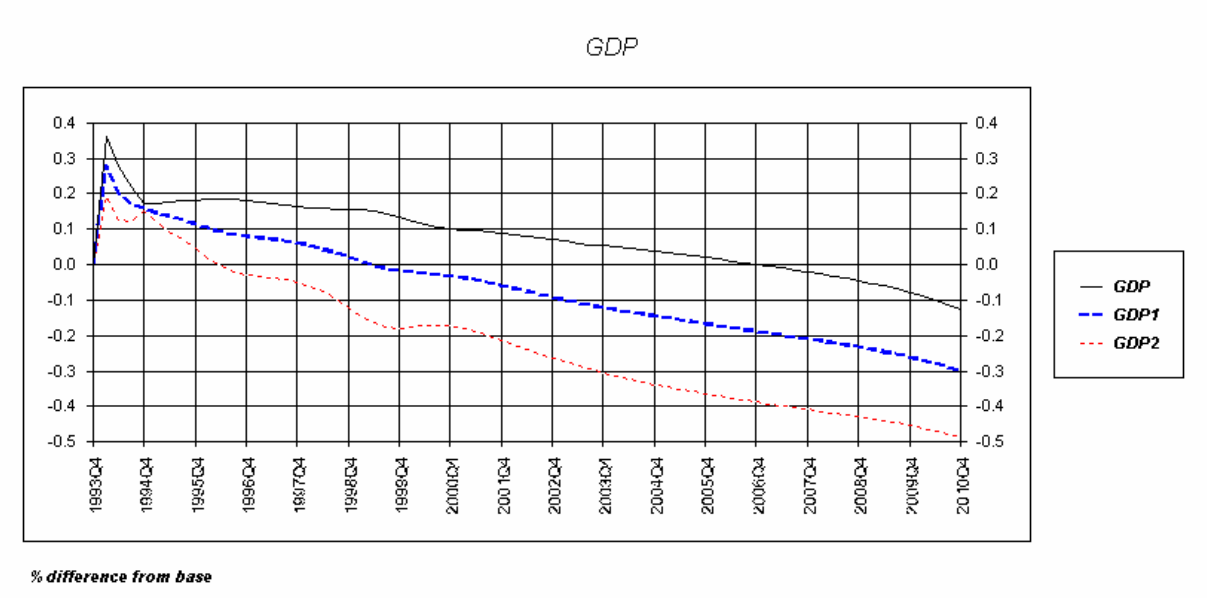
Chart 1 Counterfactual absence of fiscal discipline scenario: EU-12 GDP (1994-2010)



Note: Solid line GDP = no risk premium; Dashed line GDP1 = risk premium of 1 basis points per 1 %point increase debt; Dotted line GDP2 = risk premium of 2 basis points per 1 %point increase debt.

ANNEX Table A1 The EU fiscal framework and budgetary behaviour (EU-11)

	BE	DK	DE	EL	ES	FR	IE	IT	NL	AT	PT	FI	SE	UK
Pre EMU phase II														
Output gap	0.25* (0.53)	1.44 (1.72)	-0.23*** (-2.00)	0.18 (0.80)	-0.03 (-0.15)	0.14 (0.58)	-0.55*** (3.11)	-0.14 (-0.73)	0.02 (0.07)	0.32 (1.16)	0.03 (0.24)	0.30** (2.57)	-0.17 (-0.27)	0.20 (1.37)
Debt at t-1	0.04** (2.87)	0.07*** (3.44)	0.00* (0.00)	0.00 (0.26)	0.01 (0.66)	-0.04 (-1.15)	0.04* (2.07)	0.06*** (3.26)	0.03 (1.17)	0.02 (0.85)	0.09*** (4.05)	-0.12* (-1.79)	0.03 (0.72)	0.01 (0.44)
Primary budget balance at t-1	0.58** (2.66)	0.27 (1.13)	0.52*** (4.12)	0.58*** (3.58)	0.81** (2.59)	0.41 (0.76)	0.69*** (6.45)	0.41** (2.28)	0.31 (0.92)	0.46** (2.58)	0.44*** (3.26)	0.25 (1.25)	1.01*** (3.74)	0.66*** (5.99)
Constant	-3.99** (-2.88)	0.51 (0.59)	0.30 (0.26)	-1.31 (-1.55)	-0.58 (-1.12)	1.20 (1.05)	-2.97* (-2.02)	-6.02*** (-3.15)	-0.91 (-0.73)	-0.52 (-0.55)	-4.91*** (-4.10)	5.29* (2.86)	-1.80 (-1.08)	-0.96 (-0.59)
Number of observations	23	22	22	23	23	16	23	23	18	23	20	23	23	23
R square	0.7473	0.8217	0.3987	0.47	0.594	0.363	0.83	0.649	0.333	0.527	0.711	0.829	0.594	0.660
F	36.37	58.99	13.89	9.49	8.56	1.77	33.8	16.55	3.44	3.71	15.05	106.82	13.02	15.59
Post EMU phase II														
Output gap	0.57* (2.41)	1.82** (3.12)	2.74*** (9.04)	0.10 (0.17)	0.07 (0.26)	0.25 (0.52)	1,07*** (4.72)	0.65* (1.22)	1.25*** (5.25)	0.47 (1.55)	0.25 (1.88)	0.83** (2.78)	1.23 (1.65)	5.75 (1.50)
Debt at t-1	0.00 (0.10)	-0.02* (-0.44)	0.29*** (8.60)	0.13 (0.55)	0.07 (1.20)	0.14 (0.65)	0.23*** (4.10)	0.16** (2.71)	0.14*** (6.43)	0.35*** (3.93)	0.29** (3.20)	-0.08 (-0.45)	0.21* (2.03)	-0.09 (-0.38)
Primary budget balance at t-1	0.35 (1.13)	-0.18 (-0.35)	-0.88*** (-7.95)	0.23 (1.01)	0.79** (3.04)	0.18 (0.20)	-0.40 (-1.67)	0.36 (1.92)	-0.37 (-1.29)	0.59*** (5.52)	-0.42* (-2.13)	0.17 (0.61)	0.60** (2.55)	-0.24 (-0.35)
Constant	3.62 0.73	7.19 (1.39)	-15.02*** -(8.36)	-10.04 (-0.39)	-3.87 (-0.99)	-7.29 (-0.65)	-9.98** (-2.49)	-15.53* (-2.30)	-5.20*** (-4.93)	-22.41*** -(3.96)	-16.51** -(3.13)	7.91 (0.78)	-11.79 (-1.73)	4.86 (0.46)
Number of observations	10	10	10	10	10	10	10	10	10	10	10	10	10	10
R square	0.789	0.828	0.924	0.197	0.891	0.685	0.701	0.612	0.921	0.874	0.628	0.937	0.791	0.900
F	13.67	6.84	30.69	1.15	18.43	13.46	7.81	4.99	71.19	33.51	3.64	74.76	9.98	28.29

Note: Z statistics reported in parenthesis. ***, **, * denote statistical significance at, respectively, 1, 5, and 10% level.
The output gap variable is instrumented using its own lag and the lagged US output gap. All variables are expressed as a percentage of trend output.