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António Afonso
ISEG-ULisboa; UECE, Research Unit on Complexity and Economics

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Contact: António Afonso - aafonso@iseg.utl.pt.
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António Afonso
ISEG-ULisboa; UECE,
Research Unit on Complexity and Economics

Jorge Silva
ISEG-ULisboa; UAO-Portuguese Parliament

Abstract

We study the deviations between the budget balance ratio forecasts and outcomes in the European Commission semi-annual vintage forecasts for the period 1998-2011. Our main conclusions are: i) there is evidence that the deviations of real GDP and inflation can explain the deviations of the budget balance ratio; ii) total investment growth deviations are also important; iii) unemployment rate deviations are not statistically relevant; iv) the fiscal rule index is not a statistically significant determinant of the budget forecast deviations; iv) higher than forecasted ratios of expenditure, revenue and debt for the EU are relevant; v) and expenditure-to-GDP deviations were larger than the revenue-to-GDP ones for the EU.

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1 Introduction

This paper studies the divergence between budget deficit forecasts and final outcomes for the European Commission (EC) semi-annual vintage forecasts, with a dataset for the period 1998-2011. This is naturally a policy relevant subject notably because of fiscal policy's effects on the macroeconomic environment and its links with financial markets.

Therefore, deviations between planned and observed fiscal balance-to-GDP ratios can affect the credibility of the implementation of fiscal policy. As a consequence, such deviations can have negative impacts on the interests rates paid on government debt and make it more difficult to rollover the existing stock of debt. For instance, 10-year yields in the period 1998-2008 in the European Union (EU) increased with the worsening of budget deficits Afonso (2010). Additionally, the accuracy of the estimations of fiscal multipliers has suggested higher multipliers in troughs, with more demanding fiscal consolidations connected with unfavourable deviations on real GDP growth forecast Blanchard and Leigh (2012).

Our main conclusions are: i) there is evidence that the deviations of real GDP and inflation can explain the deviations of the budget balance ratio; ii) total investment growth deviations are also important; iii) unemployment rate deviations are not statistically relevant; iv) the fiscal rule index is not a statistically significant determinant of the budget forecast deviations; iv) higher than forecasted ratios of expenditure, revenue and debt for the EU are relevant; v) and expenditure-to-GDP deviations were larger than the revenue-to-GDP ones for the EU.

The paper is organized as follows. Section two reviews the literature. Section three presents the methodology. Section four reports the empirical analysis. Section five concludes.

2 Literature

In an earlier study, Pina and Venes (2007) analysed the track record of fiscal forecast errors of 15 EU member states from 1994 to 2006. They used data from the Excessive Deficit Procedure (EDP) instead of the Stability and Growth Programme (SGP), as well as studying the forecast error not only of the budget balance-to-GDP ratio, but also the interest payments and gross fixed capital formation (GFCF). In their analysis, countries with commitment or mixed forms in fiscal governance were associated with more prudent fiscal predictions.

Moulin and Wierts (2006) investigated the track record of multiannual budgetary plans of EU member states, using data from Stability and Convergence Programmes. The results showed failures in projected reductions of expenditure-to-GDP ratios due to difficulties in reducing spending in nominal terms instead of stemming from unfavourable macroeconomic developments.

Annett (2006), for the EU countries, reports that countries with commitment and high growth volatility were associated with lower forecast errors in budgetary projections. The rules-based fiscal framework seemed to mitigate the adverse effects of elections, but in the SGP period this distortion rose again.

Brück and Stephan (2005) studied the political determinants of budget deficit forecast errors in the period under the SGP, concluding that governments had manipulated predictions before elections. Furthermore, political parties of government moving to right (left) made cautious (optimistic) forecasts.

Strauch, Hallerberg and von Hagen (2004) also studied the performance of budgetary and growth forecasts of EU member states. They used data from the Stability and Convergence Programmes from 1991 to 2002, and reported evidence of a pro-cyclical fiscal stance, at least during the convergence process until 1998.

Artis and Marcellino (2000) studied the performance of the government deficit forecasts by international institutions – EC, IMF and OECD for the G7 countries, providing different

outcome among countries and supporting an idea of asymmetric loss function. In practice, they have found different results among countries, and there was no evidence of a single agency with the most accurate projections for all countries, but the EC seems to have a better performance for some countries.

Marinheiro (2010) argues that some governments could be forced to justify optimistic deviations between the SGP's macroeconomic scenario and EC forecasts.

A natural caveat in these studies is that although the EC does not possess the full detailed budget information, the differences between government and EC forecasts are increasingly explained. Therefore, the governments and the EC know rather well the causes for any differences in their respective forecasts. Furthermore, the EC has more detailed knowledge about the European economy as a whole and about external demand than national governments, which may have impact on some fiscal variables.

3 Methodology

We use the semi-annual forecast vintages of the EC. In this context our deviation is defined by the realization, *r*, minus the forecast, *f*:

$$e_{i,t} = r_{i,t} - f_{i,t} \tag{1}$$

where *i* denotes country and *t* is the period of prediction.

Therefore, we evaluate whether the deviation of the budget balance-to-GDP ratio can be explained by deviations of other economic variables. In our study we take into account deviations not only of the budget balance-to-GDP ratio and of real GDP but also of the unemployment rate, investment, inflation and numerical fiscal rules.

In addition, we also assess the deviations in the decomposition of the government budget constraint, snow-ball effect of the stock of debt, interest rate effect, nominal GDP effect, primary balance and other adjustments. This specification integrates not only adjustments with direct impact on government debt but also variables connected to the budget deficit. Consequently, the growth forecast accuracy would have an important role on taxes, expenditures and on the denominator of the ratio. The usual government budget constraint illustrates such dynamics:

$$b_t - b_{t-1} = \frac{i_t - n_t}{1+n_t} b_{t-1} + g_t - \rho_t + sf_t \tag{2}$$

where *b* is the debt-to-GDP ratio, *i* is the implicit interest rate paid on the outstanding stock of government debt, *n* is the nominal growth rate of the economy, *g* is the primary spending-to-GDP ratio, ρ is the revenue-to-GDP ratio, and *sf* is the stock-flow adjustment-to-GDP ratio.[1]

Furthermore, we can identify the nominal (numerator) and the denominator effects (a similar reasoning was presented by Moulin and Wierts (2006)), which allow checking whether the budget balance forecast error is coming from divergence predictions on GDP as well as from expenditure or revenue items. We compare forecasts and realizations of annual variations in ratios, i.e. debt, expenditure and revenue ratios.

[1] The stock-flow adjustment includes differences in cash and accrual accounting, accumulation of financial assets, valuation changes as well as other residual effects. This term has assumed particular relevance during the 2008-2009 economic and financial crisis in light of the financial support provided by many euro area governments to ailing financial institutions and state owned enterprises.

4 Empirical analysis

The dataset was built for the EMU period (1999-2011) with twice a year vintage forecasts since spring 1998 (the original time span is 1998:1-2010:2) for the same set of countries, including a larger range of variables – real GDP, inflation, GDP deflator, unemployment rate, investment, general government gross debt, primary balance, revenue-to-GDP, expenditure-to-GDP, and budget balance-to-GDP ratios. Some variables were not available in the beginning of this period for all countries and Luxembourg had not available data for some indicators until later - autumn 1999. This dataset will allow econometric estimations as well as the decomposition of the effects underlying the government budget constraint and the revenue and expenditure-to-GDP ratios. It is important to stress that this dataset includes realizations based on final results from AMECO and Eurostat.[2] The outcomes for 1998-2011 contain revised data (and revisions usually include a systematic bias in Europe, see Castro, 2012). In this case, we used revised data because there is evidence that estimates are biased and revisions tend to present lower budget balances. In the literature there is a controversy about revised data or first estimate and no choice seems better clearly. We think that both may be acceptable, but it is important to know the differences.

Furthermore, the fiscal rule index published by the EC for the period 1990-2010 is also taken into account, as a possible determinant of forecast deviations.

4.1. Determinants of fiscal deviations

In a panel approach for the period 1998:1-2010:2 the deviation of forecasts of general government budget balance ratio in the year t+1 may be explained by other economic variables projected to t+1, notably divergences in inflation and in real GDP, see estimation results in Table I. Furthermore, the deviation of observed budget balances in the previous year t does not seem play a statistically significant role. On the other hand, the deviation of predictions of the unemployment rate as well as the period when forecasts were published (spring or autumn) is not statistically significant (not reported). There was no evidence of endogeneity.

Equation (3) presents the regression (1) of Table I**Error! Reference source not found.** and we need a first-order autoregressive coefficient of the error term in order to solve problems with autocorrelation:

$$B_{i,t}^{t+1} = \beta_0 + \beta_1 Y_{i,t}^{t+1} + \beta_2 I_{i,t}^{t+1} + \beta_3 \pi_{i,t}^{t+1} + \beta_4 U_{i,t}^{t+1} + \beta_5 B_{i,t}^{t} + \beta_6 FR_i^{t+1} + u_{i,t}^{t+1}$$
$$u_{i,t}^{t+1} = \rho u_{i,t-1}^{t} + \varepsilon_t^{t+1}, \qquad (3)$$

where B is the deviation of the budget balance ratio (percentage points), Y is the deviation of the real GDP growth rate, I is the deviation of the investment rate, π is the deviation of the inflation rate, U is the deviation of the unemployment rate, FR is the value of the fiscal rule index and ρ is the first-order autoregressive coefficient of the error term (u). Subscript (i,t) flag the forecast for the country i released in the year t for the period of superscript. Subscript (i) flag the realization for the country i in the period of superscript.

Regressions from 2 to 5 of Table I**Error! Reference source not found.** represent different combinations of independent variables in order to test robustness.

[2] AMECO and Eurostat dataset, 8 June 2012.

Table I - Estimation of balance-to-GDP ratio deviation $B_{i,t}^{t+1}$

(1998:1-2010:2 coefficients in percentage points)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
β_0	-0.3834	-0.6652**	-0.5950**	-0.5588**	-0.4029	-0.4504
	(-1.3)	(-2.1)	(-2.1)	(-2.4)	(-1.2)	(-1.3)
$Y_{i,t}^{t+1}$	0.1273	0.4105***	0.1336	0.1641	0.4283***	
	(0.9)	(4.3)	(0.9)	(0.9)	(3.3)	
$I_{i,t}^{t+1}$	0.1687**		0.1747**	0.1632**		0.2135***
	(2.4)		(2.3)	(2.4)		(5.2)
$\pi_{i,t}^{t+1}$	0.7202***	0.7095***	0.7071***	0.7045***	0.7430***	0.7666***
	(2.8)	(2.7)	(2.7)	(3.0)	(3.1)	(3.4)
$U_{i,t}^{t+1}$	-0.0375	-0.1539	-0.0434			
	(-0.1)	(-0.6)	(-0.2)			
$B_{i,t}^{t}$	-0.1190	-0.0202	-0.1131			-0.1344
	(-0.8)	(-0.1)	(-0.7)			(-0.9)
FR_i^{t+1}	-0.4148				-0.5027	-0.3736
	(-1.2)				(-1.1)	(-1.1)
ρ	0.6063***	0.5982***	0.5968***	0.5575***	0.6016***	0.6056***
	(9.8)	(8.0)	(9.1)	(5.1)	(5.8)	(10.1)
Adjusted R-square	0.71	0.69	0.71	0.71	0.68	0.71
Observations	345	425	392	392	375	345
Period	1999:2-2010:2	1998:2-2010:2	1999:1-2010:2	1999:1-2010:2	1998:2-2010:2	1999:2-2010:2

Notes: fixed effects. t-statistics in brackets. *, **, *** denote significance at 10, 5 and 1% levels. White cross-section standard errors & covariance.

Regression (2) of Table I suggests that there is an unfavourable deviation of 0.67 pp of budget balance-to-GDP ratios in case of no deviations regarding other variables. The errors in inflation forecasts (1 pp) imply an upward deviation of 0.71 pp, and real GDP positive growth deviations of 1 pp cause an upward realization of 0.41 pp in the budget balance ratios' error deviations. The estimation results in regression (2) are then rather consistent with the automatic stabilizers mechanisms and an imperfect indexation tax system. Deviations in total investment growth regressions (3) and (4) have a statistical significance, which may imply that higher than expected investment realizations may also be connected with higher real GDP. However, there may be multicollinearity between the deviations of the real GDP rate and investment rate because investment is a component of GDP. In column (6) we test the investment deviation instead of the real GDP deviation and we conclude that a deviation in the total investment growth rate (1 pp) has a positive impact on the deviation of the budget balance ratio (0.21 pp).

On the other hand, in regression (5) in Table I, we get a low estimated and non-significant coefficient for the fiscal rule index, which may suggest that the EC forecasts are more able to take into account the different performance of fiscal governance among countries in the EMU period. Some previous studies von Hagen (2010) have reported the importance of that kind of determinants. Therefore, fiscal governance indicators would have statistical importance in the case of data provided by the national governments such as Stability (or Convergence) and Growth Programmes.

4.2. Government budget constraint 1999-2011

Taking into account the set of variables provided by the EC forecasts during the EMU period, it is possible to decompose the deviation of the variation of general government gross debt. However, it is important to stress that the data sources of the forecasts of each variable

has one decimal place, which may differ a little from the real projection after some calculations. For example, the forecast of the snow ball effect considers interest expenditure, real GDP and GDP deflator (inflation when it is not available) while the stock flow adjustment is obtained by difference.

Furthermore, there may be some small differences between the error for the gross debt ratio variations and the sum of the errors of the snow ball effect, the primary balance effect, and the stock flow adjustments, because some predictable variables were not available in some years for all countries.[3] Again, the period under analysis covers semi-annual vintage forecasts from autumn 1999 to autumn 2010.

Table II presents the medium deviation (MD = realization - forecast) for the 15 Member States, the EU and the euro area.[4] Predictions were published in year t for year t+1, including both spring and autumn forecasts. The EC has predicted on average positive (negative) variations of general government debt ratios in some (other) countries. However, since realizations have been higher (less negative or positive) than forecasted, i.e. we may conclude that there has been a bias – optimistic predictions. Equation (4) details the decomposition of the deviation of the debt-to-GDP ratio.

$$\left(\frac{D_i^{t+1}}{Y_i^{t+1}}-\frac{D_i^{t}}{Y_i^{t}}\right)-\left(\frac{D_{i,t}^{t+1}}{Y_{i,t}^{t+1}}-\frac{D_{i,t}^{t}}{Y_{i,t}^{t}}\right)=$$
$$=\left[\left(\frac{IP_i^{t+1}}{Y_i^{t+1}}\right)-\left(\frac{n_i^{t+1}*D_i^{t+1}}{Y_i^{t+1}}\right)-\left(\frac{PB_i^{t+1}}{Y_i^{t+1}}\right)+\left(\frac{SF_i^{t+1}}{Y_i^{t+1}}\right)\right]-\left[\left(\frac{IP_{i,t}^{t+1}}{Y_{i,t}^{t+1}}\right)-\left(\frac{n_{i,t}^{t+1}*D_{i,t}^{t+1}}{Y_{i,t}^{t+1}}\right)-\left(\frac{PB_{i,t}^{t+1}}{Y_{i,t}^{t+1}}\right)+\left(\frac{SF_{i,t}^{t+1}}{Y_{i,t}^{t+1}}\right)\right]= \quad (4)$$
$$=\left[\left(\frac{IP_i^{t+1}}{Y_i^{t+1}}\right)-\left(\frac{IP_{i,t}^{t+1}}{Y_{i,t}^{t+1}}\right)\right]+\left[-\left(\frac{n_i^{t+1}*D_i^{t+1}}{Y_i^{t+1}}\right)+\left(\frac{n_{i,t}^{t+1}*D_{i,t}^{t+1}}{Y_{i,t}^{t+1}}\right)\right]+\left[-\left(\frac{PB_i^{t+1}}{Y_i^{t+1}}\right)+\left(\frac{PB_{i,t}^{t+1}}{Y_{i,t}^{t+1}}\right)\right]+\left[\left(\frac{SF_i^{t+1}}{Y_i^{t+1}}\right)-\left(\frac{SF_{i,t}^{t+1}}{Y_{i,t}^{t+1}}\right)\right]$$

In (4), D is the nominal public debt and Y is the nominal GDP. The left-hand side of the formula (first step) is the realization of variation of the debt-to-GDP ratio, and the right-hand side is the forecast. The variation of debt ratio is decomposed (third step) as interest payments (IP), nominal effect due to the nominal growth rate of GDP (n), primary balance (PB) and stock flows adjustments (SF). Subscripts (i,t) are the forecast for the country i released in the year t for the period of the superscript while subscript (i) is the realization value in the year of the superscript.

[3] Data for Luxembourg did not include all the variables in autumn 1999.

[4] Realizations are values downloaded from Ameco on 8 June 2012, which integrate revisions.

Table II - Government Budget Constraint 1999-2011
(average deviations – pp of GDP)

Country	*Δ Debt t+1*	*interest effect t+1*	*nominal effect t+1*	*snow ball effect t+1*	*Primary Balance t+1*	*Stock flow t+1*
Belgium	1.10	-0.23	0.27	0.04	0.50	0.55
Germany	1.46	-0.06	0.37	0.31	0.11	1.04
Greece	6.19	0.29	1.67	1.96	4.48	-0.25
Spain	0.56	-0.12	-0.05	-0.17	1.29	-0.56
France	1.33	-0.12	0.26	0.14	0.76	0.43
Ireland	4.48	0.06	0.99	1.04	2.79	0.65
Italy	1.72	0.02	1.12	1.14	0.66	-0.09
Luxembourg	0.90	0.02	-0.02	0.00	-1.52	2.43
Netherlands	1.17	-0.21	0.28	0.07	0.67	0.43
Austria	0.66	-0.11	-0.05	-0.16	0.51	0.31
Portugal	3.41	-0.03	0.73	0.71	1.74	0.97
Finland	0.96	-0.22	0.21	-0.01	-0.11	1.08
Denmark	1.26	-0.28	0.17	-0.11	0.10	1.27
Sweden	0.60	-0.55	0.24	-0.30	0.60	0.30
United Kingdom	2.21	0.09	0.22	0.31	1.04	0.86
European Union	1.40	-0.07	0.58	0.51	0.76	0.13
Euro Area	1.40	-0.05	0.44	0.39	0.72	0.30

Source: European Commission (European Economic Forecast and Eurostat) and calculations.

Our results show that the EC has underestimated the positive variation of general government debt ratios with a particular size in Greece, Ireland and Portugal, especially in the primary balance. Indeed, the EU countries that in 2012 were under IMF/EC/ECB financing support depicted more important deviations. The deviation in the snow ball effect is either negative or positive among countries but close to zero (see Table II**Error! Reference source not found.**).

The EC forecasts would be unbiased in case of a MD = 0 or close to zero, however, the track record seems to show an optimistic bias. This result in the budget government constraint may be explained a little by deviation in other economic variables – nominal GDP growth and weight of interest payments as gross debt of general government (see Table II).

Still from Table II, we see that the larger than expected debt deviations occurred in the EU are decomposed into deviations of primary balance and snow ball effect (mostly the effect of nominal GDP).

4.3. Expenditure-to-GDP ratio: numerator and denominator effects 1999-2011

We have also studied the deviation of the EC forecasts between the realizations and predictions of yearly variations of expenditure-to-GDP ratios, which had been projected in year t for t+1. The period includes the vintage forecasts from spring 1999 to autumn 2010. Table III presents the decomposition of the deviations of the expenditure-to-GDP ratios.

Equation (5) details the error of the expenditure to GDP ratio between deviation of nominal expenditure (numerator effect: G) and deviation of nominal GDP (denominator effect: Y):

$$\left(\frac{G_i^{t+1}}{Y_i^{t+1}}-\frac{G_i^t}{Y_i^t}\right)-\left(\frac{G_{i,t}^{t+1}}{Y_{i,t}^{t+1}}-\frac{G_{i,t}^t}{Y_{i,t}^t}\right)=$$

$$=\left[\left(\frac{G_i^{t+1}-G_i^t}{Y_i^{t+1}}\right)-\left(\frac{G_i^t}{Y_i^{t+1}}\right)\left(\frac{Y_i^{t+1}-Y_i^t}{Y_i^t}\right)\right]-\left[\left(\frac{G_{i,t}^{t+1}-G_{i,t}^t}{Y_{i,t}^{t+1}}\right)-\left(\frac{G_{i,t}^t}{Y_{i,t}^{t+1}}\right)\left(\frac{Y_{i,t}^{t+1}-Y_{i,t}^t}{Y_{i,t}^t}\right)\right]= \quad (5)$$

$$=\left[\left(\frac{G_i^{t+1}-G_i^t}{Y_i^{t+1}}\right)-\left(\frac{G_{i,t}^{t+1}-G_{i,t}^t}{Y_{i,t}^{t+1}}\right)\right]+\left[-\left(\frac{G_i^t}{Y_i^{t+1}}\right)\left(\frac{Y_i^{t+1}-Y_i^t}{Y_i^t}\right)+\left(\frac{G_{i,t}^t}{Y_{i,t}^{t+1}}\right)\left(\frac{Y_{i,t}^{t+1}-Y_{i,t}^t}{Y_{i,t}^t}\right)\right]$$

The deviation of the ratio government expenditure (G) to nominal GDP (Y) can be decomposed between the numerator effect (left term of the third line of equation (5)) and the denominator effect (right term of the third line of equation (5)). Subscripts and superscripts have the same meaning as in the previous section. The numerator effect is the variation of expenditure, while the denominator effect is the variation of GDP. The deviations of the both effects are detailed in Table III.

Table III - Decomposition about deviation of expenditure-to-GDP ratio 1999-2011

(average deviations – pp of GDP)

Country	*Expenditure ratio t+1*	*numerator effect*	*denominator effect*
Belgium	0.41	0.34	0.07
Germany	0.14	-0.26	0.40
Greece	0.94	0.70	0.25
Spain	0.32	0.49	-0.16
France	0.58	0.39	0.20
Ireland	2.15	1.44	0.71
Italy	0.52	0.11	0.41
Luxembourg	0.29	0.24	0.05
Netherlands	0.47	0.47	0.00
Austria	0.25	0.22	0.04
Portugal	0.72	0.55	0.18
Finland	0.67	0.28	0.40
Denmark	0.63	0.35	0.29
Sweden	0.00	-0.72	0.72
United Kingdom	0.66	-0.59	1.26
European Union	0.43	0.07	0.36
Euro Area	0.43	0.18	0.25

Source: European Commission (European Economic Forecast and Eurostat) and calculations.

In most countries the average prediction implied negative variations of the expenditure ratios (the exceptions being Luxembourg and the United Kingdom). Therefore, we may conclude that realizations of variations have not been favourable as forecasted. In fact the reduction (or the increase) in the spending ratio has been much lower (stronger) than forecasted reduction, (see column one in Table III).

These results also suggest that the EC projections have initially some optimistic bias about the spending ratios in most countries, which afterwards is not fulfilled. This outcome is rather in line with the results of Moulin and Wierts (2006), who studied the government forecast through the SGPs, showing the inability of governments to cut expenditure and reporting also evidence of deliberately optimistic growth forecasts in order to justify nominal spending increases.

The forecasts about the decomposition of the numerator and of the denominator effects were consistent, in the entire sample, i.e. a favourable path of nominal GDP and an increase of nominal expenditure, in which the denominator effect was stronger than the numerator one in most countries.

The deviations in the numerator effect in Germany, Sweden and the United Kingdom have been favourable, which means that predictions about the variation of nominal expenditure were lower than realizations while in other countries increases in nominal expenditure turned out higher than predicted.

In addition, unfavourable deviations of the denominator effect mean that GDP nominal growth presented a contribution to higher expenditure-to-GDP ratios than predicted in most countries (an exception was Spain). Furthermore, it would still be possible to study the decomposition of nominal GDP growth between real output variation and deflator increase as mentioned before.

4.4. Revenue-to-GDP ratio: numerator and denominator effects 1999-2011

Again for the same period of the EC vintage forecasts, from spring 1999[5] to autumn 2010, regarding the predictions in year t to year t+1 as before, the decomposition of revenue ratios between numerator and denominator effects does not seem to present a pattern. Equation (6) presents a similar reasoning as for the expenditure-to-GDP ratio before.

Table IV presents the decomposition of the deviation of the variation of revenue ratios in the same way as the expenditure one, and we can see that the EC predictions have underestimated the variation of the revenue ratios in most cases, except in Spain. The medium forecast of revenue ratio variation in this period was negative for most countries and positive in just a few cases (Portugal, Spain and the United Kingdom).

$$\left(\frac{R_i^{t+1}}{Y_i^{t+1}}-\frac{R_i^t}{Y_i^t}\right)-\left(\frac{R_{i,t}^{t+1}}{Y_{i,t}^{t+1}}-\frac{R_{i,t}^t}{Y_{i,t}^t}\right)=$$
$$=\left[\left(\frac{R_i^{t+1}-R_i^t}{Y_i^{t+1}}\right)-\left(\frac{R_i^t}{Y_i^{t+1}}\right)\left(\frac{Y_i^{t+1}-Y_i^t}{Y_i^t}\right)\right]-\left[\left(\frac{R_{i,t}^{t+1}-R_{i,t}^t}{Y_{i,t}^{t+1}}\right)-\left(\frac{R_{i,t}^t}{Y_{i,t}^{t+1}}\right)\left(\frac{Y_{i,t}^{t+1}-Y_{i,t}^t}{Y_{i,t}^t}\right)\right]= \quad (6)$$
$$=\left[\left(\frac{R_i^{t+1}-R_i^t}{Y_i^{t+1}}\right)-\left(\frac{R_{i,t}^{t+1}-R_{i,t}^t}{Y_{i,t}^{t+1}}\right)\right]+\left[-\left(\frac{R_i^t}{Y_i^{t+1}}\right)\left(\frac{Y_i^{t+1}-Y_i^t}{Y_i^t}\right)+\left(\frac{R_{i,t}^t}{Y_{i,t}^{t+1}}\right)\left(\frac{Y_{i,t}^{t+1}-Y_{i,t}^t}{Y_{i,t}^t}\right)\right]$$

Table IV - Decomposition about deviation of revenue-to-GDP ratio 1999-2011

(average deviations – pp of GDP)

Country	*Revenue ratio t+1*	*numerator effect*	*denominator effect*
Belgium	0.31	0.25	0.06
Germany	0.18	-0.19	0.37
Greece	0.16	-0.24	0.40
Spain	-0.40	-0.19	-0.21
France	0.13	-0.04	0.17
Ireland	0.38	-0.01	0.40
Italy	0.37	-0.02	0.39
Luxembourg	0.24	0.29	-0.05
Netherlands	0.09	0.12	-0.03
Austria	0.24	0.20	0.04
Portugal	0.47	0.27	0.20
Finland	0.73	0.40	0.34
Denmark	0.64	0.37	0.27
Sweden	0.12	-0.61	0.73
United Kingdom	0.02	-1.01	1.03
European Union	0.11	-0.21	0.32
Euro Area	0.14	-0.08	0.22

Source: European Commission (European Economic Forecast and Eurostat) and calculations.

[5] Except for Luxembourg.

The forecasts about the decomposition of the numerator and denominator effects show the same path in all countries, similarly to the case of expenditure ratios, specifically a positive path of nominal GDP and a raise of nominal revenue, in which the denominator effect would be stronger than the numerator effect in most countries (exceptions are Portugal, Spain and the United Kingdom as mentioned before). The predictions about nominal revenue were positive on average for all countries. Therefore, we can conclude that positive (negative) deviations of the numerator effect mean that predictions about variations of nominal receipts were lower (higher) than realizations. Spain recorded nominal revenue increases lower than predicted, which contributed favourably to decrease revenue-to-GDP.

4.5. The period before the financial crisis: 1999-2008

Additionally, we study the deviations of the expenditure-to-GDP ratio as well as of the revenue-to-GDP ratio for the period 1999-2008. In this way we have excluded the period of the 2009-2011 economic and financial crisis in order to focus on a period of more stability. In fact, there is evidence of large deviations of budget balance ratios as well as real GDP growth rate after 2008. Deviations are larger in the case of the expenditure ratio than in the revenue ratio during both period of analysis, 1999-2011 and 1999-2008.

Table V presents the deviation for the predictions released in the year t for the period t+1, where t+1 is from 1999 to 2008. It is possible to conclude that the denominator effect was more favourable for all countries as well as for the EU and the euro area during the period 1999-2008 (when we compare the column of the denominator effect of Table III and of Table V).

Table V - Decomposition about deviation of expenditure-to-GDP ratio 1999-2008

(average deviations – pp of GDP)

Country	*Expenditure ratio t+1*	*numerator effect*	*denominator effect*
Belgium	0.33	0.39	-0.06
Germany	-0.03	-0.28	0.26
Greece	1.26	1.22	0.04
Spain	0.22	0.71	-0.49
France	0.54	0.58	-0.04
Ireland	1.35	1.64	-0.29
Italy	0.39	0.28	0.11
Luxembourg	0.09	0.27	-0.18
Netherlands	0.32	0.61	-0.29
Austria	0.25	0.42	-0.17
Portugal	0.33	0.32	0.01
Finland	0.44	0.58	-0.14
Denmark	0.24	0.21	0.03
Sweden	0.00	-0.39	0.39
United Kingdom	0.83	0.77	0.06
European Union	0.35	0.39	-0.04
Euro Area	0.32	0.32	-0.01

Source: European Commission (European Economic Forecast and Eurostat) and calculations.

Table VI - Decomposition about deviation of revenue-to-GDP ratio 1999-2008

(average deviations – pp of GDP)

Country	*Revenue ratio t+1*	*numerator effect*	*denominator effect*
Belgium	0.34	0.40	-0.06
Germany	-0.01	-0.25	0.24
Greece	0.24	-0.02	0.26
Spain	-0.19	0.31	-0.50
France	0.17	0.21	-0.04
Ireland	0.42	0.78	-0.36
Italy	0.35	0.23	0.12
Luxembourg	0.17	0.46	-0.29
Netherlands	0.31	0.62	-0.30
Austria	0.29	0.43	-0.15
Portugal	0.14	0.07	0.06
Finland	0.91	1.10	-0.20
Denmark	0.45	0.43	0.02
Sweden	0.18	-0.24	0.41
United Kingdom	0.32	0.30	0.01
European Union	0.13	0.17	-0.04
Euro Area	0.15	0.15	0.00

Source: European Commission (European Economic Forecast and Eurostat) and calculations.

In addition, Table VI details the deviations and it is possible to conclude that the error of the revenue-to-GDP is lower than the expenditure-to-GDP one. This result is similar to the period 1999-2011. The error of the numerator effect is larger than the one from the denominator. Finally, when we compare expenditure and revenue ratios for the periods 1999-2011 and 1999-2008, it is possible to verify that for the EU the denominator effect is close to zero during the period before the financial crisis and larger during 1999-2011 (in this period it is even larger than numerator effect, which is in line with higher forecasted nominal GDP than realizations).

5. Conclusion

In this study we have found evidence of systematic deviations in the forecasts underlying the budget balance-to-GDP ratios. In the case of the EC forecasts, our estimations show that the real GDP growth deviation and prices variation can explain the budget deficit deviations when predicted in t to year t+1. Indeed, higher real GDP than predicted has a positive impact on taxes' revenue and expenditure through automatic stabilizers, while higher inflation can influence budget balances through the imperfect tax indexation system. The deviation of total investment growth is also statistically significant because it is part of GDP, revealing a positive deviation, and therefore a favourable impact on the budget balance. On the other hand, unemployment rate deviations do not present relevant impacts on the budget balance ratios.

The fiscal rule index would be a way to overcome specific features of each country. However, in our recent period of analysis the fiscal rule index has not statistically significance, which means that the EC forecasts take into account different performance of fiscal governance among countries in the period of the EMU. The analysis of the expenditure and revenue ratios reveals that the EC underestimated annual variations for the EU. Furthermore, the variations of the debt-to-GDP were higher than forecasted due to lower primary balances and snow ball effects in the case of the EU.

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