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The relevance of fiscal rules for fiscal and yield developments

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The relevance of fiscal rules for fiscal and yield developments

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Abstract

Numerical fiscal rules mitigate the bias of pro-cyclicality, as an alternative to discretionary measures conducted by policy makers. We assess whether fiscal rules impact budget balances and sovereign yields, and we perform a simulation exercise to compute debt developments of EU countries, assuming that they had implemented a numerical expenditure rule in 1990. Our panel analysis covers 27 EU countries between 1990 and 2011. We find that fiscal rules contribute to the reduction of budget deficits, specifically expenditure rules, which significantly impact primary expenditure and conclude that countries with rules experienced lower sovereign bond yields. The simulations show that when the same rule is applied to different countries, it produces very different results, particularly on account of the initial level of primary expenditure.

Keywords: numerical fiscal rules, expenditure rules, budget balance, sovereign yields.
JEL: C33, E62, G15, H62

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1. Introduction

Over the years, concern over high budget deficits and pro-cyclical fiscal policies has grown. In the European Union (EU) several efforts have been undertaken to control this bias. The Maastricht Treaty was implemented in 1992, which defined specific criteria for entering the Economic and Monetary Union (EMU): that debt-to-GDP ratio should not be over 60% and that the budget deficit has to be limited to 3% of GDP. In addition, the Stability and Growth Pact (SGP) was introduced to guarantee the fulfilment of the referred criteria, establishing sanctions for those countries that exceeded these limits. Later on, some reforms were made to the SGP, however EU countries constantly ran budget balances and debt ratios that were above the accepted thresholds.

Some additional measures were taken to strengthen the framework of the SGP and to ensure fiscal sustainability. The Fiscal Compact and the Six Pack were signed in 2012, which reinforced and introduced new rules at both national and supranational level. These rules are: a maximum limit of annual structural deficits of 0.5 per cent of GDP, and the implementation of automatic mechanisms that are triggered when deviations from the rule occur. The supranational rules focus on debt and non-discretionary expenditure. Debt ratio has to be reduced at an annually rate of no less that $1/20^{th}$ of the difference between the observed level and the target level, and annual growth of expenditure should not exceed a medium-term rate of growth.

Numerical fiscal rules are cited in the literature as a solution for this bias of pro-cyclicality and as an alternative to discretionary measures being introduced by policy makers (Kopits & Symansky, 1998). Such rules contribute to macroeconomic stabilisation and sustainability of public finances, by targeting fiscal aggregates such as budget balance and government debt, or even subsets of these aggregates, such as public expenditure or revenue. .

Our analysis is based on two datasets of numerical fiscal rules, elaborated by the European Commission and by the IMF, for the EU 27 Member States from 1990 to 2011. We assess the link between improvements of budget balance and developments of yield spreads and the use of fiscal rules. Moreover, we focus only on rules that target public expenditure and we perform a simulation of the expenditure path and debt level that is associated with the application of a specific rule.

The paper is organised as follows: The next section provides an overview of the existing related literature; Section 3 specifies the data and the variables, and provides some

stylised facts; Section 4 presents the methodology and the main results and. finally, Section 5 concludes.

2. Related literature

The existing literature has proven the impact of better fiscal policies on output gap and on cyclically adjusted primary balance (CAPB) (Gali & Perotti, 2003; Turrini, 2008). More specifically, some authors have tried to explain the contribution of numerical fiscal rules to the improvement of fiscal stance (Ayuso et al., 2007; Debrun et al., 2008). Additionally, more attention has been given to the expenditure side of the balance sheet, as Ayuso (2012) explains, because it is the one variable that can be controlled more directly by governments. Generally, the results indicate that fiscal rules do improve public finances and that numerical expenditure rules can enhance budgetary discipline (Hauptmeier et al., 2010; Holm-Hadulla et al., 2010; Wierts, 2008).

The most common definition of such rules is the one suggested by Kopits and Symansky (1998), whereby fiscal rules are a permanent numerical constraint on fiscal policy applied to an indicator of fiscal performance, or to subsets of these overall aggregates. The authors also make assumptions about the criteria for applying rules and in what conditions this occurs. The motivations for implementation that are more often cited are: macroeconomic stability; support for other macro policies; sustainability of public finances and adverse market reactions and spillover effects. Some aspects that are considered when introducing a fiscal rule include: the statutory basis; enforcement; monitoring of compliance and long-term commitment. Several institutional arrangements can easily work, such as: constitutional, legal or treaty provision and regulation or policy guidelines. For enforcement and monitoring, the authors recommend that this should be carried out by an independent authority. Finally, Kopits and Symansky (1998) stress that fiscal rules can bring about great gains in credibility if the government commits itself to the rules with total transparency.

In Kumar et al. (2009), fiscal rules are defined as an institutional mechanism designed to support fiscal credibility and discipline, to contain the size of the government and to guarantee intergenerational equity. For Budina et al. (2012), fiscal rules are used when there are distorted incentives and pressures to overspend, contributing to debt sustainability and fiscal responsibility. Schuknecht (2004) mentions a different way in which rules have an impact: rules anchor expectations about the sustainability of fiscal policy in the future,

especially for the time inconsistency problems[1], as they limit the behaviour of governments. Further clarification is needed concerning types of fiscal rules, as the type of fiscal rule depends on the fiscal aggregate targeted. Budina et al. (2012) have a simple definition, which is described below:

- Debt rules that target the public debt as a percentage of GDP are the most effective in terms of convergence to the defined objective. However, there are a few setbacks, as debt levels are not easily influenced by budgetary measures in the short-term and they offer no practical guidance to policy makers. Moreover, when the target is binding, fiscal policy can become pro-cyclical when the economy is hit by a shock.
- Budget balance rules affect the variable that influences debt ratios, which is under the control of policy makers, allowing for operational guidance which debt rules do not provide. These rules can account for cyclicality, allowing for economic stabilisation and addressing the consequences of economic shocks.
- Expenditure rules can limit total, primary or current spending. They do not have direct impact on debt sustainability, as they do not limit the revenue side. They are, however, appropriately used as a tool for consolidation and sustainability, when matched with debt or budget balance rules. Expenditure rules are not consistent with discretionary fiscal stimulus and the amount of resources spent by the government is directly established by these rules.
- Revenue rules set the upper and lower limit on revenue and are intended to prevent excessive tax burdens and improve revenue collection. Similar to expenditure rules, revenue rules also have no effect on the control of public debt. The revenue side is very cyclical, so it might be difficult to impose limits on their development. Similar to expenditure rules, they have greater impact when the objective is to change the size of government.

Implementation of fiscal rules cannot be done without compromising other aspects. Ayuso et al. (2007) refer to the tension between fiscal discipline and the achievements of fiscal policy over the cycle, due to the pressure of resorting to contractionary fiscal policy in periods of slow growth. The authors defend that the existence of clear escape-clauses

[1] The author refers to the solution of time inconsistency problems when exposing the problem of correcting fiscal situations with discretion. Policy makers after making a commitment have economic or political incentives to brake it. Fiscal rules appear as an alternative where there is no time inconsistency problems.

contributes to the minimisation of tension. They also identify second trade-off effects between low deficits and the desirable level of specific types of government spending. The creation of protection categories of expenditure not covered by rules is presented as a solution. Finally, the attainment of low deficits can be due to "creative accounting" practices and one-off procedures, which can be diminished by designing proper rules and by creating adequate institutions for fiscal monitoring and control.

Empirically, we can find a plethora of results that justify and support the use of fiscal rules. Firstly, Turrini (2008) states that fiscal policy has been increasingly recognised as being effective on output (when properly designed) and that it could be the only tool left to offset demand shocks with a supranational monetary policy. Gali & Perotti (2003) found that, after the Maastricht Treaty, fiscal policy became a-cyclical, which Turrini (2008) also concludes, essentially at the margin. This is a concept that needs further explanation: fiscal policy becoming a-cyclical at the margin means that the cyclically adjusted primary balance (CAPB) is not influenced by changes in the cycle. Therefore, this cannot be used to conclude whether fiscal policy contributes, or not, to improvements in the output gap. However, the results evaluated across the cycle can be different: by analysing fiscal policy on average, it is possible to come to conclusions about the impact of reducing, or expanding, existing imbalances. Turrini (2008) reports that CAPB tends to fall when output is above potential levels, and rises when it is below.

Furthermore, the effective impact of fiscal rules on budget balance has also been tested in the existing literature, and results show a robust link between numerical fiscal rules and fiscal performance. Therefore, stronger rules lead to a higher CAPB, and this effect becomes weaker when the dependent variable is debt. This link is also robust with respect to the criteria used to construct the fiscal rules indexes (Ayuso et al., 2007; Debrun et al., 2008). (Afonso & Hauptmeier, 2009) also observe that fiscal rules have an impact on primary balance, and conclude that if the debt ratio is below 80%, a strong fiscal rule contributes to the improvement of primary surplus.

The European Commission (2008) reached similar conclusions and found that the CAPB improved after the introduction of fiscal rules, remaining stable, on average, over the period in analysis; whereas cyclically adjusted primary expenditure declined significantly over the period, after an expenditure rule was implemented, when compared with the average change over the period. Finally, in an exercise to assess the determinants of Excessive Deficit

Procedure fiscal forecasts, Pina and Venes (2011) report that a higher coverage of strong expenditure rules is associated with more prudent forecasts.

Some authors tried to go further by assessing the different impacts of fiscal revenue and expenditure. The results show that revenue is essentially a-cyclical and that expenditure is significantly pro-cyclical, which explains the behaviour of fiscal policy (Gali & Perotti, 2003; Wierts, 2008).

In a paper dedicated to the survey of expenditure rules' characteristics and forms of their implementation, Ayuso (2012) explains why these types of rules are more beneficial to use. His argument is that they provide a better balance between macroeconomic stabilisation and budgetary discipline. The reasoning is straightforward: expenditure is the part of the budget that governments can most easily control and it is also more likely to induce deficit bias. The formulation and monitoring of the rule is simpler, leading to more transparency and does not prevent automatic stabilisers from operating.

To that extent is it justifiable to focus on expenditure policies and on the solution for their pro-cyclicality? Wierts (2008) states that expenditure rules can be a solution and his results suggest that the stronger expenditure rules are, the weaker the effects of revenue shocks are. Holm-Hadulla et al. (2010) reach similar results and additionally find that the effectiveness of expenditure rules depends on the type of government expenditure, by taking into account: that more flexible spending leads to more pro-cyclical biases, while fixed expenditure – interest expenditure – is less subject to changes by policymakers and has no cyclical pattern. Table I summarises some of the studies available for dealing with fiscal rules.

Table I - Related Literature

Author	Data	Study	Conclusions
Afonso & Hauptmeier, (2009)	1990 - 2005 EU-27	Impact of fiscal rules and government decentralisation on a country's fiscal position.	The primary balance surplus increases as a result of increases in the stock of government debt. Fiscal rules and a lower degree of public spending decentralisation contribute to a better primary surplus. When debt-to-GDP ratio is below 80 per cent a strong fiscal rule contributes to improving the primary budget balance.
		$s_{it} = \beta_i + \delta b_{it-1} + \lambda z_{it-1} + \phi f_{it} + \gamma x_{it} + \alpha_t + u_{it}$	
Debrun et al. (2008)	1990 – 2005 EU - 25	Assesses the link between fiscal rules and fiscal discipline and the determinants of their implementation.	Fiscal rules lead to higher cyclically-adjusted primary balances and the types and design of rules affects their effectiveness. Fiscal rules are more efficient than expenditure rules, if the target is budget balance and general government debt.
		$p_{i,t} = \alpha_0 + \rho d_{i,t-1} + \gamma Rules_{i,t} + x'_{i,t}\,\beta + \eta_i + \varepsilon_{i,t}$	
Holm-Hadulla et al. (2010)	2002-2008 EU	Analyses the impact of expenditure rules on the propensity of governments to deviate from expenditure targets when surprised by cyclical conditions.	Government spending reacts pro-cyclically to changes in the output gap. Strong expenditure rules contribute to reducing this tendency. Flexible Spending items have greater influence on the behaviour of government spending.
		$dev^k_{i,t} = c_i + d_t + \alpha OG_{i,t} + \beta(OG_{i,t} \times ER_i) + \gamma X_{i,t} + u^k_{i,t}$	
Turrini, (2008)	1980-2005 EU - 11	The estimation of fiscal reaction functions in good and bad times and for expenditures and revenues.	Fiscal policy is pro-cyclical in good times, due to the behaviour of public expenditure. Expenditure rules, when strong, can be the solution for bias.
Hauptmeier et al. (2010)	1999-2009 DE, IT, FR, PT, ES, EL, IR.	A comparison study between actual expenditure trends and debt paths and rule-based expenditure developments.	For the period 1999-2009, neutral expenditure rules resulted in lower primary expenditure ratios. (2-3 1/2 p.p. in 2009). Public debt rations would have been around 60% in 2009.
Wierts (2008)	1998-2005 EU-15	Assesses the role of national expenditure rules in limiting expenditure bias and pro-cyclicality.	Higher values of the institutional strength of expenditure rules lead to a more neutral response to revenue shocks. Results are not conclusive about the causality of expenditure rules in expenditure outcomes. The existence of a third variable can be the explanation: political preferences.

3. Data and Variables

3.1. Data

Our database covers 27 EU countries between 1990 and 2011: Austria, Belgium, Bulgaria, Cyprus, The Czech Republic, Germany, Denmark, Estonia, Greece, Spain, Finland, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, The Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia and The United Kingdom.

All fiscal and macroeconomic variables were extracted from the AMECO dataset These are: CAPB, Debt-to-GDP ratio (debt), Primary expenditure (pe), Output gap measured as the gap between actual and potential gross domestic product (outputgap), 10-year sovereign bond yield (yield), short-term interest rate (I), current account balance (CA), consumer price index (CPI), real effective exchange rate (REER), industrial production (IP) and finally, GDP growth rate (GDPgr). The measurement of international risk aversion is taken from the Chicago Board Options Exchange Market Volatility Index (VIX), from Yahoo! Finance.

In order to access the impact of particular events on the dependent variable in consideration, we include a set of dummy variables in the regressions, with the following definitions:

- EMU: is a dummy for the run-up to the EMU, that takes the value 1 for the EU-15 countries and years between 1994 and 1998 (Ayuso et al., 2007; Debrun et al., 2008).
- SGP: represents the introduction of the SGP and takes the value 1 for Euro-area countries and years after 1998 (Ayuso et al., 2007; Debrun et al., 2008).
- Enlargement: is set to 1 for the 10 countries entering EU in 2003 and after (Ayuso et al., 2007; Debrun et al., 2008).
- Election year: takes the value 1 if Parliamentary elections took place (Klaus Armingeon, 2012).
- Change in Government Ideology: takes the value 1 if a change took place in the ideological composition of the Cabinet (Armingeon et al., 2012).

The EC's fiscal rule index (FRI) is constructed based on information collected directly from Members States. The dataset covers all types of numerical fiscal rules: budget balance, debt, expenditure and revenue rules; and all level of government: central, regional and local, general government and social security. The survey reports information that is divided into five criteria: the statutory base of the rule, the room for revising objectives, mechanisms for monitoring compliance and enforcement of the rule, the existence of predefined enforcement mechanisms, and the media visibility of the rule. This index covers the period of 1990-2011.

The IMF's fiscal rule index has a much wider coverage, comprising information on numerical fiscal rules for 81 countries, with a time frame that stretches from 1985 to the end of 2012. The type of rules concerned and their characteristics are broadly similar to

the ones of the EC's index. For the purpose of comparability, we only consider this index for the countries and for the years available in the EC's index.

The statistical information regarding the number of observations, average and standard deviation of all variables used in the empirical analysis can be found in Appendix B.

3.2. Stylised Facts

Based on the EC's FRI, the number of numerical fiscal rules in place since 1990 has grown continuously from 13 rules to a total of 77 in 2011 (Figure A-I in Appendix A). Rules targeting budget balance represent the majority of rules in place from 1990 to 2011, with debt rules and expenditure rules increasing considerably in recent years. Rules targeting government revenue are those that have less representation (Figure A-II).

Concerning the type of government covered, most of the rules were applied to Local Government throughout the years, with a growing representation in recent years of rules applied to General Government (Figure A-III in Appendix A). Central Government applied the most expenditure rules, whereas General Government and Local Government were the ones that targeted budget balance more (Table II).

Table II Total numerical fiscal rules by type of government and aggregate targeted (1990-2011)

	GG	LG	RG	CG	SS	Multiple	Total
BBR	15	18	6	5	5	6	55
DR	7	11	2	3	1	3	27
ER	5	0	1	14	3	8	31
RR	2	0	0	3	1	3	9
ER/BBR	0	0	0	0	0	2	2
Total	29	29	9	25	10	22	124

Note: BBR – Balance Budget Rule; DR – Debt Rule; ER – Expenditure Rule; RR – Revenue Rule; GG – General Government; LG – Local Government ; RG – Regional Government; SS – Social Security.
Source: Numerical Fiscal Rule Database, European Commission.

Currently, almost all EU countries have fiscal rules in place. Italy is the country that has most rules - ten during the range of years considered (see Figure A-IV in Appendix A), whereas those with less rules are Latvia, the Netherlands and Romania (**Error! Reference source not found.**). Cyprus, Greece and Malta never adopted one numerical fiscal rule. In 2011, the country with the most rules applied was France - six, (Figure A-V in Appendix A) and almost 30% of countries had only 2 rules in place.

Turning now to the analysis of the evolution of FRI per country, we can see countries that have no variation in the way they implemented numerical fiscal rules, starting with the countries already mentioned above that have no rules in force (Cyprus, Greece and Malta), to countries like The Netherlands, Latvia, Romania which have only changed their rules a few times, through to more dynamic countries that make more frequent changes to the rules, such as Germany (Appendix A, Figure A-VI to A-IX).

4. Empirical Strategy and Results

4.1. Empirical specifications

For the empirical analysis, we use a fiscal reaction function to assess the impact of the existence of fiscal rules on the primary balance (Debrun et al., 2008). Therefore we have estimated a fiscal reaction function following the common approach in the literature (see Table I for a review of the literature on the subject):

$$capb_{it} = \beta i + \delta debt_{it-1} + \lambda outputgap_{it-1} + \phi fri_{it} + \gamma x_{it} + u_{it}, \quad (1)$$

where $capb_{it}$ is the cyclically adjusted primary balance in country i, at time t, β_i represents the individual effects of each country i, $debt_{it-1}$ is the debt-to-GDP ratio of country i in period $t-1$, $outputgap_{it-1}$ is the lagged output gap, fri_{it} is the fiscal rule index and finally, x_{it} represents a set of variables that can have additional explanatory power, focusing on specific events (e.g. election years and the run-up to EMU).

After computing the results we expect $\phi > 0$, which means that more and better rules (better FRI) impact positively on the value of CAPB, leading to a healthier fiscal position.

As mentioned above, we undertake this exercise using FRI from the EC and compare these results with the ones using the IMF's FRI. In addition, in order to assess the effectiveness of expenditure rules, we compute an expenditure rule index based on the EC Fiscal Rule Dataset and use primary expenditure as a dependent variable.

In order to have an additional assessment of the importance of numerical fiscal rules for long-term government bond yields, we also estimate a specification for the analysis of the impact of FRI on 10-year maturity bond yields:

$$yield_{it} = \beta_{it} + \rho \bar{X}_{it} + \phi fri_{it} + \gamma vix_{it} + \lambda I_{it} + u_{it}, \quad (2)$$

where, $yield_{it}$ is the 10-year maturity bond yield, $\bar{X}_{it}$ is a vector comprising CAPB, debt, CA, REER, IP, GRPgr and CIP, for period *t,* and country *i.* vix_{it} is the measure of investors' willingness to take risk. I_{it} is the short-term interest rate for each period *t,* and country *i* and *fri* have the definition already mentioned above.

4.2. Baseline Results

Our baseline results for the EC index overall suggest that FRI is significant with a positive coefficient, which means that if the FRI increases by 1 unit, then CAPB can increase by up to 0.52 percentage points (p.p.). In column 1, Table III, the control variables were omitted to see if they bias the impact of the rules and the effect is still robust.

When control variables are included in column (2), Table III, the following have a significant impact on the dependent variable: run-up to the EMU, election period and ideological change in government composition. The interpretation is that during the years of implementation of the EMU in the EU-15 countries, CAPB is 1.19 p.p. higher. The years where ideological change took place resulted in an increment on CAPB of 0.43 p.p. and, finally, years of election have a negative impact of 0.77. The ten member countries after 2003 have an increment of 1.23 p.p. on CAPB and those that have been part of the Euro-area since 1998 have a negative impact on CAPB of -0.87.

The results obtained from a fixed effects OLS regression, column (3), Table III, are essentially the same, with two more variables becoming statistically significant, namely: the EU-10 countries after 2003 have an increment of 1.23 p.p. on CAPB and those that have been part of the Euro-area since 1998 have a negative impact on CAPB of 0.87. Column 4, Table III, reports a Two Stage Least Squares, with the instrument of FRI being its own lag and a variable that captures the commitment of governments[2]. FRI is no longer significant and the p-value of the Wu-Hausman test shows that there are no problems of endogeneity. However, there are concerns about reverse causality between the fiscal stance and FRI. However, by analysing the Granger Causality Test (Appendix CTable C-III), we cannot conclude whether, in fact, it is the implementation of fiscal rules that leads to better balances, or whether it is better fiscal outcomes that lead to the implementation of more rules.

[2] Similar to Debrun et al. (2008), we use a dummy variable that represents governments which, by their nature – coalition governments – have implemented commitment models, which easily allows for the implementation of fiscal rules. This variable was constructed based on (Hallerberg et al., 2009) and (Annett, 2006). Regarding the effectiveness of these instruments, see Debrun et al. (2008).

Table III - Baseline results: fiscal rules and fiscal performance

Dependent Variable	EC				IMF			
	Cyclically Adjusted Primary Balance							
	OLS (1)	OLS (2)	OLS (3)	2SLS (4)	OLS (5)	OLS (6)	OLS (7)	2SLS (8)
c	-098**	-0.70**	-0.60	-0.16	-1.37**	-0.88	-0.73	0.01
	(0.42)	(0.30)	(0.47)	(0.54)	(0.56)	(0.52)	(0.65)	(0.95)
capb(-1)	0.63***	0.83***	0.68***	0.71***	0.61***	0.87***	0.75***	0.80***
	(0.10)	(0.06)	(0.12)	(0.13)	(0.10)	(0.08)	(0.15)	(0.17)
debt(-1)	0.02**	0.01**	0.01	0.01	0.01**	0.00	0.01	0.00
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
outputgap(-1)	-0.03	-0.02	-0.06	-0.06	-0.06	-0.03	-0.04	-0.04
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
fri	0.51***	0.25***	0.52***	0.31	0.29*	0.18	0.07	-0.15
	(0.16)	(0.09)	(0.17)	(0.24)	(0.17)	(0.11)	(0.18)	(0.26)
emu	-	1.19***	2.05***	2.34**	-	0.89**	3.89***	3.76***
		(0.31)	(0.76)	(1.06)		(0.38)	(0.80)	(0.83)
enlargement	-	0.20	1.23**	-1.30***	-	0.25	0.49	1.05
		(0.28)	(0.48)	(0.44)		(0.34)	(0.63)	(0.70)
sgp	-	-0.06	-0.87*	1.30 **	-	-0.13	-1.00**	-1.01**
		(0.20)	(0.44)	(0.54)		(0.21)	(0.48)	(0.57)
legelec	-	-0.77***	-0.72***	-0.64***	-	-0.70***	-0.72***	-0.73***
		(0.17)	(0.17)	(0.18)		(0.18)	(0.19)	(0.20)
gov_new	-	0.43**	0.50**	0.59**	-	0.52**	0.66***	0.75***
		(0.20)	(0.23)	(0.25)		(0.24)	(0.25)	(0.27)
mdms	-	0.00	0.00	0.00 **	-	0.00	0.00*	0.00**
		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
Number of observations	463	437	437	397	420	366	366	324
R^2	0.72	0.69	0.76	0.77	0.73	0.67	0.78	0.78
Adjusted R^2	0.69	0.68	0.73	0.73	0.70	0.66	0.74	0.74
Endogeneity test	-	-	-	0.21	-	-	-	0.74
Fixed Effects Random effects (Hausman test)	1.97***	-	2.16***	-	2.55***	-	2.05***	-
Period	-	20.66**	-	-		15.94	-	-
Cross-section	-	13.40	-	-		9.82	-	-

Notes: Robust standard errors are reported in parenthesis *, **, and *** denoting, respectively, significance at the 10, 5 and 1% level. Period range for EC's FRI: 1991-2011 (463 observations), 1991-2010 (437 observations and 397 observations). Period range for IMF's FRI: 1990-2011 (420 observations), 1991-2010 (366 observations and 324 observations). Instrumental variables are the FRI own lag and a variable for capturing government commitment.

The use of the IMF's Fiscal Rule Index generates some different results, although for the same period range, we only have 366 observations. The index is only

significant at a level of 10%, with no control variables included. Although the index takes into account the same characteristics and types of rules, the methodology used is different, so therefore the results might differ on account of that (see column (5)-(8), Table III). Thus, the methodology used to compute the index may have an important effect on the conclusions that can be made about the impact of fiscal rules on fiscal outcomes.

We performed the same exercise for the IMF Expenditure Rule Index (ERI), using a calculation based on the methodology provided in the EC's FRI database, which was only applied to rules targeting public expenditure. We considered Primary Expenditure as the dependent variable - interest payments are hardly controlled by governments - as expenditure rules are more effective with regard to expenditure alone, and not to the whole balance sheet (see Table **IV**Table **IV**).

We performed a fixed effects OLS regression again, as well as an IV estimation using the ERI's own lag as the instrument. Similar to the analysis for FRI, Column (1), Table IV, relates the possibility of control variables biasing the significance of the ERI on Primary Expenditure. Despite this omission, numerical expenditure rules contribute to the control of public expenditure at a significant level. This conclusion is valid when control variables are included in column (2), but with a smaller coefficient. In this way, if everything else is held constant, then the increase of one unit in ERI contributes to a decrease of the Primary Expenditures-to-GDP ratio of 0.18 p.p. in (2), and 0.37 p.p. in (3). The introduction of SGP, election periods, and changes in government ideology, are other explanatory variables which impact on Public Expenditure. The results remain robust when ERI instruments are used, confirming that the results are not biased on account of reverse causality.

Table IV - The impact of expenditure rules on primary expenditure

Dependent Variable	Primary Expenditure			
	OLS (1)	OLS (2)	OLS (3)	2SLS (4)
c	12.99***	1.33***	9.41***	40.7***
	(3.42)	(0.46)	(2.71)	(1.00)
pe(-1)	0.70***	0.98***	0.78***	-0.66***
	(0.09)	(0.01)	(0.07)	(0.13)
debt(-1)	-0.01	-0.01**	-0.01	0.00
	(0.01)	(0.00)	(0.01)	(0.01)
outputgap(-1)	0.05	0.05	0.04	0.09
	(0.04)	(0.04)	(0.04)	(0.06)
eri	-0.33**	-0.18**	-0.37**	-0.88***
	(0.15)	(0.09)	(0.16)	(0.23)
emu	-	-0.44*	-1.47	-2.64
		(0.25)	(1.02)	(1.65)
enlargement	-	-0.39*	-0.16	-0.58
		(0.24)	(0.46)	(0.70)
sgp	-	0.23	0.96**	2.59***
		(0.18)	(0.47)	(0.67)
legelec	-	0.63***	0.59***	0.62**
		(0.17)	(0.16)	(0.25)
gov_new	-	-0.41**	-0.57***	-0.77***
		(0.19)	(0.21)	(0.29)
mdms	-	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)
Number of observations	464	437	437	397
R^2	0.98	0.97	0.98	0.97
Adjusted R^2	0.97	0.97	0.97	0.96
Endogeneity test	-	-	-	0.11
Fixed Effects	2.56***		1.54**	
Random effects (Hausman test)				
Period	-	17.88*	-	-
Cross-section	-	33.09***	-	-

Notes: Robust standard errors are reported in parenthesis *, **, and *** denoting, respectively, significance at the 10, 5 and 1% level. Period range: 1991-2011 (464 observations), 1991-2010 (437 observations and 397 observations). Instrumental variables are the ERI own lag and a variable for capturing government commitment.

To stress the importance of numerical fiscal rules, we performed an additional empirical exercise to assess the impact of rules on the yield of 10-year maturity bonds. The index shows significance in every regression computed, meaning that if FRI increases by one unit, then the yield, in (1) of Table V, decreases by 0.25 p.p. When

investors become more risk averse - *vix* increases – and we can see that, if everything else is held constant, yields decrease by 0.02 p.p. As expected, the variables representing better economic environment – GDPgr and IP – lead to lower values of sovereign bond yields. In column (3) of Table V, we performed a 2SLS. The endogeneity tests show that FRI is not endogenous with regards to causality. The Granger tests in Appendix C show that causality runs from FRI to the yields.

In Appendix C, **Error! Reference source not found.**, it is possible to observe regression results when considering different sets of explanatory variables and also the same regressions, but considering yield spread against Germany as the dependent variable. The conclusions are the same - that FRI is significant in all regressions and that variables capturing economic developments maintain their statistical significant as well.

Overall, we observe that FRI is strongly significant in most regressions, as are the variables capturing developments in the EU and in the EMU (sgp, emu, and enlargement). Variables capturing country-specific developments are also important in explaining budget balances. When we only consider expenditure rules, these are also important for explaining primary expenditure ratios. Countries that apply rules to discretionary public expenditure, experience better expenditure ratios. In addition, capital markets react positively to countries that have implemented rules and demand lower yields in these cases.

Table V - The impact of FRI on 10-Year Bond Yield

Dependent Variable	10 year bond yield		
	OLS (1)	OLS (2)	2SLS (3)
c	6.44***	7.57***	6.25***
	(1.02)	(0.92)	(0.82)
capb(-1)	-0.13***	-0.15***	-0.14***
	(0.03)	(0.03)	(0.03)
debt	0.00	0.01*	0.00
	(0.00)	(0.01)	(0.00)
cpi	0.01	-0.02*	0.01
	(0.01)	(0.01)	(0.01)
ca	0.02	0.08***	0.03
	(0.02)	(0.03)	(0.02)
reer	0.00	-	-
	(0.01)		
i	0.53***	0.47***	0.51***
	(0.04)	(0.04)	(0.03)
ip	-0.04***	-0.02***	-0.03***
	(0.01)	(0.01)	(0.01)
fri	-0.25***	-0.30***	-0.34***
	(0.07)	(0.11)	(0.10)
vix	-0.02	-0.02*	-0.02**
	(0.01)	(0.01)	(0.01)
gdpgr	-0.10**	-0.13***	-0.10**
	(0.04)	(0.04)	(0.04)
Number of observations	337	362	335
R^2	0.63	0.75	0.68
Adjusted R^2	0.62	0.72	0.68
Endogeneity test	-	-	0.36
Cross-section fixed effects	-	3.33***	-
Random effects (Hausman test)			
Cross-section	56.78***	-	-

Notes: Robust standard errors are reported in parenthesis *, **, and *** denoting, respectively, significance at the 10, 5 and 1% level. Period range: 1995-2011 (337 observations), 1991-2010 (362 observations and 335 observations). Instrumental variables are the FRI own lag and a variable for capturing government commitment.

4.3. Simulation

Finally, we performed a simulation of the level of government debt, by computing an expenditure rule and applying it to real expenditure level, based on the specifications in Hauptmeier et al. (2010). For the detailed methodology please see Appendix D.

The simulation exercise was made with the purpose of understanding debt developments of EU countries, assuming that they had adopted a rule for the discretionary component of public expenditures.

Firstly, there are a few countries with unusual situations during the period considered, showing years where public expenditures were greater than the consolidated gross debt. For that reason, rule-based expenditure levels would lead to negative values of debt.

Secondly, in the majority of countries the debt ratio is lower than the actual ratio when GDP was computed only using an expenditure multiplier of 0.3, taking into consideration only the last five year of the analysis. In 2013, only three countries do not present rule-based values with debt ratio above the actual one: Italy, Greece and Sweden. Sweden is the only case in the EU-15 countries that would not benefit much from a ruled-based expenditure path, with new debt developments very similarly to those of the actual path.

Considering the SGP constraint of maintaining debt ratio below 60%, this barrier would have been exceeded much later and for Denmark this means that it would never experience debt ratios above 60%. For Austria, instead of being over 60% in 1993, it would only reach this value in 2009, as well as France and Portugal, instead of 2003 and 2004, respectively. Greece would not enter the EMU although adopted the SGP with debt ratios already above 60%, but would only pass it in 1996 and the barrier of 100% debt would only be achieved in 2009, instead of 1996.

Overall, the fiscal stance of the majority of EU countries would have been much sounder if a rule had been applied to public expenditure since 1990.

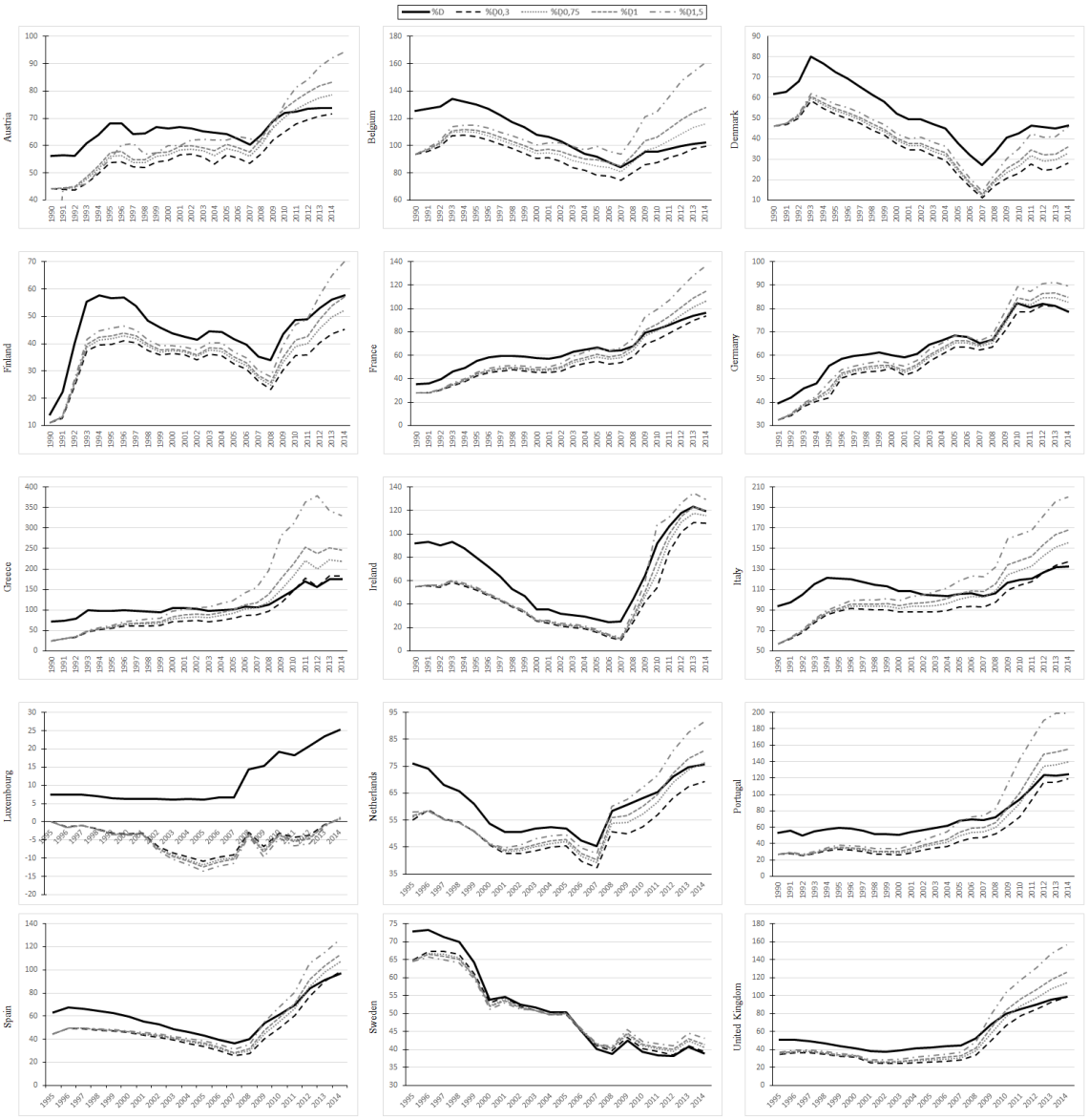

Figure 1: Actual and rule-based debt in percentage of GDP for EU-15 countries

5. Conclusions

The purpose of this paper was to assess whether those countries that implemented more, or better, fiscal rules have better budget balances, and consequently, better debt ratios. From the theory discussed, the general idea is that there is a relation between fiscal rules and fiscal balances. From our empirical study we confirm that countries with more fiscal rules, have better CAPB in fact, but we could not guarantee that causality runs from FRI to CAPB. Also, the methodology used to compute this type of indexes seems to be instrumental, given that the IMF's FRI for the same countries produces different results from the ones computed with the EC's FRI, even though broadly the same criteria are considered.

With regard to the perspective of capital markets, we studied the impact of FRI on 10-year bond yields. Investors seem to reward countries that have implemented fiscal rules. This can be explained by the commitment associated with such rules and by greater certainty about fiscal results.

With revenues being essential a-cyclical, we tried to see whether rules applied to public expenditures contribute to their control and to the consolidation of fiscal balances. Our regression results show that ERI has the ability to explain developments in primary expenditure. Therefore, it is justifiable to construct rules that specifically target the expenditure side of the budget. This leads to the second objective of our paper: to simulate debt developments of EU countries, assuming that they had implemented an expenditure rule in 1990. If public expenditure had increased at the growth rate of potential GDP, countries would have experienced smaller debt ratios in comparison to the actual ones, and would have complied more easily with the SGP constraint of keeping debt ratios below 60%. The results show that the fiscal stance of most EU countries would have been sounder if an expenditure rule had been used since 1990.

We should flag some caveats of our study notably that different methods of computing the fiscal rule index can lead to different results. It is recommended that further analysis be carried out on the proper methodology to be used, or on new instruments for capturing the commitment to rules, as this could contribute to reaching additional conclusions on this subject.

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Appendix A – Stylised facts - figures

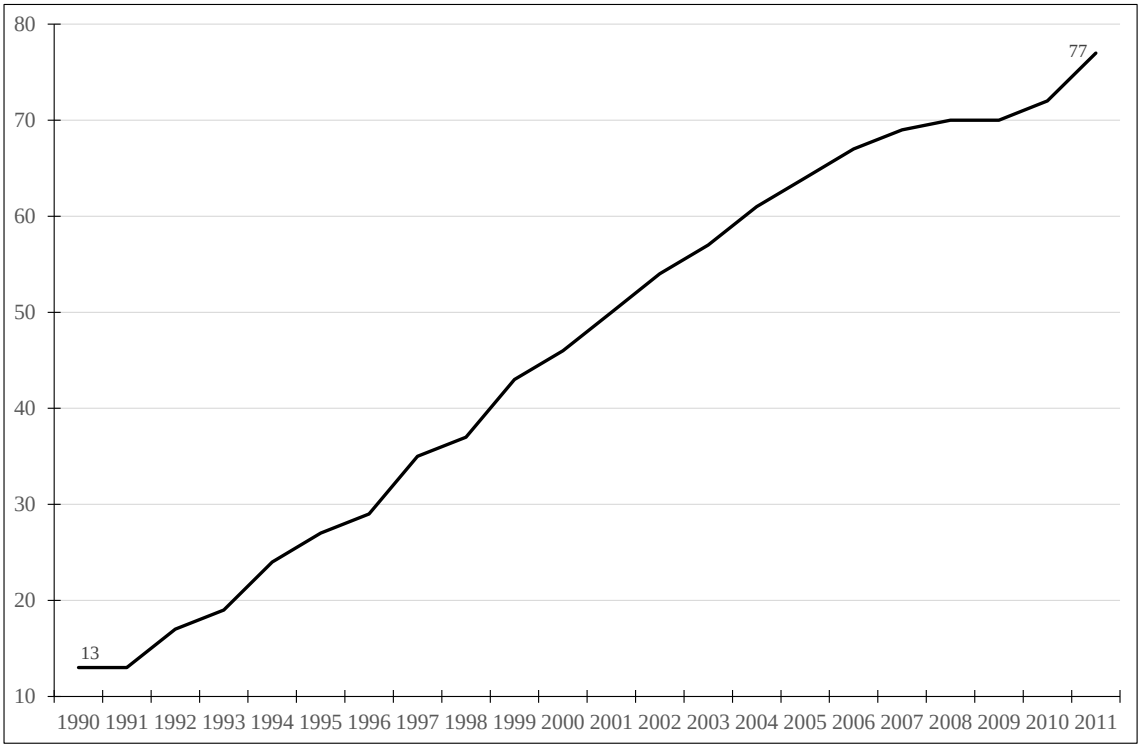

Figure A-I: Evolution of total number of rules from 1990 to 2011

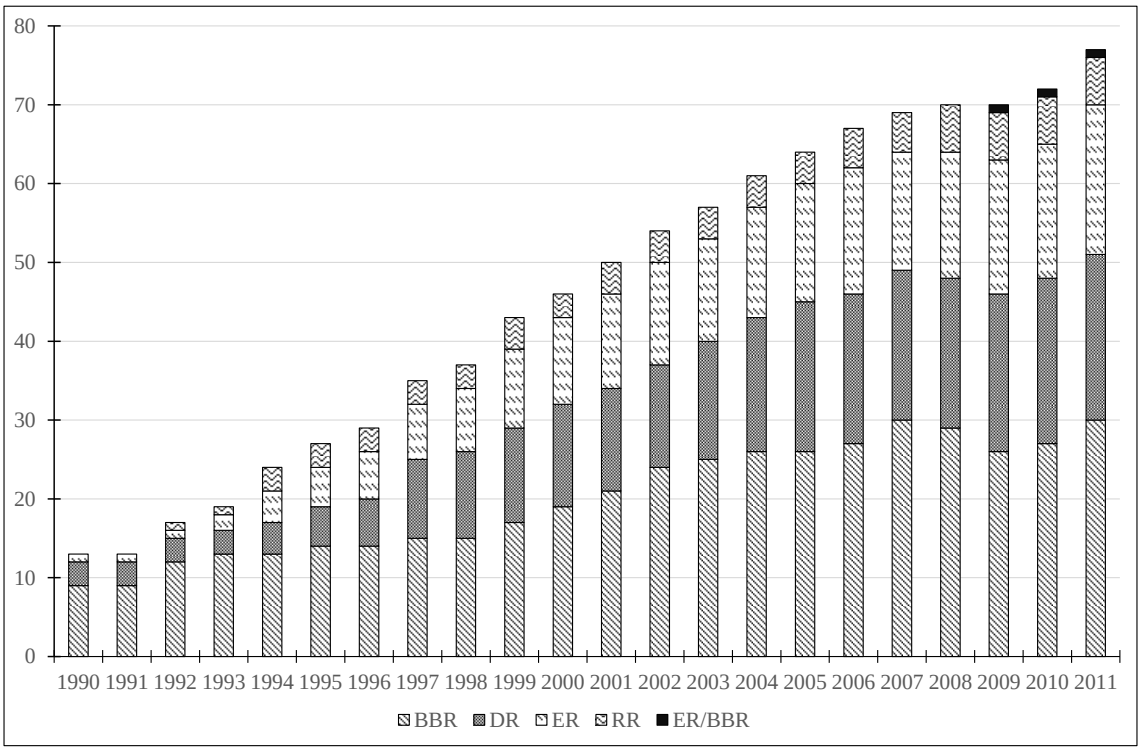

Figure A-II: Numerical fiscal rules by type of aggregate targeted since 1990

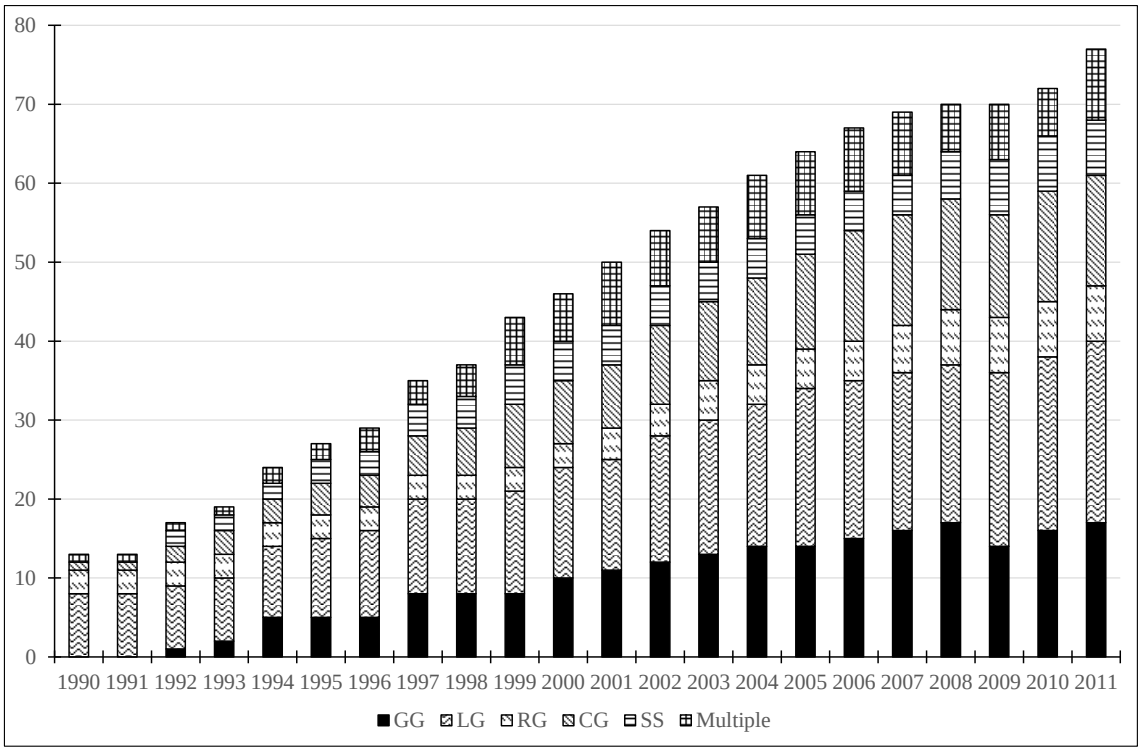

Figure A-IV: Numerical fiscal rules by type of government since 1990

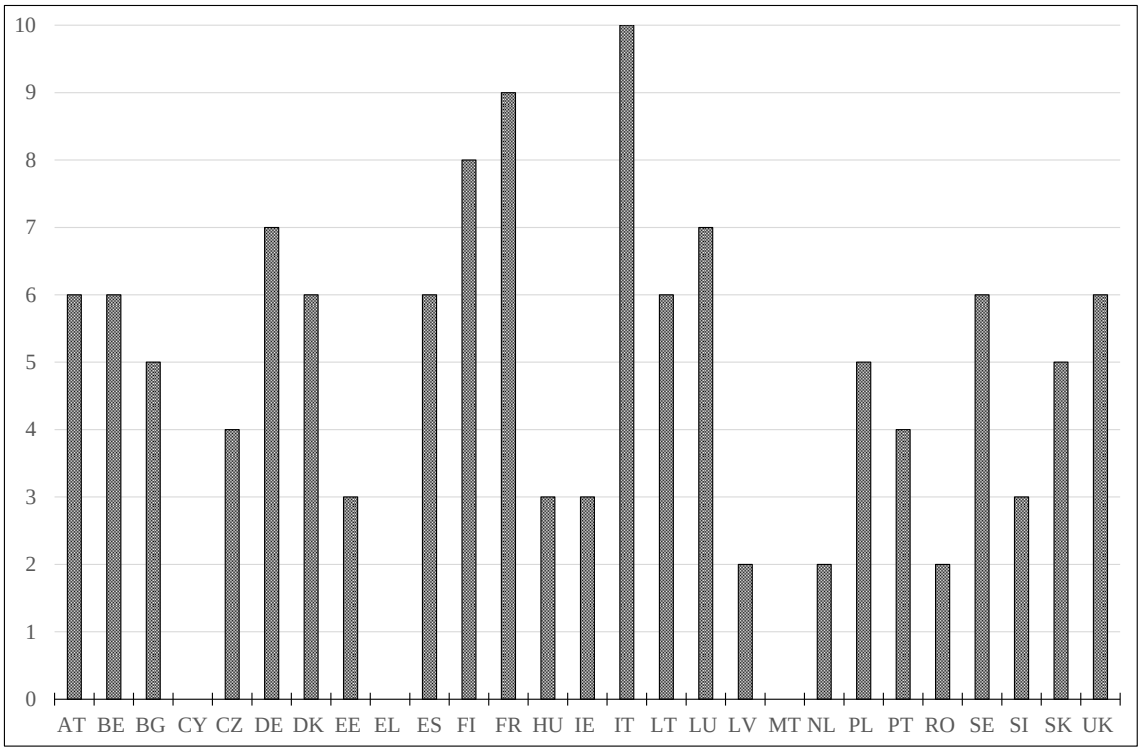

Figure A-III: Total numerical fiscal rules by country

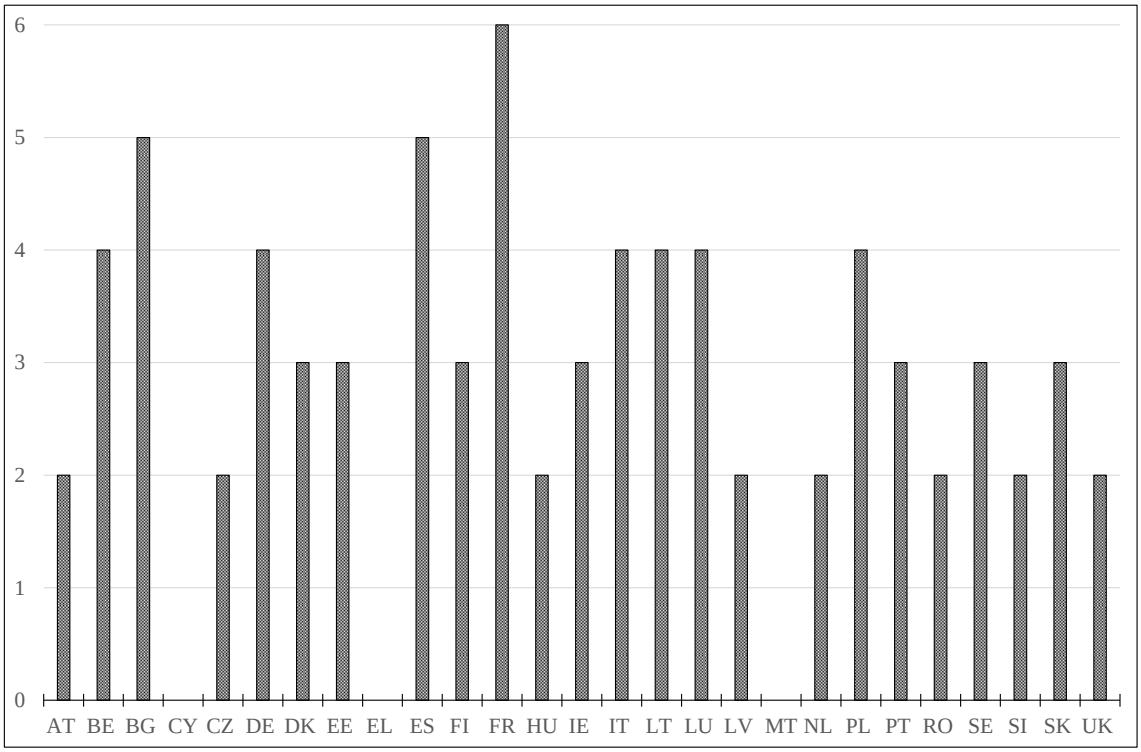

Figure A-V: Numerical fiscal rules by country in 2011

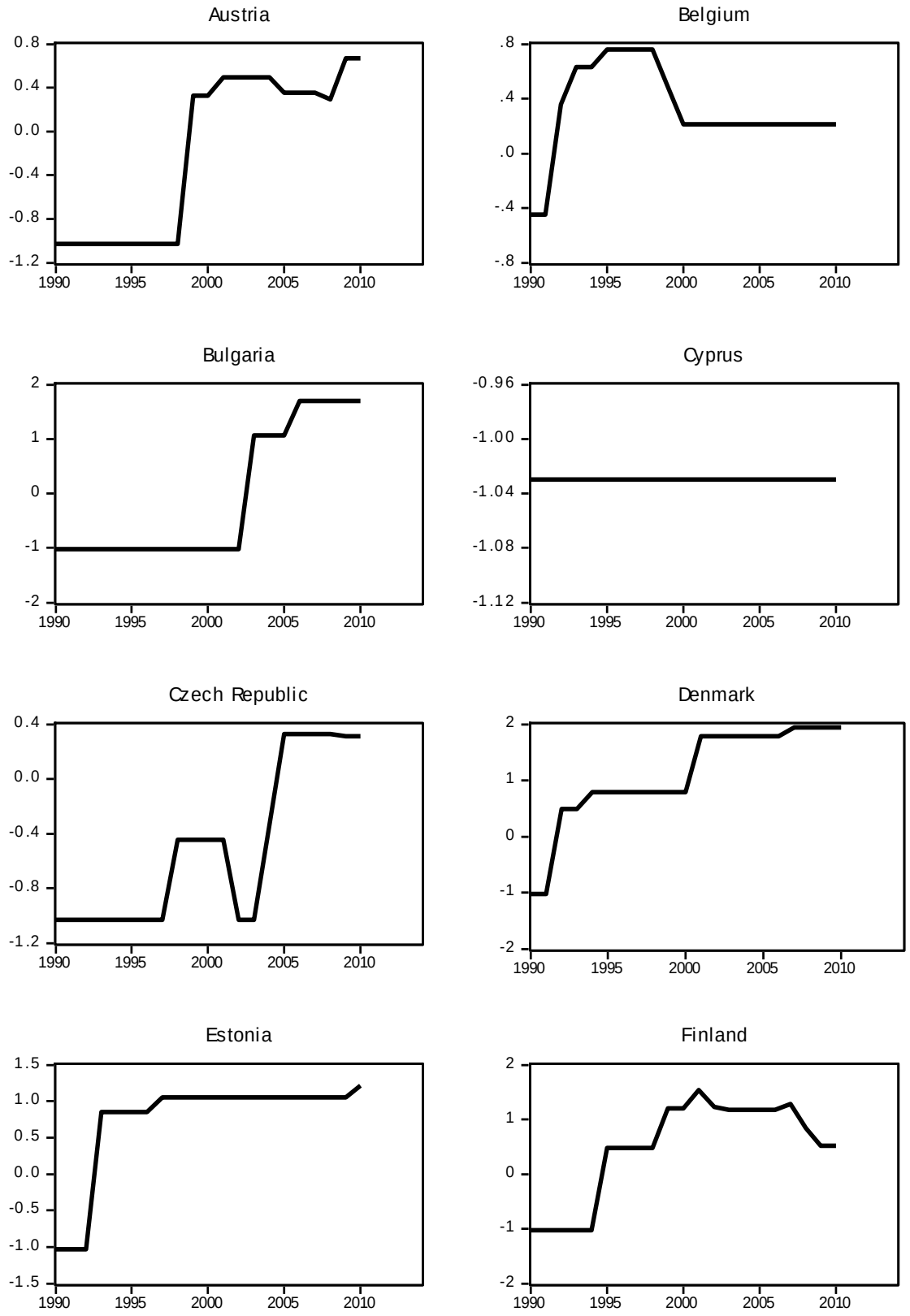

Figure A-VI: FRI by country from 1990 to 2011

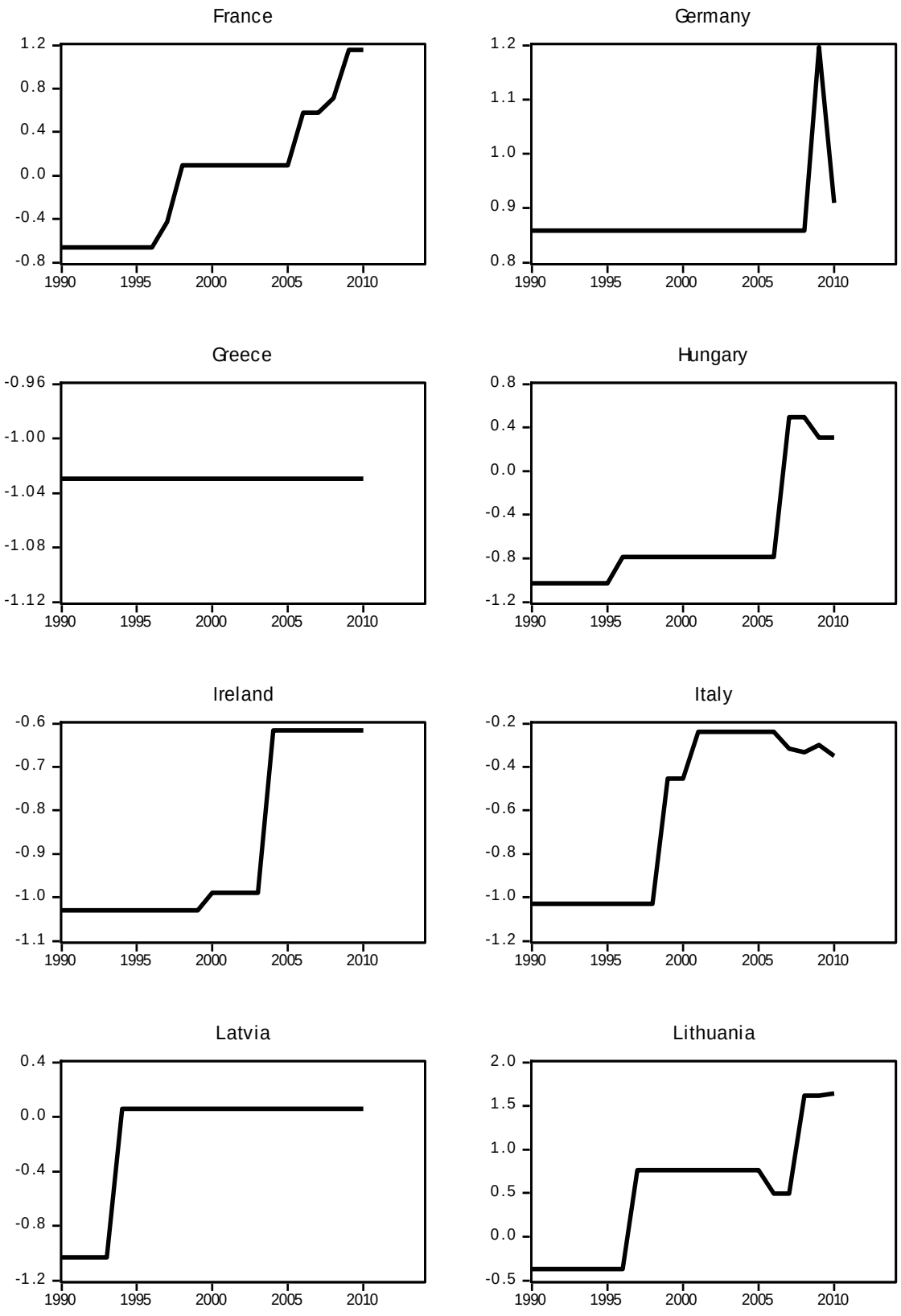

Figure A-VII: FRI by country from 1990 to 2011 (continued)

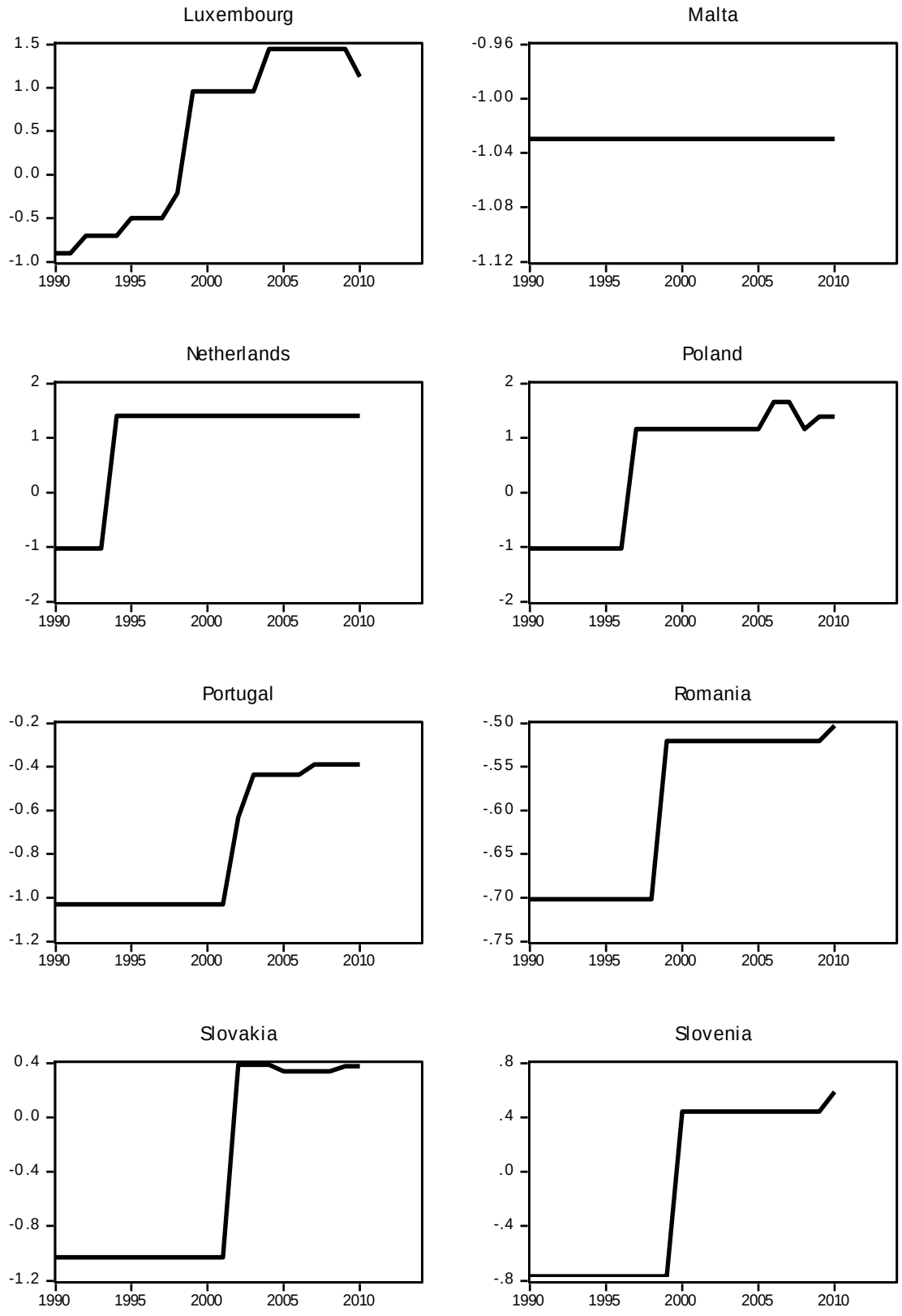

Figure A-VIII: FRI by country from 1990 to 2011 (continued)

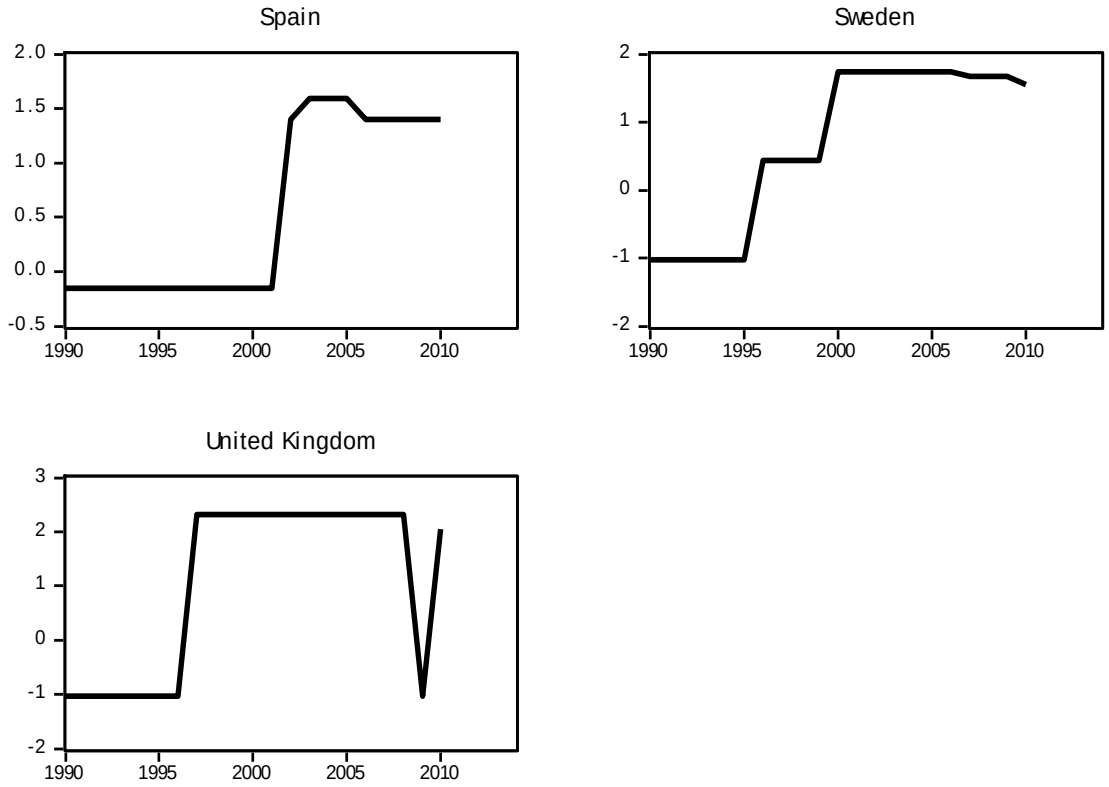

Figure A-IX: FRI by country from 1990 to 2011 (continued)

Appendix B – Data statistics

Table B-I - Descriptive statistics

Sample: 1990-2014		Mean	Median	Std. Dev.	Skewness	Kurtosis	Observations
Cyclically Adjusted Primary Balance	CAPB	0.30	0.39	3.06	-1.09	10.67	647
Debt-to-GDP	DEBT	60.43	49.97	44.59	2.46	12.34	678
Primary Expenditure	PE	41.50	42.66	10.58	-2.54	11.65	657
Output Gap	OUTPUTGAP	-0.12	-0.03	2.93	-0.06	6.21	669
CE's FRI	FRI	0.00	-0.21	1.00	0.59	2.13	593
IMF's FRI	FRI_IMF	2.40	2.44	0.86	0.44	1.85	443
Expenditure Rule Index	ERI	0.00	-0.50	1.00	2.31	8.91	594
Run-up of the EMU Dummy	EMU	0.11	0.00	0.31	2.47	7.13	675
Entrance of 10 countries in EU Dummy	ENLARGEMENT	0.18	0.00	0.38	1.69	3.84	675
Introduction of SGP Dummy	SGP	0.38	0.00	0.49	0.50	1.25	675
Election Year Dummy	LEGELEC	-19.04	0.00	137.67	-6.98	49.77	621
Government Ideological Change Dummy	GOV_NEW	0.27	0.00	0.44	1.03	2.06	539
District Magnitude	MDMS	-425.45	-999.00	738.15	0.78	2.03	618
10 Year Bond Yield	YIELD	5.96	4.99	2.94	2.36	11.68	479
Chicago Board Options Exchange Market Volatility Index	VIX	20.45	21.98	5.89	0.30	2.15	713
Short-term interest rate	I	6.51	4.39	8.12	5.10	39.12	524
Current Account Balance	CA	-2.90	-2.77	3.24	-1.13	9.51	632
Real Effective Exchange Rate	REER	99.22	99.48	14.24	0.39	5.38	540
GDP growth rate	GDPGR	2.23	2.40	3.71	-1.71	17.72	663

Appendix C – Additional Results

Table C-I - Estimation results considering the impact of FRI on 10 Year Bond Yield

Dependent Variable	10 year bond yield		
	OLS (1)	OLS (2)	2SLS (3)
c	5.89***	5.77***	5.66***
	(1.04)	(1.20)	(1.07)
capb(-1)	-0.04	-	-0.03
	(0.03)		(0.04)
debt	0.00	-	0.00)
	(0.00)		(0.00)
cpi	0.02**	0.02**	0.03**
	(0.01)	(0.01)	(0.01)
cab	0.01	0.00	0.01
	(0.02)	(0.02)	(0.03)
reer	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)
i	0.54***	0.53***	0.53***
	(0.04)	(0.04)	(0.04)
ip	-0.04***	-0.03***	-0.03***
	(0.01)	(0.01)	(0.01)
fri	-0.30***	-0.32***	-0.42***
	(0.07)	(0.07)	(0.10)
vix	-0.03***	-0.03**	-0.04***
	(0.01)	(0.01)	(0.01)
gdpgr	-0.12***	-0.13***	-0.12***
	(0.04)	(0.04)	(0.05)
Number of observations	338	338	311
R^2	0.60	0.59	0.60
Adjusted R^2	0.59	0.58	0.59
Endogeneity test	-	-	0.01
Random effects (Hausman test)	-	-	-
Cross-section	56.77***	53.56***	-

Notes: Robust standard errors are reported in parenthesis *, **, and *** denoting, respectively, significance at the 10, 5 and 1% level. Period range: 1995-2011 (338 observations and 331 observations). Instrumental variables are the FRI own lag and a variable for capturing government commitment.

Table C-II - Estimation results considering the impact of FRI on 10-Year Yield Spreads against Germany

Dependent Variable	10-year yield spread against Germany					
	OLS (1)	OLS (2)	2SLS (3)		OLS (4)	OLS (5)	2SLS (6)
c	-2.46**	-2.68**	-2.74***	c	-1.92**	-0.65	-3.68***
	(0.98)	(1.16)	(1.03)		(0.96)	(0.73)	(0.78)
capb	-0.06*	-	-0.05	capb(-1)	-0.15***	-0.14***	-0.16***
	(0.03)		(0.04)		(0.03)	(0.03)	(0.03)
debt	0.00	-	0.00	debt	0.00	0.02***	0.00
	(0.00)		(0.00)		(0.00)	(0.01)	(0.00)
cpi	0.09***	0.09***	0.09***	cpi	0.07***	0.02**	0.06***
	(0.01)	(0.01)	(0.01)		(0.01)	(0.01)	(0.01)
cab	0.00	-0.01	0.00	cab	0.02	0.10***	0.03
	(0.02)	(0.02)	(0.03)		(0.02)	(0.02)	(0.02)
reer	-0.02***	-0.02**	-0.02**	reer	-0.02**	-	-
	(0.01)	(0.01)	(0.01)		(0.01)		
i	0.42***	0.41***	0.41***	i	0.41***	0.27***	0.34***
	(0.03)	(0.03)	(0.04)		(0.03)	(0.03)	(0.04)
ip	-0.03***	-0.03***	-0.03***	ip	-0.03***	-0.02**	-0.02**
	(0.01)	(0.01)	(0.01)		(0.01)	(0.01)	(0.01)
fri	-0.28***	-0.32***	-0.37***	fri	-0.23***	0.09	-0.19**
	(0.07)	(0.07)	(0.09)		(0.06)	(0.09)	(0.10)
vix	-0.04***	-0.04***	-0.04***	vix	-0.02*	-0.02	-0.01
	(0.01)	(0.01)	(0.01)		(0.01)	(0.01)	(0.01)
gdpgr	-0.12***	-0.13***	-0.12**	gdpgr	-0.10**	-0.12***	-0.08*
	(0.04)	(0.04)	(0.05)		(0.04)	(0.04)	(0.04)
Number of observations	338	338	311		337	362	335
R^2	0.57	0.56	0.57		0.62	0.73	0.54
Adjusted R^2	0.56	0.55	0.56		0.61	0.70	0.53
Endogeneity test	-	-	0.08		-	-	0.99
Cross-section fixed effects	-	-	-		-	8.60***	-
Random effects (Hausman test)	-	-	-		-	-	-
Cross-section	145.06***	98.83***			122.62***		

Notes: Robust standard errors are reported in parenthesis *, **, and *** denoting, respectively, significance at the 10, 5 and 1% level. Period range: 1995-2011 (338, 337 and 331observartions), 1991-2010 (362 and 335 observations). Instrumental variables are the FRI own lag and a variable for capturing government commitment.

Table C-III - Granger Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
CAPB does not Granger Cause FRI	436	0.28068	0.7554
FRI does not Granger Cause CAPB		1.95933	0.1422
YIELD does not Granger Cause FRI	388	0.53108	0.5884
FRI does not Granger Cause YIELD		3.90872	0.0209
PE does not Granger Cause ERI	437	4.61091	0.0104
ERI does not Granger Cause PE		1.01303	0.3640

Appendix D – Simulation Methodology and Figures

The methodology of the simulation exercise is based on Hauptmeier et al. (2010). The first step is to construct a new expenditure path that follows a predetermined rule of growth. For the purpose of this exercise we define the rule growth rate as the same growth rate of potential GDP. The formulas used are defined as follows:

Table D-I - Simulation's Methodology

Concept	Formula
Expenditure path	$\overline{G}_t = \overline{G}_{t-1} * (1 + gr_t)$, $\overline{G}_t = G_t \; when \; t = 0$ $\overline{G}_t$ is the rule-based expenditure path. G_t is the actual expenditure path. gr_t is the growth rule
Debt path	$\overline{D}_t = D_t + \Delta G_t + \overline{I}_t$, where ΔG_t is the difference between the rule-based expenditure path and the actual expenditure path.
Interest rate	$\overline{I}_t = \Delta G_t * r$, *r* is the implicit interest rate computed as Interests over Gross Consolidated Debt at period *t*.
GDP	$\overline{Y}_t = Y_t * (1 + \%\Delta G_t * m)$, $\%\Delta G_t$ is the difference between the rule-based expenditure path and the actual expenditure path in percentage of GDP, *m* is the expenditure multiplier – we consider four possible values 0.3, 0.75, 1, 1.5[3].

We used total expenditure excluding interest, consolidated gross debt, GDP at market prices - all expressed in billions of national currency for each country extracted from the AMECO Database.

[3] GDP was computed considering different values for the impact of expenditure on output. The range used was based on Baum et al. (2012) and Boussard et al. (2012).

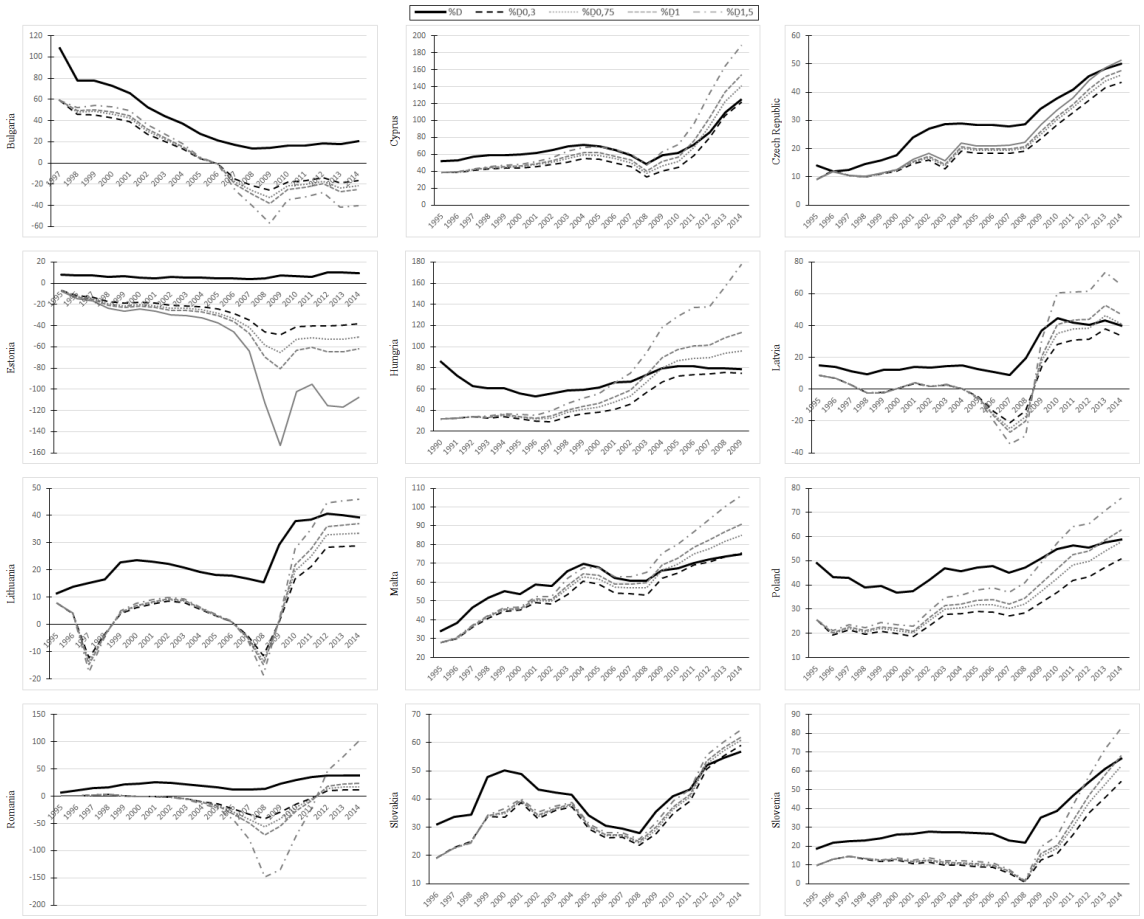

Figure D-I: Actual and rule-based expenditure in percentage of GDP for EU-10 countries

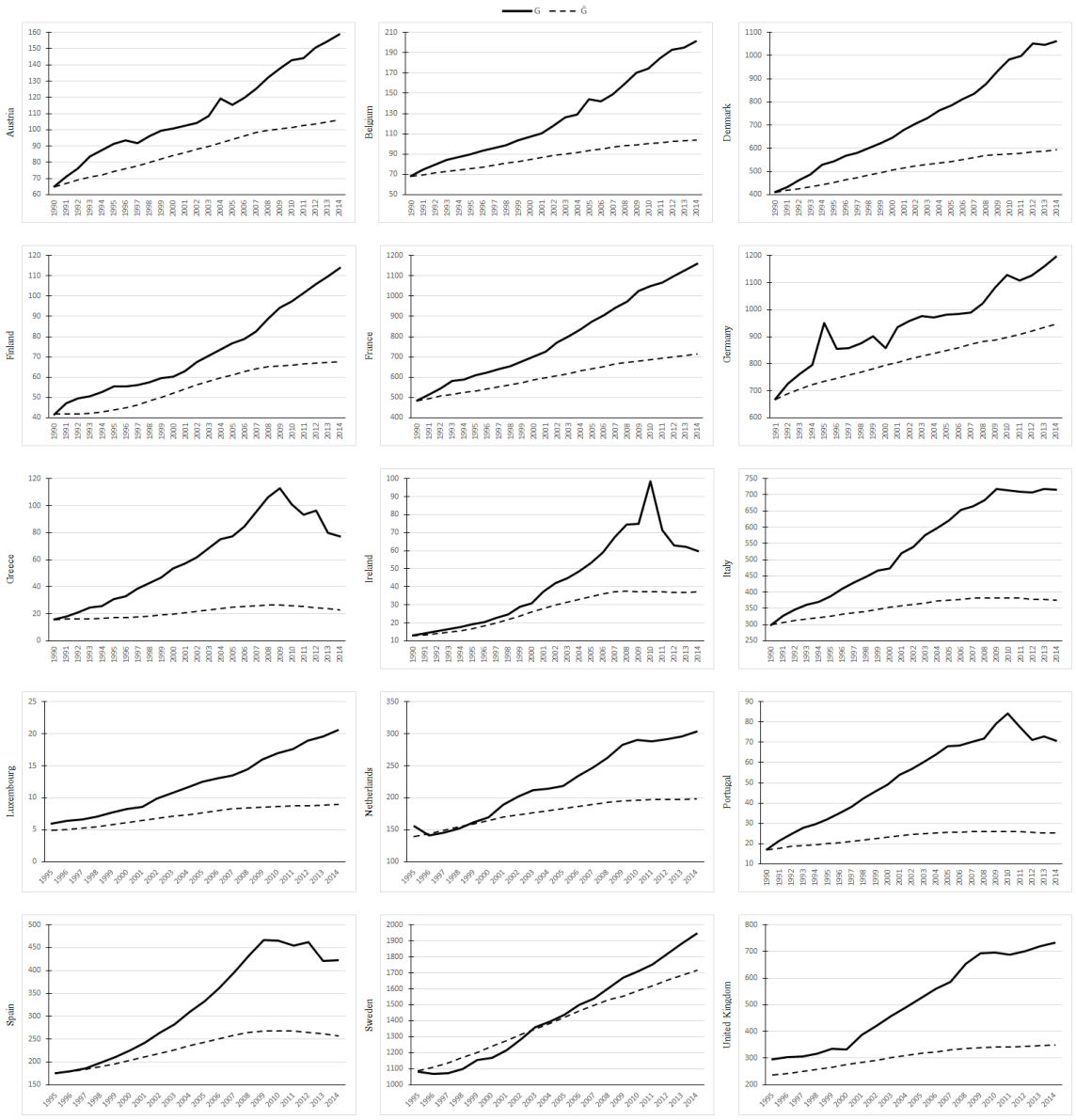

Figure D-II: Actual and rule-based expenditure in billions of national currency for EU-15 countries

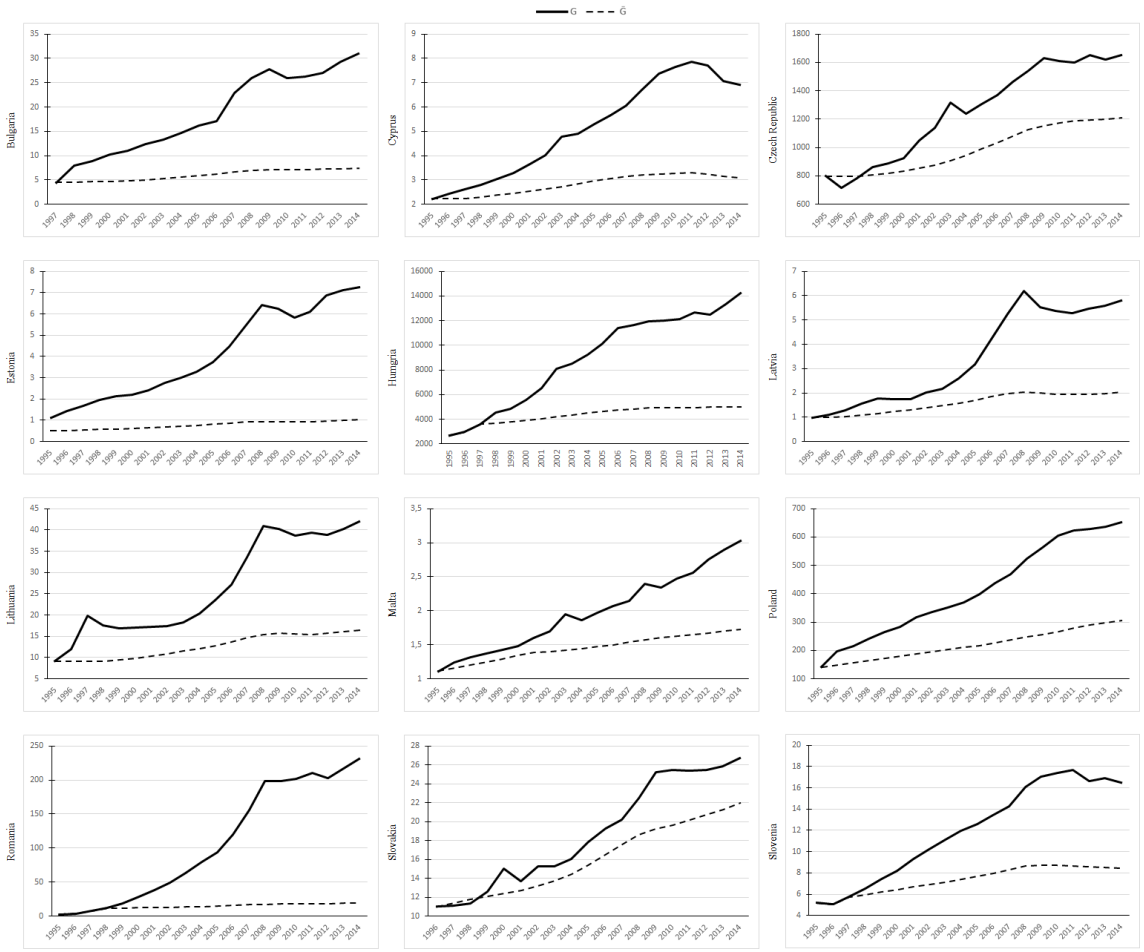

Figure D-III: Actual and rule-based expenditure in billions of national currency for EU-10 countries

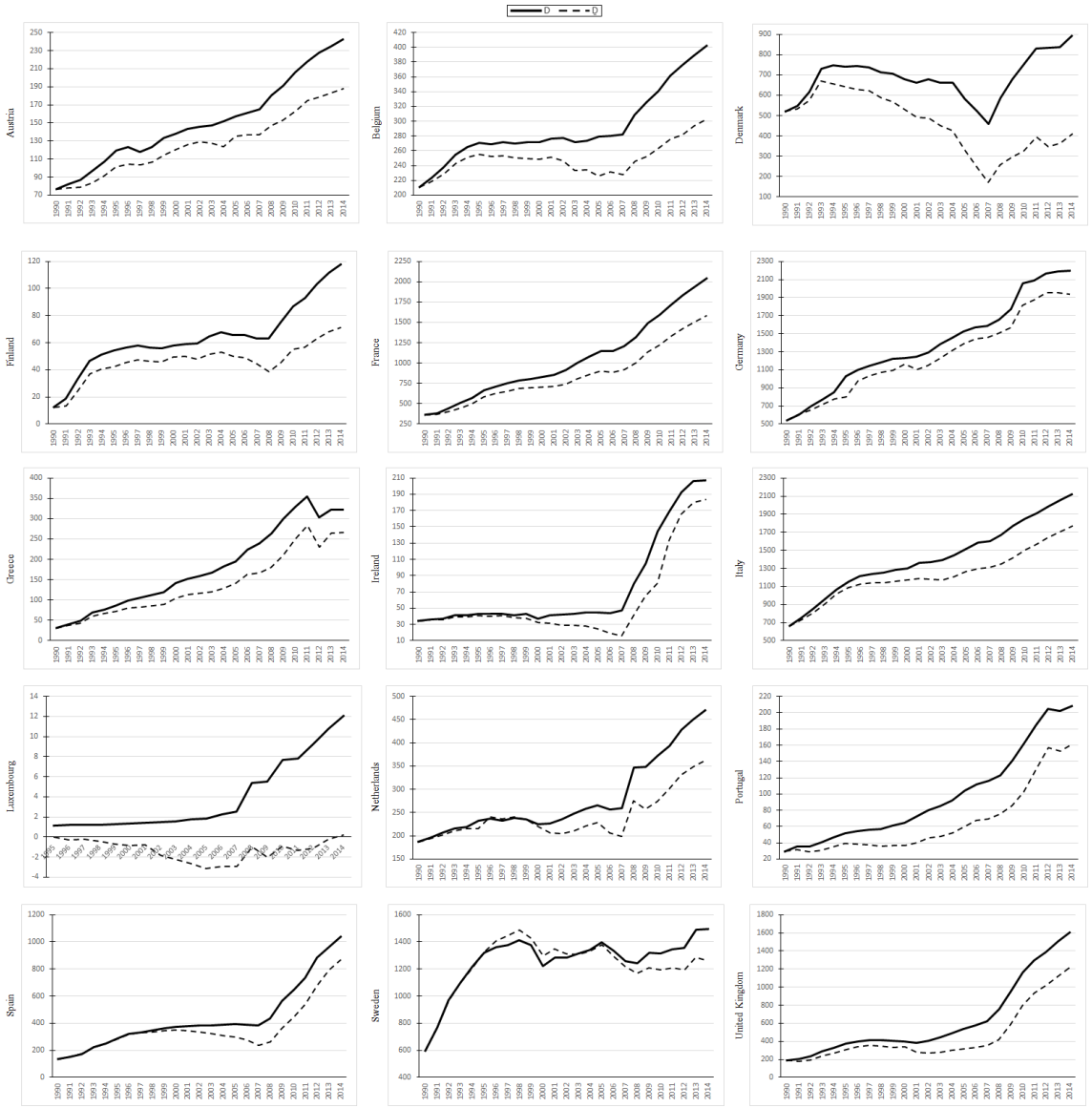

Figure D-IV: Actual and rule-based debt in billions of national currency for EU-15 countries

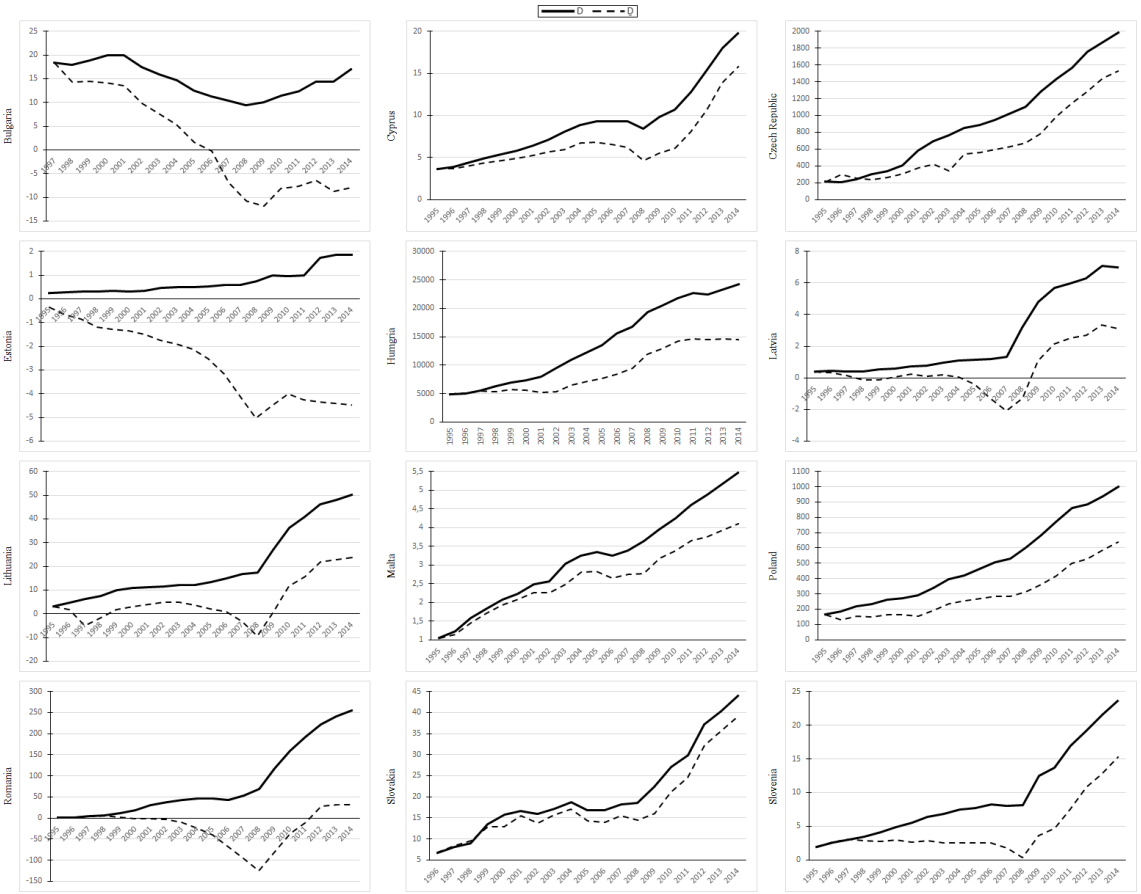

Figure D-V: Actual and rule-based debt in billions of national currency for EU-10 countries

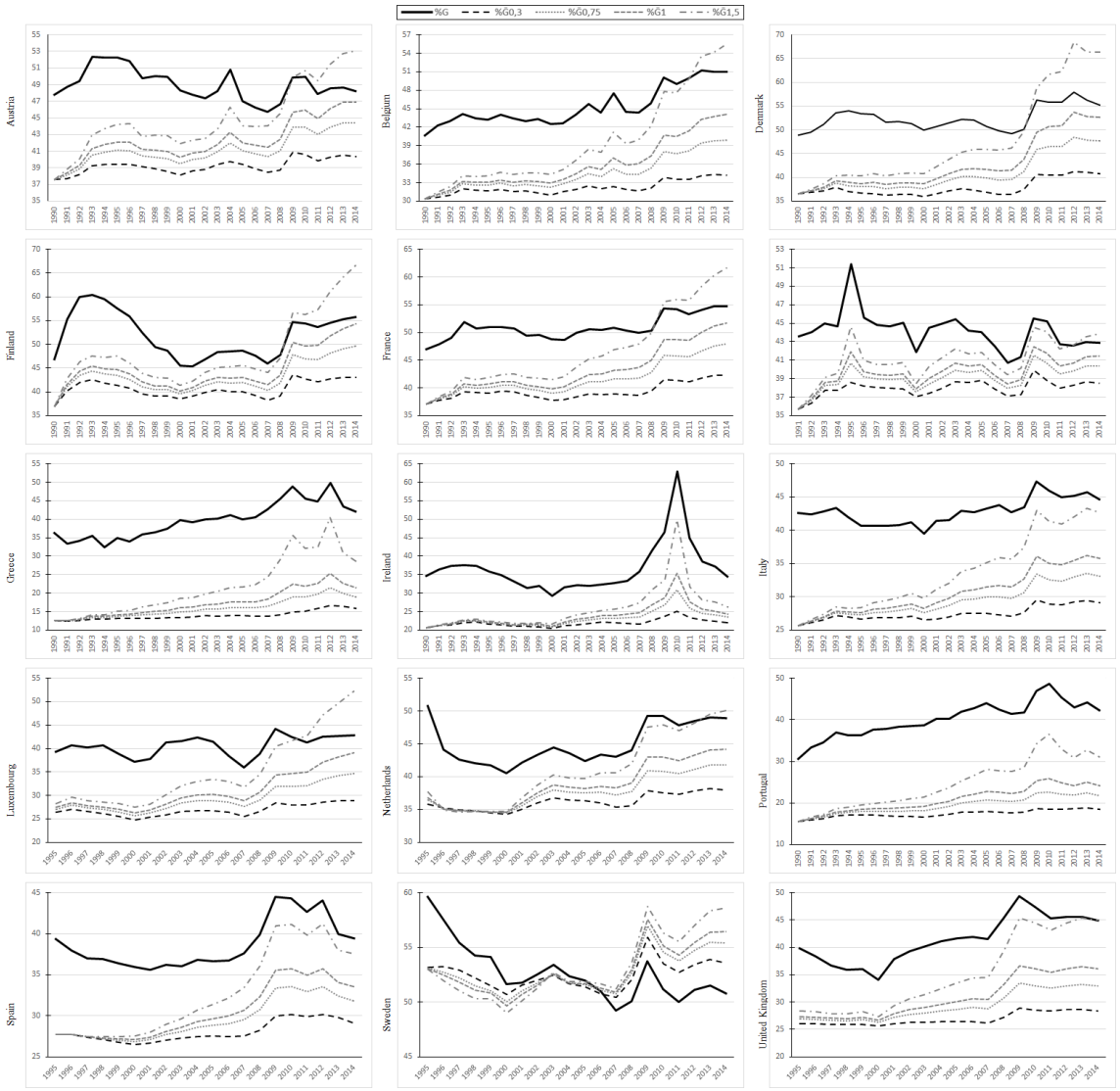

Figure D-VI: Actual expenditure and rule-based expenditure in percentage of GDP for EU-15 countries

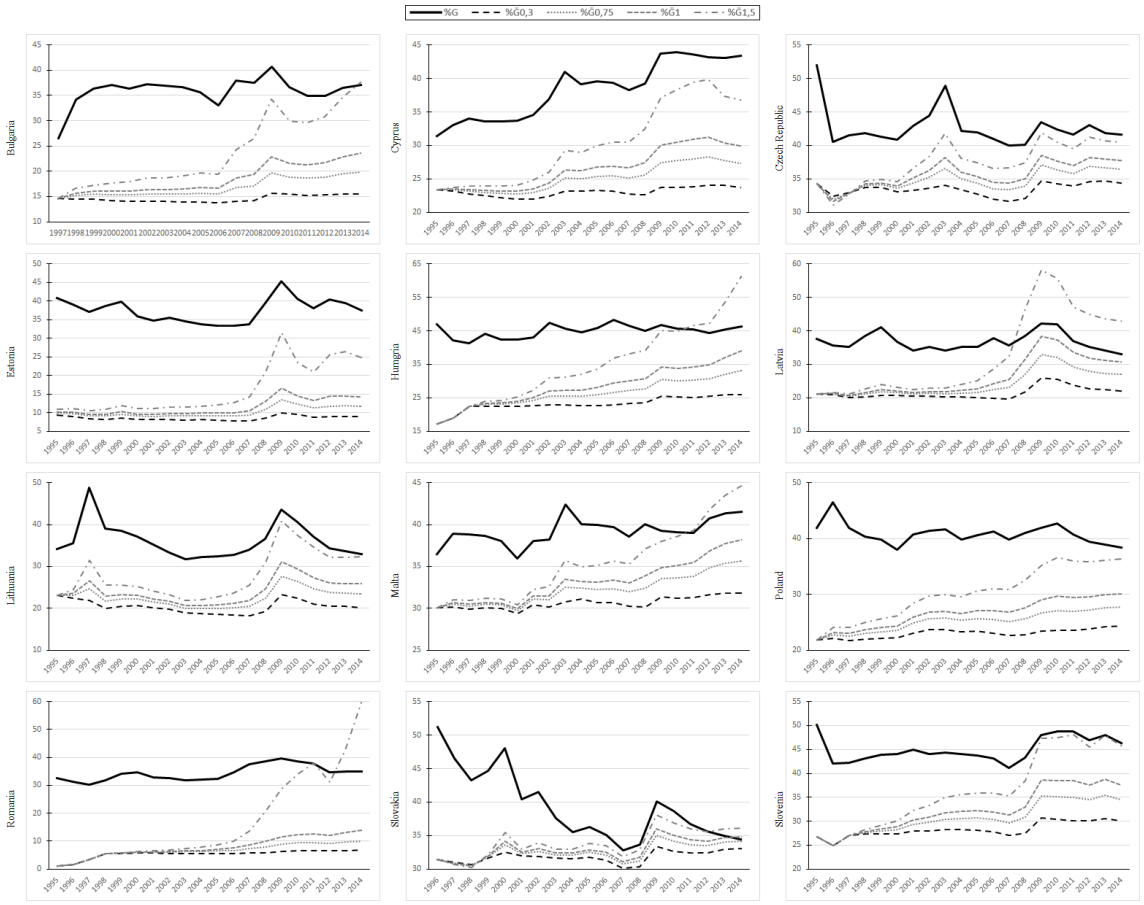

Figure D-VII: Actual expenditure and rule-based expenditure for EU-10 countries

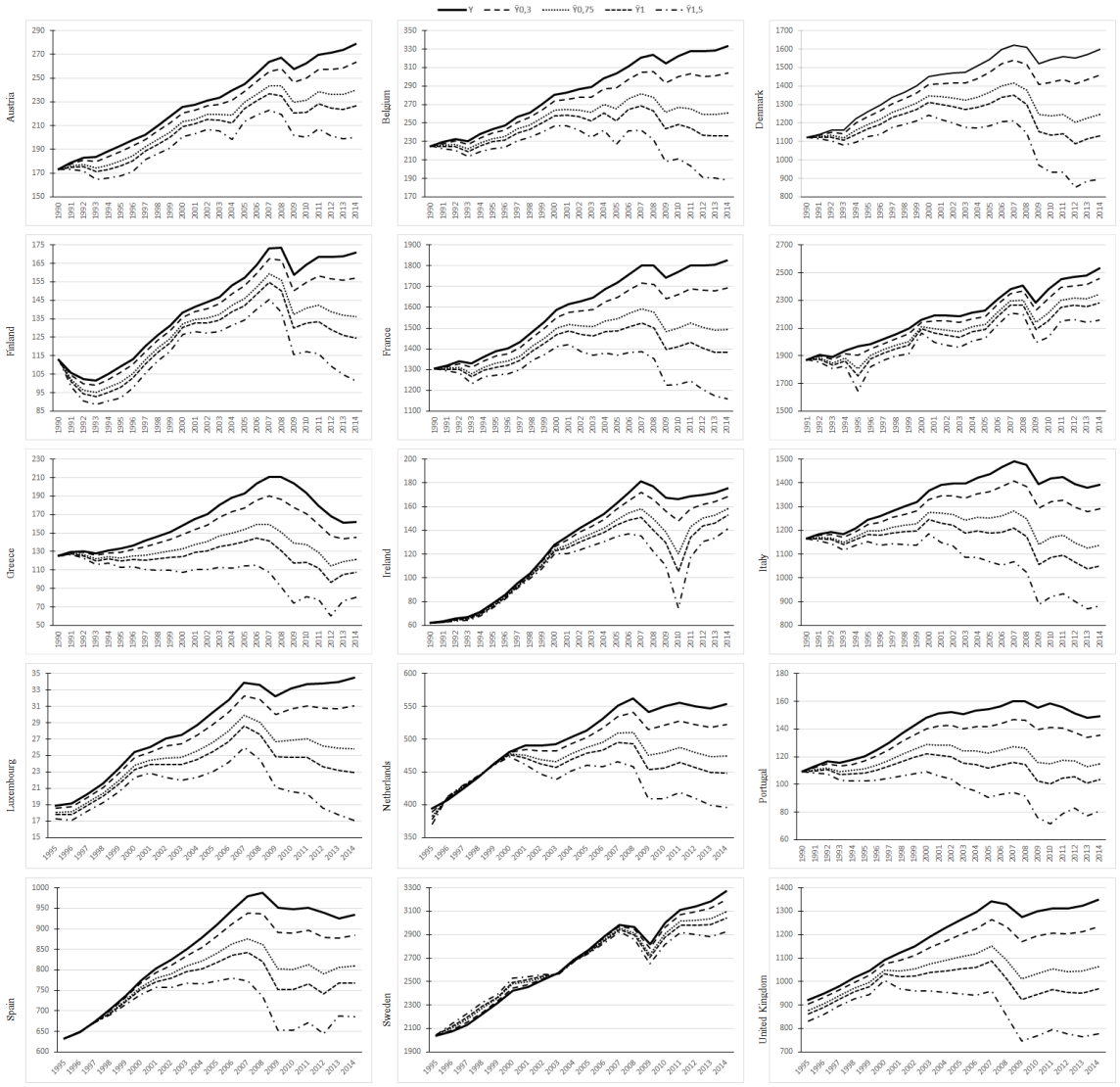

Figure D-VIII: Actual output and rule-based output by expenditure multiplier for EU-15 countries

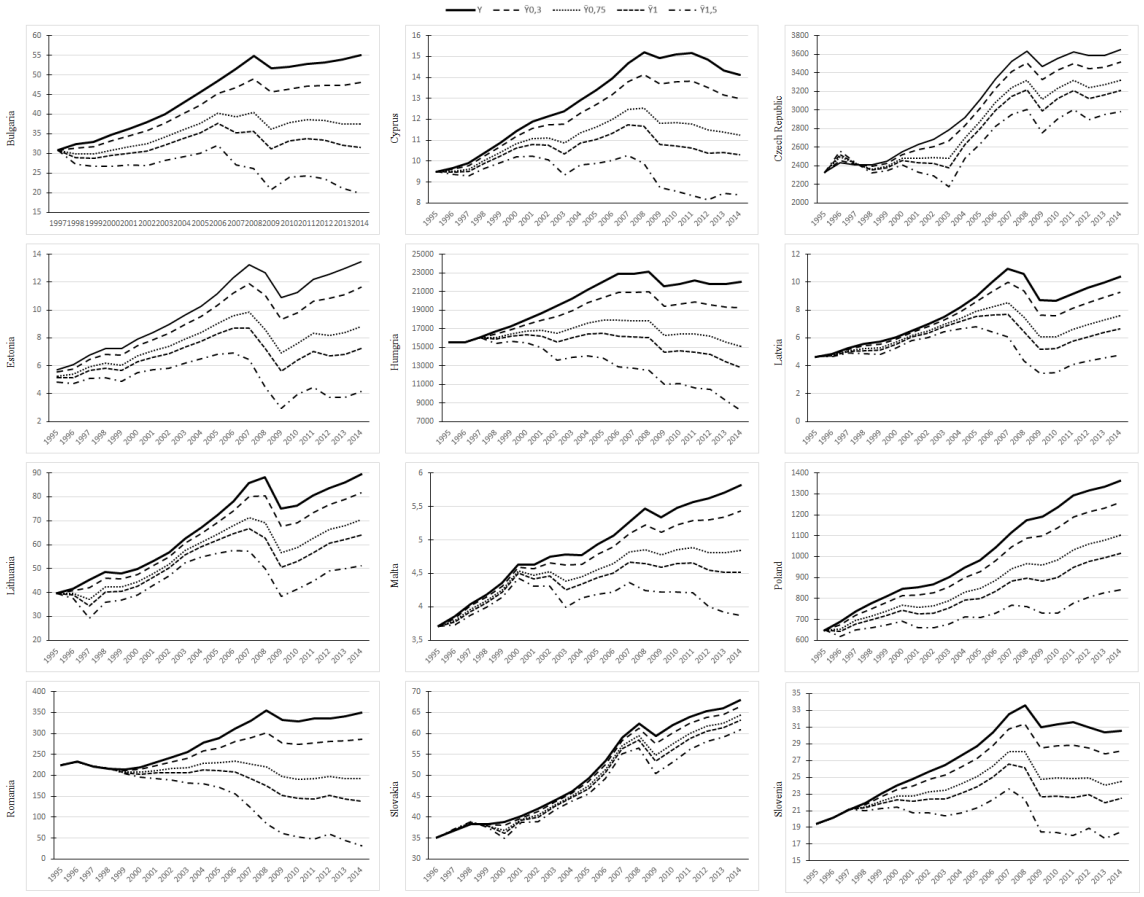

Figure D-IX: Actual output and rule-based output by expenditure multiplier for EU-10 countries

Table D-II - Actual debt and expenditure values, rule-based debt and expenditure in absolute values and relative to GDP for specific years

	Austria								Belgium								Denmark							
	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$
1995	119.2	100.9	68.2	53.7	91.3	74.1	-17.2	39	270.7	255.7	130.2	106.8	89.9	75.8	-14.1	31.7	740.0	641.6	72.6	52.0	544.3	453.2	-91.1	36.7
2000	138.0	120.5	66.2	54.6	100.8	84.1	-16.6	38	272.2	248.5	107.8	90.8	107.2	84.9	-22.4	31.0	678.1	529.2	52.4	37.5	646.8	507.1	-139.7	36.0
2005	157.4	135.2	64.2	56.6	115.3	94.1	-21.2	39	279.0	225.7	92.0	78.3	144.3	93.4	-50.9	32.4	583.5	333.3	37.8	22.6	783.6	543.9	-239.7	36.9
2010	206.1	163.0	72.0	65.2	143.0	101.6	-41.4	41	340.3	263.4	95.5	87.8	174.7	100.5	-74.2	33.5	752.8	328.2	42.7	23.1	982.7	575.6	-407.1	40.5
2013	234.6	183.1	73.8	70.8	154.6	104.9	-49.7	41	388.6	293.7	101.4	97.7	195.2	103.2	-91.9	34.3	836.1	363.2	45.0	25.3	1044.9	588.3	-456.6	41.0
	Finland								France								Germany							
	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$
1995	54.4	42.0	56.6	39.6	55.3	43.8	-11.6	41.3	662.8	581.5	55.4	42.6	609.5	533.6	-75.9	39.1	1027.7	797.0	55.6	41.8	949.3	734.9	-214.4	38.6
2000	57.9	49.4	43.8	36.4	60.2	52.3	-7.9	38.5	826.4	703.8	57.4	45.4	702.7	586.1	-116.6	37.8	1232.3	1164.5	60.2	54.4	857.8	793.5	-64.4	37.1
2005	65.7	49.7	41.7	32.6	76.6	61.2	-15.4	40.0	1145.4	904.1	66.7	54.8	873.9	642.5	-231.5	39.0	1524.8	1386.5	68.5	63.5	980.2	847.7	-132.6	38.8
2010	87.0	55.0	48.6	35.5	97.2	66.0	-31.2	42.7	1595.0	1222.6	82.4	73.5	1048.6	687.5	-361.1	41.3	2056.1	1817.6	82.4	78.7	1127.6	897.3	-230.2	38.8
2013	111.6	68.1	56.2	43.7	109.9	67.2	-42.6	43.1	1937.1	1506.3	94.0	89.8	1127.2	708.1	-419.1	42.2	2185.7	1954.6	81.1	81.0	1158.2	933.8	-224.3	38.7
	Greece								Ireland								Italy							
	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$
1995	86.9	71.2	97.9	55.0	30.9	17.0	-13.9	13.1	43.1	40.5	80.1	52.2	19.2	16.8	-2.5	21.6	1151.5	1084.5	120.9	88.4	387.5	326.7	-60.7	26.6
2000	141.0	104.5	104.4	70.4	53.6	19.9	-33.7	13.4	37.2	31.9	35.1	25.3	30.9	25.9	-5.0	20.5	1299.8	1172.0	108.5	88.0	473.7	353.0	-120.7	26.5
2005	195.4	140.7	101.2	79.3	77.1	24.9	-52.2	14.0	44.4	24.9	27.3	15.8	53.4	34.6	-18.8	22.0	1518.6	1261.6	105.7	92.6	621.1	375.4	-245.7	27.5
2010	329.5	251.2	148.3	146.7	101.1	26.0	-75.1	15.2	144.2	80.0	92.1	54.0	98.4	37.1	-61.3	25.1	1851.3	1506.1	119.3	114.1	712.8	380.9	-331.9	28.9
2013	321.5	264.1	175.2	183.1	79.8	23.8	-56.1	16.5	206.4	179.8	123.3	109.6	62.3	36.8	-25.5	22.4	2061.0	1706.1	131.4	133.4	717.5	377.0	-340.5	29.5
	Luxembourg								Netherlands								Portugal							
	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$
1995	1.1	0.0	7.4	0.0	5.9	4.9	-1.0	26.4	232.2	215.2	76.1	55.2	155.1	139.4	-15.8	35.8	52	38.9	59.2	33.3	31.9	20.0	-11.9	17.1
2000	1.4	-0.8	6.2	-3.3	8.2	6.1	-2.1	24.7	224.8	219.7	53.8	45.8	169.3	164.5	-4.8	34.3	64.5	37.1	50.7	26.4	49.2	23.4	-25.8	16.7
2005	1.8	-3.1	6.1	-10.9	12.5	7.7	-4.8	26.7	266.1	229.3	51.8	45.6	217.9	182.7	-35.2	36.3	104.4	60.1	67.7	42.5	68.0	25.4	-42.5	18.0
2010	7.7	-0.9	19.2	-3.0	17.0	8.6	-8.4	28.0	371.8	274.6	63.1	52.6	289.8	195.8	-93.9	37.5	162.5	102.5	94.0	72.6	84.1	26.1	-58.1	18.5
2013	10.8	-0.2	23.4	-0.8	19.6	8.9	-10.8	28.8	450.8	349.6	74.6	67.5	296.2	197.6	-98.5	38.2	202.2	153.0	123.0	114.2	72.7	25.2	-47.5	18.8
	Spain								Sweden								United Kingdom							
	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$	D	$\underline{D}$	%D	%$\underline{D}$	G	$\bar{G}$	ΔG	%$\bar{G}$
1995	283.1	283.1	63.3	44.7	175.8	175.8	0.0	27.8	1317.4	1324.6	72.8	64.9	1079.4	1086.1	6.7	53.2	375.6	311.1	50.6	34.4	295.7	236.0	-59.7	26.1
2000	374.0	349.8	59.4	45.6	226.5	203.5	-23.0	26.5	1221.0	1295.0	53.9	52.9	1169.5	1239.6	70.0	50.7	400.6	340.0	41.1	31.6	332.4	275.5	-56.9	25.6
2005	392.5	298.2	43.2	33.8	333.2	242.7	-90.5	27.5	1395.9	1377.2	50.4	49.8	1440.1	1422.0	-18.1	51.4	533.2	312.5	42.2	26.0	526.7	317.3	-209.5	26.4
2010	644.7	440.9	61.5	49.6	465.1	268.3	-196.7	30.2	1316.3	1191.7	39.4	40.2	1709.3	1587.2	-122.1	53.5	1164.8	793.0	79.4	66.5	696.1	340.7	-355.4	28.6
2013	960.0	794.9	91.3	90.5	420.3	261.4	-158.8	29.8	1488.3	1283.9	40.7	41.1	1884.4	1683.9	-200.5	53.9	1505.0	1120.2	95.5	92.4	719.1	346.7	-372.4	28.6

Table D-III - Simulation example for Portugal

Year	Output	PGDP	PGDPgr	D	G	Implicite R	$\bar{G}$	ΔG	$\bar{I}$	$\underline{D}$	$\bar{Y}0{,}3$	$\bar{Y}0{,}75$	$\bar{Y}1$	$\bar{Y}1{,}5$	%D	$\%\underline{D}0{,}3$	$\%\underline{D}0{,}75$	$\%\underline{D}1$	$\%\underline{D}1{,}5$	%G	$\%\bar{G}0{,}3$	$\%\bar{G}0{,}75$	$\%\bar{G}1$	$\%\bar{G}1{,}5$
1990	109.40	104.30	0.05	29.60	17.02	0.00	17.02	0.00	0.00	29.60	109.40	109.40	109.40	109.40	53.26	27.06	27.06	27.06	27.06	30.61	15.56	15.56	15.56	15.56
1991	113.09	109.47	0.05	35.50	21.22	0.17	17.86	-3.35	-0.58	31.56	112.08	110.57	109.73	108.06	55.63	28.16	28.55	28.76	29.21	33.28	15.94	16.16	16.28	16.53
1992	116.63	114.35	0.04	35.80	24.80	0.16	18.66	-6.14	-0.97	28.69	114.79	112.02	110.49	107.41	49.97	24.99	25.61	25.96	26.71	34.60	16.26	16.66	16.89	17.37
1993	115.83	117.34	0.03	40.90	27.69	0.15	19.15	-8.55	-1.28	31.07	113.26	109.42	107.28	103.01	54.57	27.43	28.40	28.96	30.17	36.95	16.91	17.50	17.85	18.59
1994	117.55	120.02	0.02	46.50	29.52	0.12	19.58	-9.93	-1.20	35.37	114.57	110.10	107.62	102.65	57.27	30.87	32.12	32.86	34.45	36.32	17.09	17.79	18.20	19.08
1995	120.26	122.63	0.02	52.00	31.88	0.11	20.01	-11.87	-1.25	38.88	116.70	111.36	108.39	102.46	59.15	33.31	34.91	35.87	37.94	36.29	17.15	17.97	18.46	19.53
1996	124.70	125.74	0.03	54.30	35.03	0.09	20.52	-14.52	-1.26	38.53	120.34	113.81	110.18	102.93	58.21	32.01	33.85	34.97	37.43	37.58	17.05	18.03	18.62	19.93
1997	130.20	129.59	0.03	56.10	38.25	0.07	21.15	-17.10	-1.19	37.80	125.06	117.37	113.09	104.54	55.49	30.23	32.21	33.43	36.16	37.82	16.91	18.02	18.70	20.23
1998	136.89	134.19	0.04	57.20	42.33	0.06	21.90	-20.44	-1.24	35.52	130.75	121.56	116.45	106.23	51.79	27.16	29.22	30.50	33.44	38.35	16.75	18.01	18.80	20.61
1999	142.46	138.75	0.03	61.00	45.75	0.06	22.64	-23.11	-1.39	36.50	135.53	125.13	119.35	107.80	51.41	26.93	29.17	30.58	33.86	38.55	16.71	18.09	18.97	21.00
2000	148.04	143.20	0.03	64.50	49.20	0.06	23.37	-25.83	-1.58	37.09	140.29	128.67	122.21	109.29	50.67	26.44	28.83	30.35	33.94	38.64	16.66	18.16	19.12	21.38
2001	150.96	147.16	0.03	72.30	54.05	0.06	24.01	-30.03	-1.82	40.45	141.95	128.44	120.93	105.92	53.79	28.49	31.49	33.44	38.19	40.19	16.92	18.70	19.86	22.67
2002	152.12	150.28	0.02	79.90	56.55	0.05	24.52	-32.02	-1.73	46.14	142.51	128.10	120.09	104.08	56.81	32.38	36.02	38.42	44.33	40.23	17.21	19.14	20.42	23.56
2003	150.73	152.35	0.01	85.20	60.21	0.05	24.86	-35.35	-1.68	48.17	140.13	124.22	115.38	97.71	59.40	34.38	38.78	41.75	49.30	41.97	17.74	20.01	21.55	25.44
2004	153.08	154.61	0.01	92.40	63.90	0.05	25.23	-38.68	-1.76	51.97	141.48	124.08	114.41	95.07	61.91	36.73	41.88	45.42	54.66	42.80	17.83	20.33	22.05	26.54
2005	154.27	155.92	0.01	104.40	67.95	0.04	25.44	-42.51	-1.81	60.08	141.52	122.38	111.76	90.50	67.68	42.45	49.09	53.76	66.38	44.05	17.98	20.79	22.77	28.11
2006	156.50	157.45	0.01	111.70	68.25	0.04	25.69	-42.55	-1.82	67.33	143.74	124.59	113.95	92.67	69.43	46.84	54.04	59.09	72.65	42.43	17.87	20.62	22.55	27.72
2007	160.20	158.60	0.01	115.80	70.03	0.04	25.88	-44.15	-1.97	69.68	146.96	127.09	116.06	93.98	68.38	47.42	54.83	60.04	74.15	41.36	17.61	20.36	22.30	27.54
2008	160.19	159.98	0.01	123.30	71.74	0.04	26.11	-45.64	-2.05	75.62	146.50	125.96	114.55	91.73	71.69	51.62	60.03	66.01	82.43	41.72	17.82	20.72	22.79	28.46
2009	155.53	159.72	0.00	141.10	79.06	0.04	26.06	-53.00	-2.05	86.05	139.63	115.78	102.53	76.03	83.70	61.62	74.32	83.92	113.17	46.91	18.67	22.51	25.42	34.28
2010	158.55	159.76	0.00	162.50	84.12	0.03	26.07	-58.05	-2.00	102.45	141.13	115.01	100.49	71.47	93.99	72.59	89.08	101.95	143.36	48.67	18.47	22.67	25.94	36.48
2011	156.08	159.01	0.00	185.20	77.54	0.04	25.95	-51.59	-2.20	131.40	140.60	117.39	104.49	78.69	108.29	93.46	111.94	125.76	166.98	45.33	18.45	22.10	24.83	32.97
2012	151.14	156.54	-0.02	204.50	71.12	0.04	25.54	-45.58	-1.79	157.13	137.46	116.95	105.55	82.76	123.62	114.31	134.36	148.86	189.85	43.00	18.58	21.84	24.20	30.86
2013	148.21	154.59	-0.01	202.20	72.70	0.04	25.22	-47.48	-1.67	153.05	133.97	112.60	100.73	77.00	122.95	114.24	135.92	151.93	198.78	44.21	18.83	22.40	25.04	32.76
2014	149.37	153.92	0.00	208.20	70.85	0.04	25.12	-45.74	-1.61	160.85	135.65	115.07	103.63	80.76	124.34	118.58	139.79	155.22	199.16	42.31	18.52	21.83	24.24	31.10