Instituto Superior de Economia e Gestão

UNIVERSIDADE TÉCNICA DE LISBOA

DESDE 1911

MASTER

MONETARY AND FINANCIAL ECONOMICS

FINAL MASTER DISSERTATION

FISCAL RULES: BUDGETARY AND SOVEREIGN YIELD DEVELOPMENTS

ANA SOFIA DA SILVA GUIMARÃES

SUPERVISOR:
ANTÓNIO AFONSO

SEPTEMBER - 2013

Fiscal rules, budgetary and sovereign yield developments

Ana Sofia da Silva Guimarães

Supervisor: Prof. Doutor António Afonso

Master in: Monetary and Financial Economics

Abstract

Numerical fiscal rules appear in the literature as a solution for the bias of pro-cyclicality and as an alternative to discretionary measures conducted by policy makers. With this work we will try to understand if fiscal rules do, in fact, impact budget balances and sovereign yields, and afterwards perform a simulation exercise to assess what would have been the debt level if a numerical expenditure rule had been applied in 1990. The empirical analysis is based in a data panel of 27 EU countries covering the years between 1990 and 2011. We find that fiscal rules contribute to the reduction of budget balances, specifically expenditure rules significantly impact primary expenditure and that countries with rules applied experienced smaller sovereign bond yields. The simulations show that the same rule applied to different countries produces very different results, particularly due to the initial level of primary expenditure.

Keywords: numerical fiscal rules, expenditure rules, budget balance, sovereign yields.

Acknowledgements

First and foremost, I would like to thank my supervisor, Professor António Afonso, for the interest in guiding me in the development of this subject, for all the time dedicated and for the knowledge and motivation that he transmitted me.

Second, I would like to thank my family, without their daily and unconditional support I would not be able to devote myself entirely to this work. Thank you for the faith placed in me and for making me who I am. I also like to thank my boyfriend, that even with the same challenge of writing his own thesis, never ceased to be by my side, sharing the same doubts and concerns and contributing to its resolution. My friends, who shared with me their experience, motivation, availability and for having always a friendly word to share when I needed.

Finally, I would like to thank the authors who contributed to the development of this theme, by sharing data, for their support and help. To all my teachers, who contributed to my theoretical training, which gave me the tools necessary to complete this step and that above all contributed to my development as a person.

Contents

List of abbreviations

CAPB - Cyclically Adjusted Primary Balance

2SLS - Two Stage Least Squares

CAB - Current Account Balance

DEBT - Debt-to-GDP

EC - European Commission

EMU - Run-up of the EMU Dummy

ENLARGEMENT - Entrance of 10 countries in EU Dummy

ERI - Expenditure Rule Index

EU - European Union

FRI – Fiscal Rule Index

FRI_IMF - IMF's FRI

GDP - Gross Domestic Product

GDPGR - GDP growth rate

GOV_NEW - Government Ideological change Dummy

I - Shor-term Interest Rate

IMF - International Monetary Fund

LEGELEC - Election Year Dummy

MDMS - District Magnitude

OLS - Ordinary Least Squares

OUTPUTGAP - Output gap

PE - Primary expenditure

REER - Real Effective Exchange Rate

SGP - Introduction of Stability and Growth Pact Dummy

VIX - Chicago Board Options Exchange Market Volatility Index

YIELD - 10 Year Bond Yield

1. Introduction

Over the years, the concern with high budget deficits and pro-cyclical fiscal policies has grown. In the European Union (EU) several efforts have been undertaken to control this bias. In 1992 was implemented the Maastricht Treaty that defined specific criteria to enter the Economic and Monetary Union (EMU): the debt-to-GDP ratio should not be over 60% and the budget deficit had a limit of 3% of GDP. In addition, the Stability and Growth Pact (SGP) was introduced to guarantee the fulfilment of the referred criteria, establishing sanctions for the countries that exceeded those limits. Later on, some reforms were made to the SGP, however, EU countries constantly ran budget balances and debt ratios 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 with new rules at both the national and the supranational level. The rules to be adopted are a limit of annual structural deficits to a maximum of 0.5 percent GDP, and automatic mechanisms that are triggered when deviations from the rule occur. The supranational rules are directed to debt and non-discretionary expenditure. The debt ratio has to be reduced at an annually pace of no less that $1/20^{th}$ of the distance between the observed level and the target, and the annual growth of the expenditure should not exceed a medium-term rate of growth.

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

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 the budget balance and developments of the yield spreads and the use of fiscal rules. Moreover, we will focus only in rules that target public expenditure and we perform a simulation of the expenditure path and debt level associated with the application of a specific rule.

The thesis is organised as follows. The next section provides an overview of the existing related literature. Section 3 specifies the data and the variables used, and provides some stylised facts. Section 4 presents the methodology and the main results. Finally, section 5 concludes.

2. Related literature

The existing literature has proven the impact of better fiscal policies on the output gap and on the 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 improve the fiscal stance (Ayuso et al., 2007; Debrun et al., 2008). Additionally, more attention has been given to the expenditure side of the balance, as Ayuso (2012) explains, because it is the one variable that can be more directly controlled by the government. 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) that 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 make also assumptions concerning why the rules are applied and in what conditions. The motivation for

implementation that are often indicated are macroeconomic stability, support to other macro policies, sustainability of public finances and adverse market reactions and spillover effects. Some aspects have been considered when introducing a fiscal rule: the statutory basis, the enforcement, the monitoring of compliance and long-term commitment. Several institutional arrangements can easily work: constitutional, legal or treaty provision, regulation or policy guidelines. For the enforcement and the monitoring, the authors recommend that they should be carried out by an independent authority. Finally, Kopits and Symansky (1998) stress that fiscal rules can have great credibility gains if the government commits itself to the rule with transparency.

In Kumar et al. (2009), fiscal rules are defined as an institutional mechanism design 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 via which rules have an impact: specially for the time inconsistency problems[1], rules anchor expectations about the sustainability of fiscal policy in the future as they limit the behaviour of the government.

Further clarification is needed concerning the types of fiscal rules, and the type of fiscal rules depends on the fiscal aggregate targeted. Budina et al. (2012) have a simple definition, as described below:

- Debt rules that target the public debt as percentage of GDP are the most effective in terms of convergence to the defined objective. However, there are a few setbacks, debt

[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.

levels are not easily influenced by budgetary measures in the short-term, offering no practical guidance for 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 the operational guidance that debt rules do not have. 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, because they do not limit the revenue side. They are, however, appropriately used as a tool of consolidation and sustainability when matched with debt or budget balance rules. Expenditure rules are not consistent with discretionary fiscal stimulus, the amount of resources spent by the government are 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. As for the 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 to their development. As expenditure rules they have greater impact when the objective is to change the government size.

The 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 recurring to contractionary fiscal policy in periods of slow growth. The authors defend that the existence of clear escape-clauses contributes to the minimisation of the 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 the 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 attenuated by designing proper rules and setting adequate institutions for fiscal monitoring and control.

Empirically, we can find a plethora of results that justify and support the use of fiscal rules. First, Turrini (2008) sates that fiscal policy has been increasingly recognised as 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 being a-cyclical at the margin means that the cyclically adjusted primary balance (CAPB) is not influenced by changes in the output gap. Therefore, this cannot be used to conclude if 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 conclude about the impact in reducing or expanding existing imbalances. Turrini (2008) reports that the CAPB falls when the output is above potential and rises when it is below.

Furthermore, the effective impact of fiscal rules on the budget balance was already tested in the existing literature, and the 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 the 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 also

conclude that if the debt ratio is below 80%, a strong fiscal rule contributes to the improvement of the primary surplus.

The European Commission (2008) reached similar results and concluded that the CAPB improved after the introduction of fiscal rules while being stable, on average, over the period in analysis; whereas cyclically adjusted primary expenditure declined significantly in the period after an expenditure rule was implemented in comparison with the average change over the period. Finally, Pina and Venes (2011) in an exercise to assess the determinants of the Excessive Deficit Procedure fiscal forecasts report that a higher coverage and strength of expenditure rules are associated with more prudent forecasts.

Some authors tried to go further by assessing the different impact of fiscal revenues and expenditures. The results show that revenues are essentially a-cyclical and expenditure significantly pro-cyclical, explaining the behaviour of fiscal policy (Gali & Perotti, 2003; Wierts, 2008).

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

To that extent, it is justifiable to focus on expenditure policies and in 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, the weaker the effects of revenue shocks.

Holm-Hadulla et al. (2010) reach similar results and additionally find that the effectiveness of expenditure rules depend on the type of government expenditure taken into account: more flexible spending leads to more pro-cyclical biases, while fixed expenditure – interest expenditure – are less subject to changes by policymakers and have no cyclical patterns. Table I summarises some of the available studies 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 decentralization on country's fiscal position.	The primary balance surplus increases as a result of increases in the stock of government debt. Fiscal rules and lower degree public spending decentralization contribute to better primary surplus. When debt-to-GDP ratio is below 80 percent a strong fiscal rule contributes to improve 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	Assess 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 matter for their effectiveness. Fiscal rules are more efficient if the target is the budget balance and the general government debt rather than expenditure rules.
		$p_{i,t} = \alpha_0 + \rho d_{i,t-1} + \gamma Rules_{i,t} + x'_{i,t}\,\beta + \eta_i + \varepsilon_{i,t}$	
(Holm-Hadulla et al., 2010)	2002-2008 EU	Analyse 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 reduce this tendency. Flexible Spending items have greater influence in 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	Estimation of a fiscal reaction function 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 the bias.
(Hauptmeier et al., 2010)	1999-2009 DE, IT, FR, PT, ES, EL, IR.	Comparison study between actual expenditure trends and debt paths and rule-based expenditure developments.	For the period 1999-2009, neutral expenditure rules have implied 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	Assess the role of national expenditure rules in limiting expenditure bias and pro-cyclicality.	Higher values of institutional strength of expenditure rules lead to a more neutral responses 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, Czech Republic, Germany, Denmark, Estonia, Greece, Spain, Finland, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia and United Kingdom.

All fiscal and macroeconomic variables, 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 (CAB), consumer price index (CPI), real effective exchange rate (REER), industrial production (IP) and finally, GDP growth rate (GDPgr) were extracted from the AMECO dataset. The measurement of international risk aversion is taken from the Chicago Board Options Exchange Market Volatility Index (VIX), from Yahoo! Finance.

To access the impact of particular events on the dependent variable in consideration we include in the regressions a set of dummy variables that are defined as follows:

- EMU: is a dummy for the run-up to the EMU, that takes the value 1 for the EU-15 countries and years between years 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 year 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 it took place a change in the ideological composition of the cabinet (Klaus Armingeon, 2012).

The EC's fiscal rule index (FRI) is constructed based on information collected directly from the 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 5 criteria: the statutory base of the rule, the room for revising objectives, the mechanisms of monitoring compliance and enforcement of the rule, the existence of predefined enforcement mechanisms, and media visibility of the rule. This index covers the period 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 goes 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 consider this index only for the countries and the years available for the EC's index.

The statistical information as 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 EC's FRI, the number of numerical fiscal rules in place since 1990 has continuously grown from 13 rules to a total of 77 in 2011 (Figure A-I in Appendix A). The rules targeting the budget balance represent the majority of the rules in place from

1990 to 2011, with debt rules and the expenditure rules in the recent years increasing considerably. Rules targeting government revenue are the ones with less representation (Figure A-II).

Concerning the type of government that is covered, most of the rules were applied to the Local Government throughout the years, with a growing representation of rules applied to the General Government, in recent years (Figure A-III in Appendix A).

Central Government applied mostly expenditure rules, whereas General Government and Local Government targeted the budget balance (Table II).

Table II
Total numerical fiscal rules by type of government and aggregate targeted

	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 with more rules, ten, in the range of years considered (see Figure A-IV in Appendix A), whereas the ones with less rules are Latvia, the Netherlands and Romania (Figure A-IV). Cyprus, Greece and Malta never adopted a numerical fiscal rule. In 2011, the country with more rules applied, six, was France (Figure A-V in Appendix A) and almost 30% of the countries had only 2 rules in place.

Analysing now the evolution of the FRI per country, we can see countries with no variation in the way they implemented numerical fiscal rules, starting by the countries already mentioned that have no rules in force (Cyprus, Greece and Malta), countries like

Netherlands, Latvia, Romania, Germany that have changed their rules a few times, and countries that are more dynamic with more frequent changes in the rules (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 run-up to EMU).

After computing the results we expect $\phi > 0$ meaning that more and better rules (better FRI) impacts positively in the value of the CAPB leading to a healthier fiscal position.

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

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

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

where, $yield_{it}$ is the 10-year maturity bond yield, $\bar{X}_{it}$ is a vector comprising CAPB, debt, CAB, REER, IP, GDPgr 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 county *i* and *fri* has the definition already mentioned above.

4.2. Baseline Results

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

Table III
Baseline results: fiscal rules and fiscal performance

	EC				IMF			
Dependent Variable	Cyclically Ajusted 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)

Dependent Variable	EC				IMF			
	Cyclically Ajusted Primary Balance							
	OLS (1)	OLS (2)	OLS (3)	2SLS (4)	OLS (5)	OLS (6)	OLS (7)	2SLS (8)
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 *** denote, 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 capturing the commitment of governments.

When the control variables are included in column (2), Table III, the run-up to the EMU, the election period and the ideological change in government composition have a significant impact on de dependent variable. The interpretation is as follows: in the years of implementation of the EMU in the EU-15 countries, the CAPB is 1.19 p.p. higher. The years where occurred an ideological change led to an increment of the CAPB of 0.43 p.p. and finally the years of election have a negative impact of 0.77.

The results obtained from a fixed effects OLS regression, column (3), Table III, are essentially the same, with two more variables becoming statistically significant, the EU-10 countries after 2003 have an increment of 1.23 p.p on CAPB and those being part of the euro-area after 1998 have a negative impact of 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 capturing 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, still, by analysing the Granger Causality Test (Appendix CTable C-III) we cannot conclude if, in fact, is the implementation of fiscal rules that leads to better balances, or if it is the better fiscal outcomes that lead to the implementation of more rules.

The use of the IMF's Fiscal Rule Index generates some different results, and for the same period range we have only 366 observations. The index is significant only 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 and so the results might differ because of that (see column (5)-(8), Table III). Therefore, the methodology used to compute the index may have an important role in the conclusions that can be made about the impact of fiscal rules in fiscal outcomes.

We performed the same exercise for the IMF Expenditure Rule Index (ERI), calculated based on the methodology provided in the EC's FRI Database applied only to rules

[2] Similarly to Debrun et al. (2008), we use a dummy variable representing governments that by their nature – coalition governments – have implemented commitment models, which easily allow the implementation of fiscal rules. This variable was constructed based on (Hallerberg et al., 2009) and (Annett, 2006). Regarding the effectiveness of this instruments see Debrun et al. (2008), box. 3, p. 325.

targeting public expenditure. We considered as dependent variable the Primary Expenditure - interest payments are hardly controlled by the governments - as expenditure rules are more effective regarding expenditure alone and not the whole balance (see Table IV).

We performed again a fixed effects OLS regression and an IV estimation with the instrument being the ERI's own lag. Column (1), Table IV, similarly to the analysis for the FRI, accounts for the possibility of control variables biased 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 the control variables are included, column (2), but with a smaller coefficient. In this way, holding everything constant, the increase of one unit in the 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 the SGP, election periods, and changes in government ideology are other explanatory variables with an impact in Public Expenditure. The results remain robust when the ERI instruments are used, confirming that the results are not biased due to 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)

Dependent Variable	Primary Expenditure			
	OLS (1)	OLS (2)	OLS (3)	2SLS (4)
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 *** denote, 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 capturing the commitment of governments.

To stress the importance of numerical fiscal rules, we performed an additional empirical exercise to assess the impact of rules on the 10-year maturity bonds yield. The index shows significance in every regression computed, meaning that if the FRI increases by one unit, the yield, in (1) of Table V, decreases by 0.25 p.p. When investors become more risk averse - *vix* increases - we can see that, holding everything else constant, the 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 testes shows that the FRI is not endogenous, regarding causality, the Granger tests in Appendix C, show that causality runs from the FRI to the yields.

In Appendix C, Table C-I and Table-CII, it is possible to observe regression results considering different sets of explanatory variables and, also, the same regressions but considering the yield spread against Germany as the dependent variable. The conclusions are the same, the FRI is significant in all regressions and the variables capturing economic developments maintain their statistical significant as well.

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)
cab	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)

Dependent Variable	10 year bond yield		
	OLS (1)	OLS (2)	2SLS (3)
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 *** denote, 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 capturing the commitment of governments.

Overall, we observe that the FRI is strongly significant is most of the regressions, together with the variables capturing developments in the EU and in the EMU (sgp, emu, and enlargement). The variables capturing countries specific developments – election and gov-new – have also explanatory power for the budget balances. When we consider only expenditure rules, these are also important to explain primary expenditure ratios. Countries with rules applied to discretionary public expenditure experience better expenditure ratios. In addition, capital markets react positively to countries that have rules implemented, demanding lower yields.

4.3. Simulation

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

The simulation exercise has the purpose of understanding what would have been the debt developments if EU countries had adopted a rule for the discretionary component of public expenditures.

First, we have a few countries with an unusual situation in the period considered, with 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.

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

Considering the SGP constraint of maintaining the debt ratio below 60%, this barrier would have been exceed much later, 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 and adopted the SGP with debt ratios already above 60% but would pass it only in 1996, 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 applied to public expenditures had been in place since 1990.

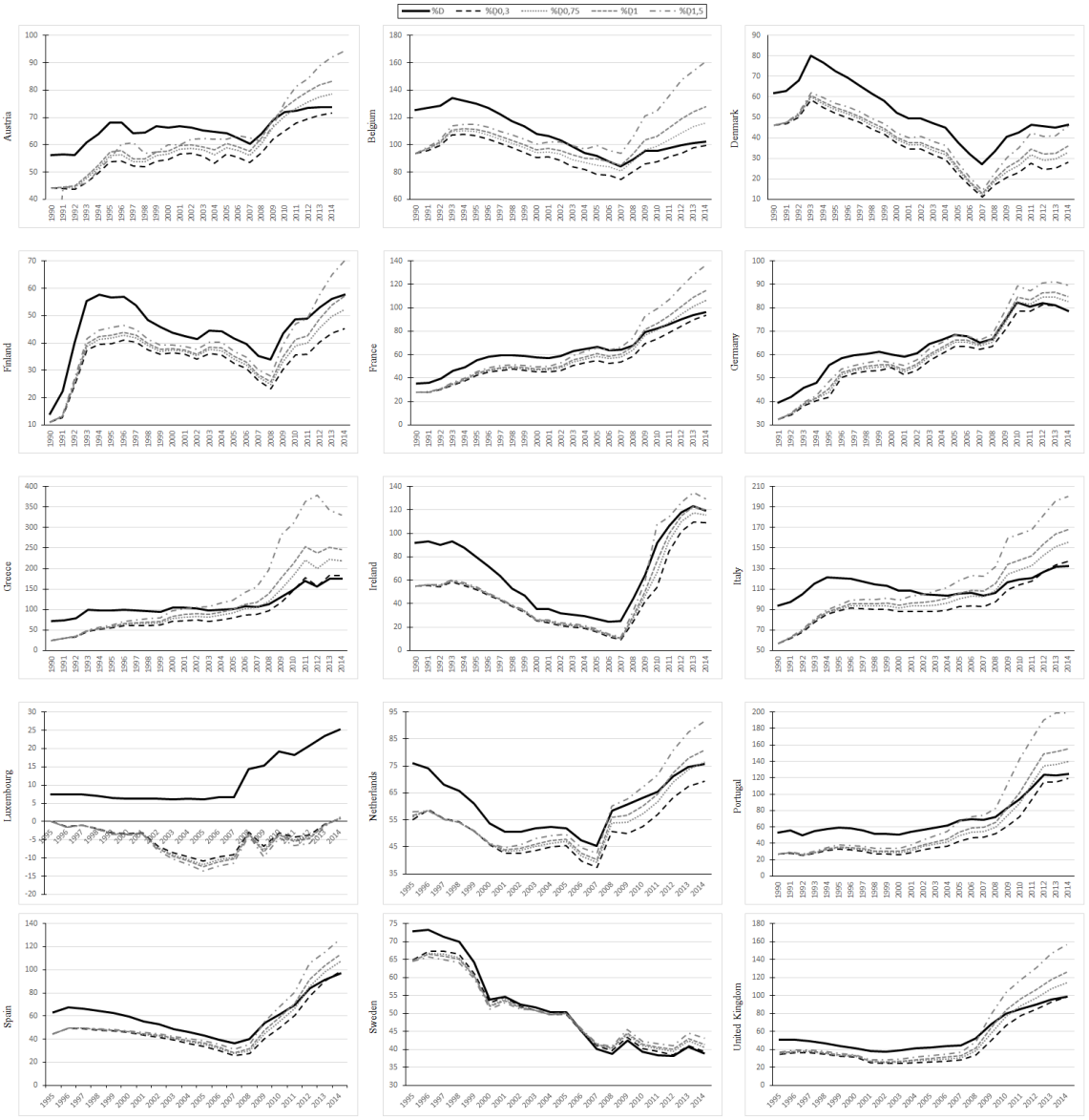


Figure 1: Actual and rule-based debt in percentage of GDP for EU-15 countries

5. Conclusions

The purpose of this thesis was to assess whether countries with more or better fiscal rules implemented 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, in fact, have better CAPB. But we could not guarantee that causality runs from FRI to CAPB. Also, the methodology used to compute this type of indexes seems to matter, given that IMF's FRI for the same countries, considering broadly the same criteria, produces different results from the ones computed with the EC's FRI.

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

With revenues being essential a-cyclical, we tried to prove that rules applied to public expenditures contribute to their control and for the consolidation of fiscal balances, our regression results show that the ERI has explanatory power to explain developments in primary expenditures. Therefore, it is justifiable to construct rules that target specifically the expenditure side of budget.

This leads to the second objective of our work, assess the debt developments of the EU countries if they had implemented an expenditure rule in 1990. If public expenditures had increased at the growth rate of potential GDP, countries would have experienced smaller debt ratios compared to the actual ones and would have had more easily complied with the SGP constraint of debt ratios below 60%.

As mentioned before, this work has some limitations. First, it was not possible to prove that, without doubt, the FRI causes better results of the CAPB and not the other way around. Second, different methods of computing the fiscal rule index can lead to different results. Further analysis on the proper methodology to be used or new instruments capturing the commitment to rules could contribute to the conclusions on the subject.

References

Afonso, A., & Hauptmeier, S. (2009). Fiscal behaviour in the European Union - rules, fiscal decentralization and government indebtedness, ECB Working Paper Series, **1054.**

Annett, A. (2006). Enforcement and the Stability and Growth Pact: How Fiscal Policy Did and Did Not Change Under Europe's Fiscal Framework, IMF Working Papers, **06/116.**

Ayuso, J. (2012). National Expenditure Rules – Why, How and When, EC Economic Papers, **473.**

Ayuso, J., Debrun, X., Kumar, M. S., Moulin, L., & Turrini, A. (2007). Beyond the SGP - Features and effects of EU national-level numerical fiscal rules, Centre for Economic Policy Research.

Baum, A., Ribeiro, M. P., & Weber, A. (2012). Fiscal Multipliers and the State of the Economy, IMF Working Papers, **12/286.**

Boussard, J., de Castro, F., & Salto, M. (2012). Fiscal Multipliers and Public Debt Dynamics in Consolidations, Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

Budina, N., Schaechter, A., Weber, A., & Kinda, T. (2012). Fiscal Rules in Response to the Crisis - Toward the "Next-Generation" Rules. A New Dataset, IMF Working Papers, **12/187.**

Debrun, X., Moulin, L., Turrini, A., Ayuso-i-Casals, J., & S. Kumar, M. (2008). Tied to the mast? National fiscal rules in the European Union. *Economic Policy, 23*, 297-362.

European Commission. (2008). Fiscal rules in the EU at national level : experiences and lessons. *Presupuesto y gasto público, 51*(2), p.59-82.

Gali, J., & Perotti, R. (2003). Fiscal Policy and Monetary Integration in Europe. *Economic Policy, 18*(37), 533-572.

Hallerberg, M., Strauch, R., & Hagen, J. v. (2009). *Fiscal Governance in Europe*.

Hauptmeier, S., Sanchez-Fuentes, J., & Schuknecht, L. (2010). Towards expenditure rules and fiscal sanity in the euro area. *1266*.

Holm-Hadulla, F., Hauptmeier, S., & Rother, P. (2010). The impact of numerical rules on budgetary discipline over the cycle, ECB Working Paper Series, **1169.**

Klaus Armingeon, R. C., David Weisstanner, Sarah Engler, Panajotis Potolidis, Marlène Gerber. (2012). *Comparative Political Data Set III (35 OECD Countries and/or EU-member countries)*.

Kopits, G., & Symansky, S., A. (1998). Fiscal Policy Rules, IMF Occasional Papers, **162.**

Kumar, M., Baldacci, E., Schaechter, A., Caceres, C., Kim, D., Debrun, X., . . . Zymek, R. (2009). Fiscal Rules - Anchoring Expectations for Sustainable Public Finances, IMF staff paper.

Pina, Á. M., & Venes, N. M. (2011). The political economy of EDP fiscal forecasts: An empirical assessment. *European Journal of Political Economy, 27*(3), 534-546.

Schuknecht, L. (2004). EU fiscal rules: issues and lessons from political economy, ECB Working Paper Series, **421.**

Turrini, A. (2008). Fiscal policy and the cycle in the Euro Area: The role of the government revenue and expenditure. *European Economy - Economic Papers, 323*.

Wierts, P. (2008). How do expenditure rules affect fiscal behaviour? , DNB Working Paper, **166.**

Appendix A – Stylised facts - figures

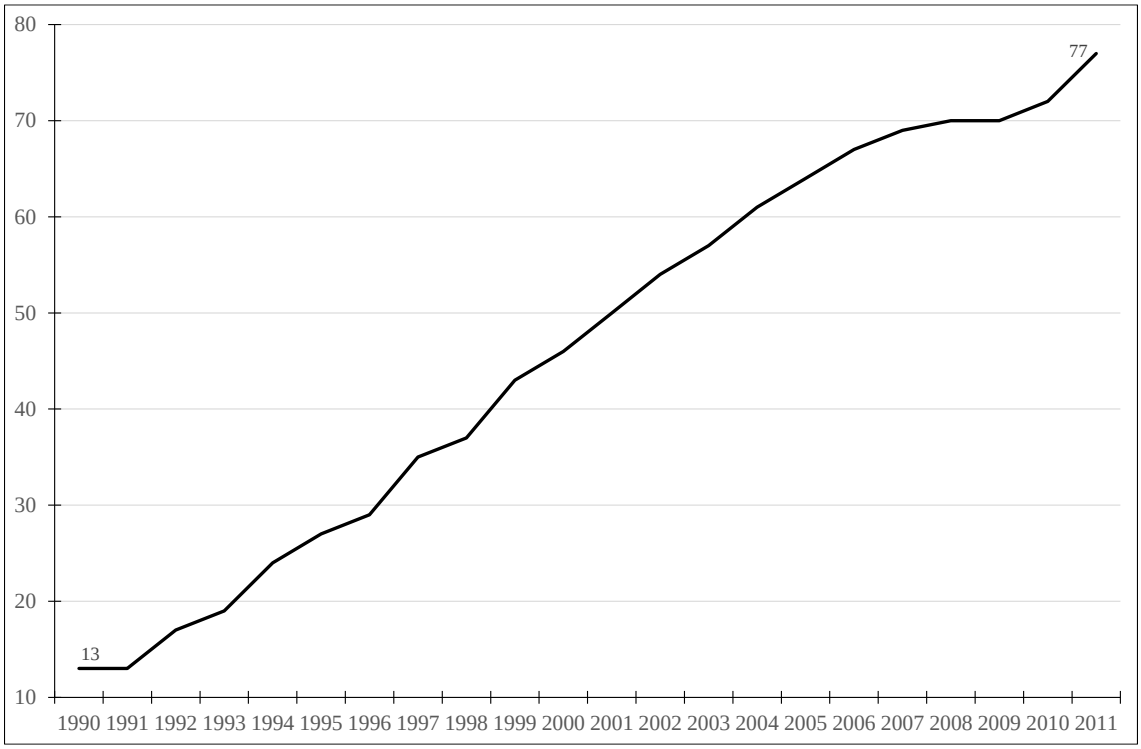


Figure A-I: Evolution of total number of rules from 1990 to 2011

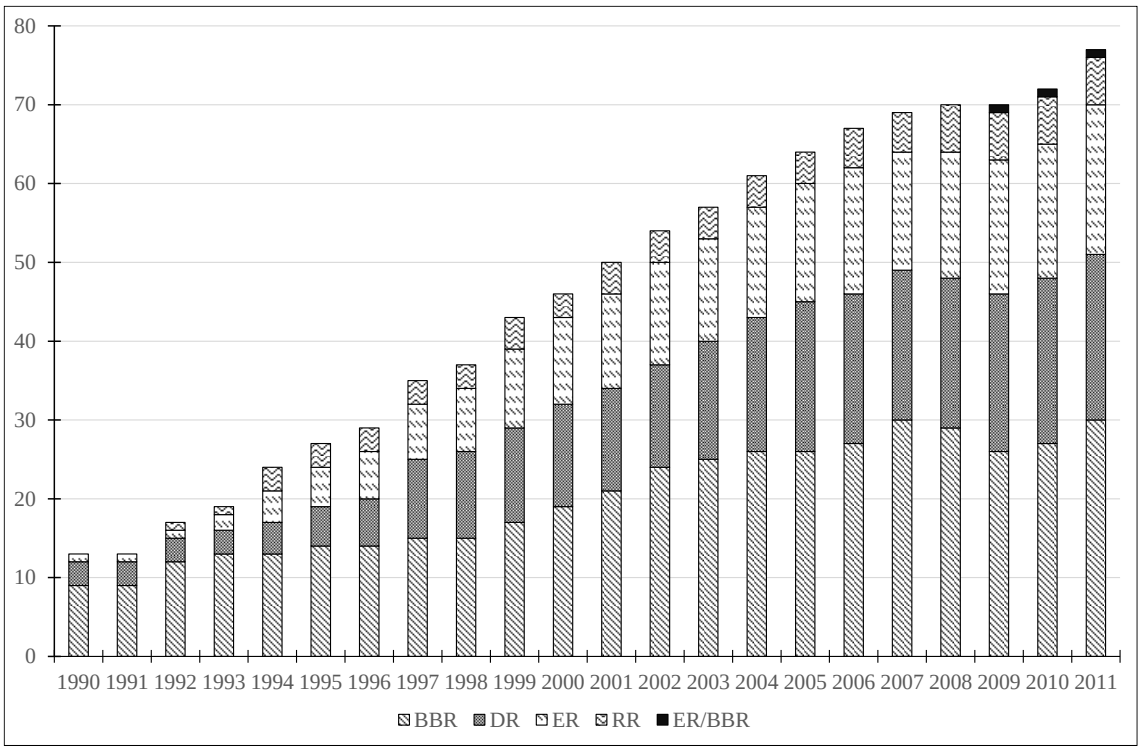


Figure A-II: Numerical fiscal rules by type of aggregate targeted since 1990

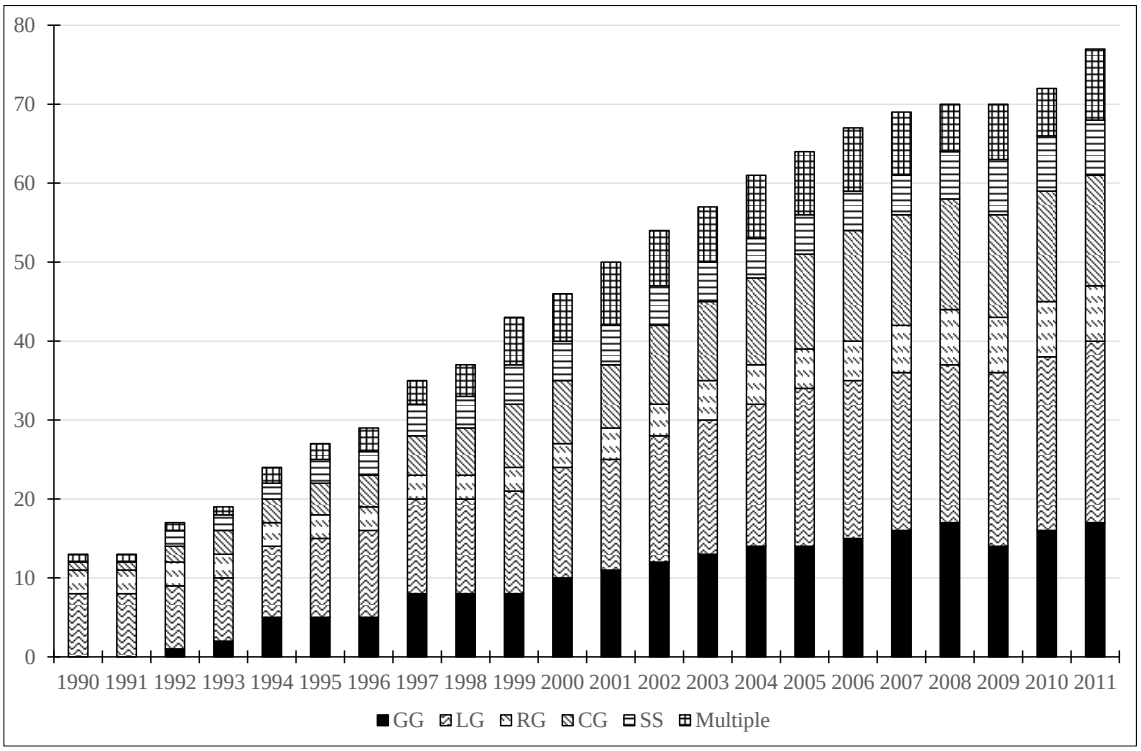


Figure A-III: Numerical fiscal rules by type of government since 1990

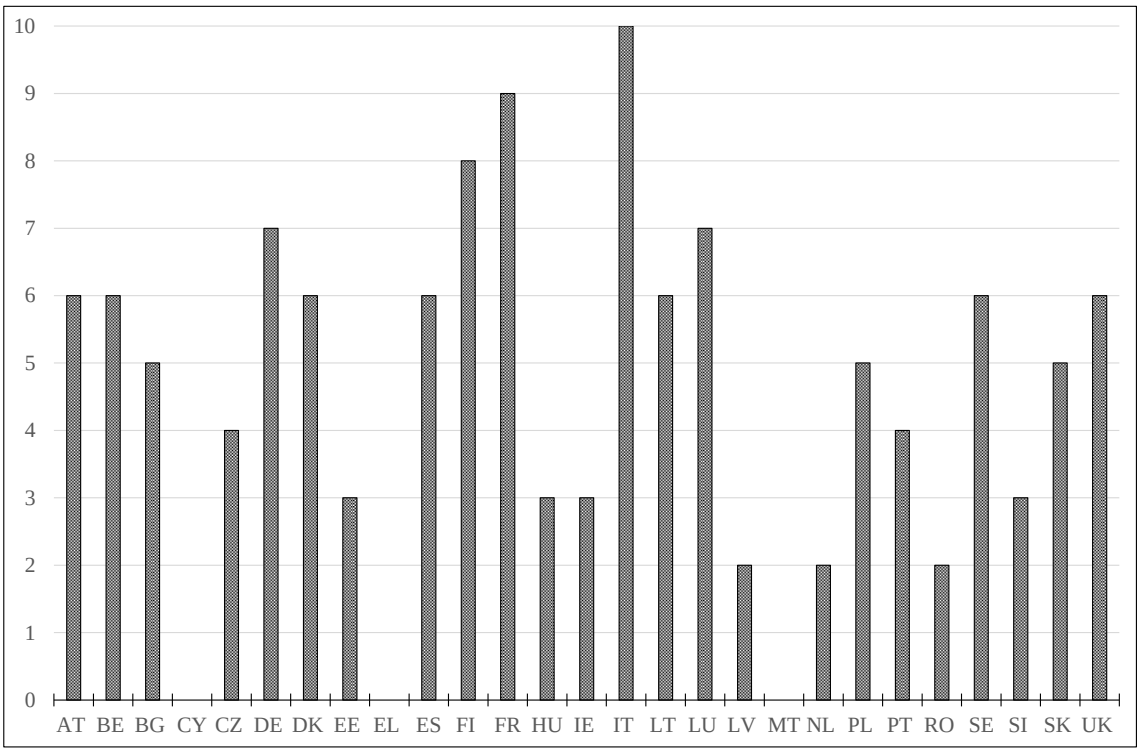


Figure A-IV: Total numerical fiscal rules by country

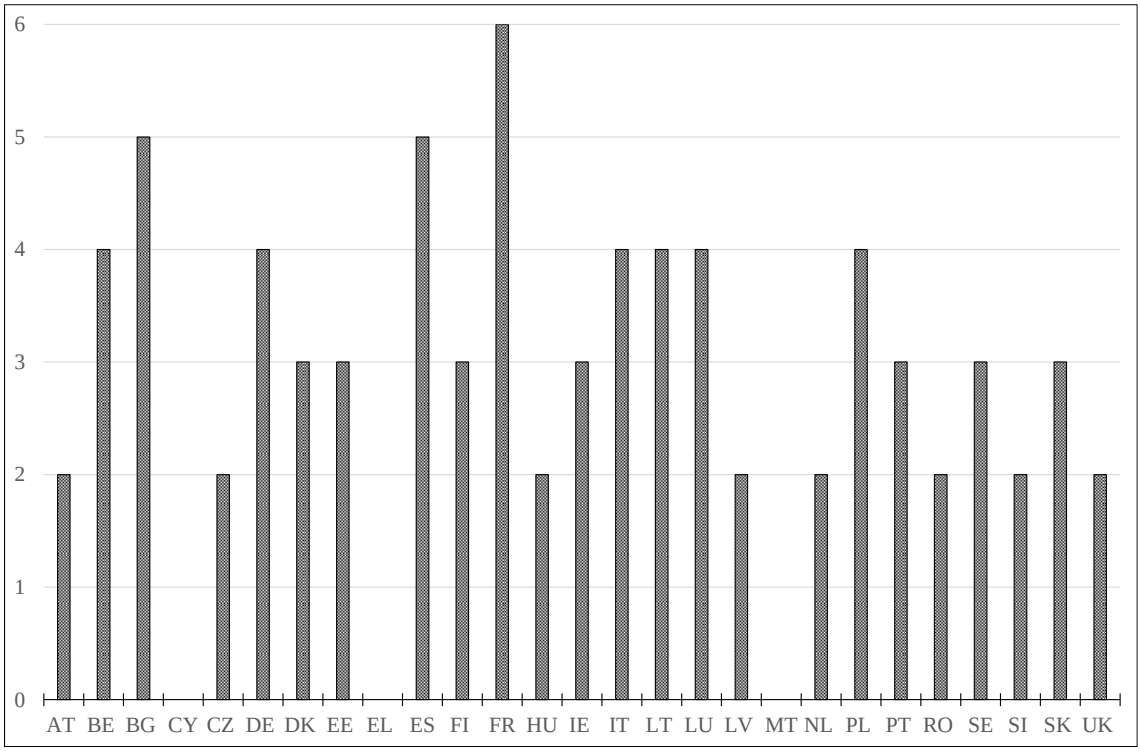


Figure A-V: Numerical fiscal rules by country in 2011

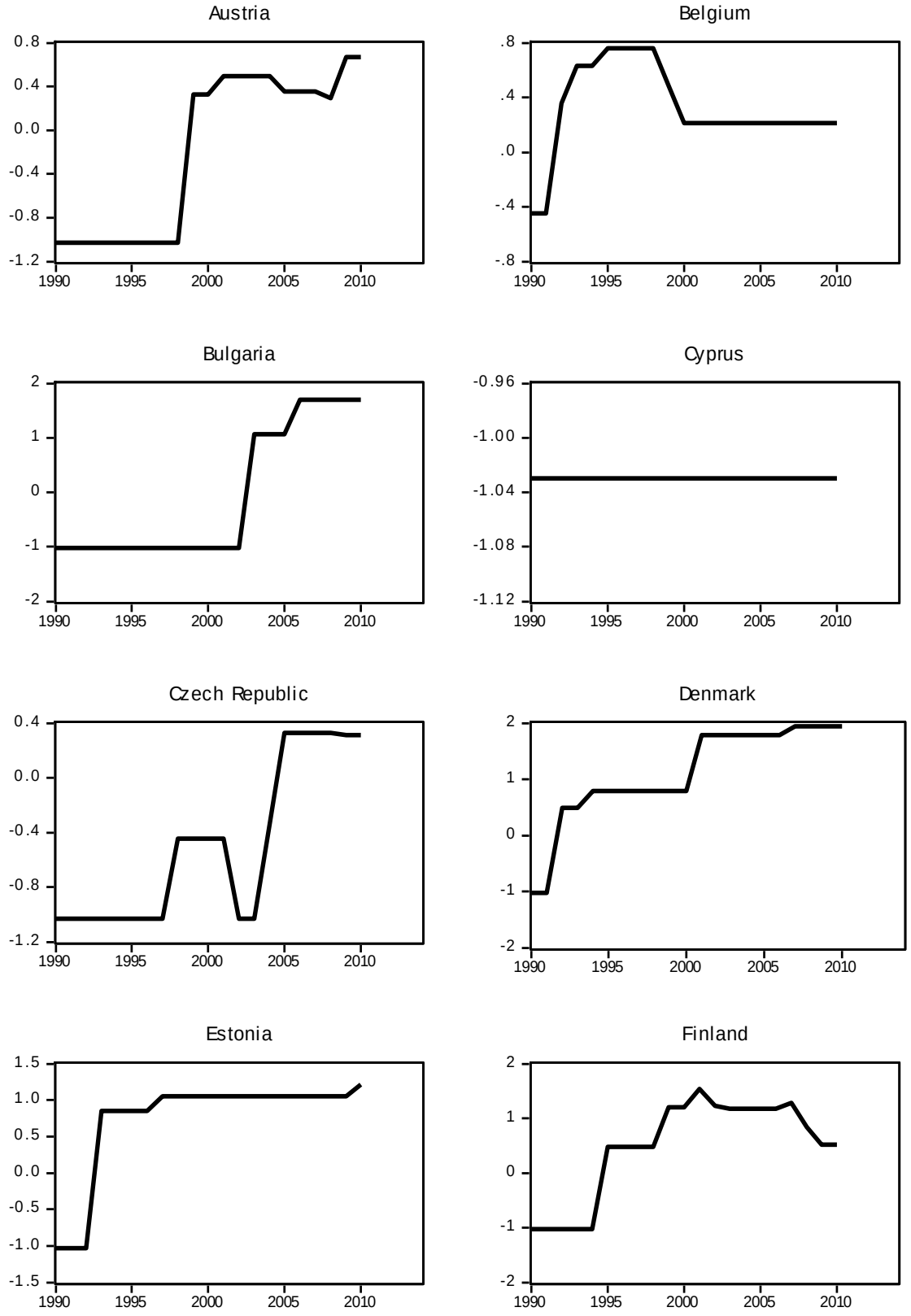


Figure A-VI: FRI by country from 1990 to 2011

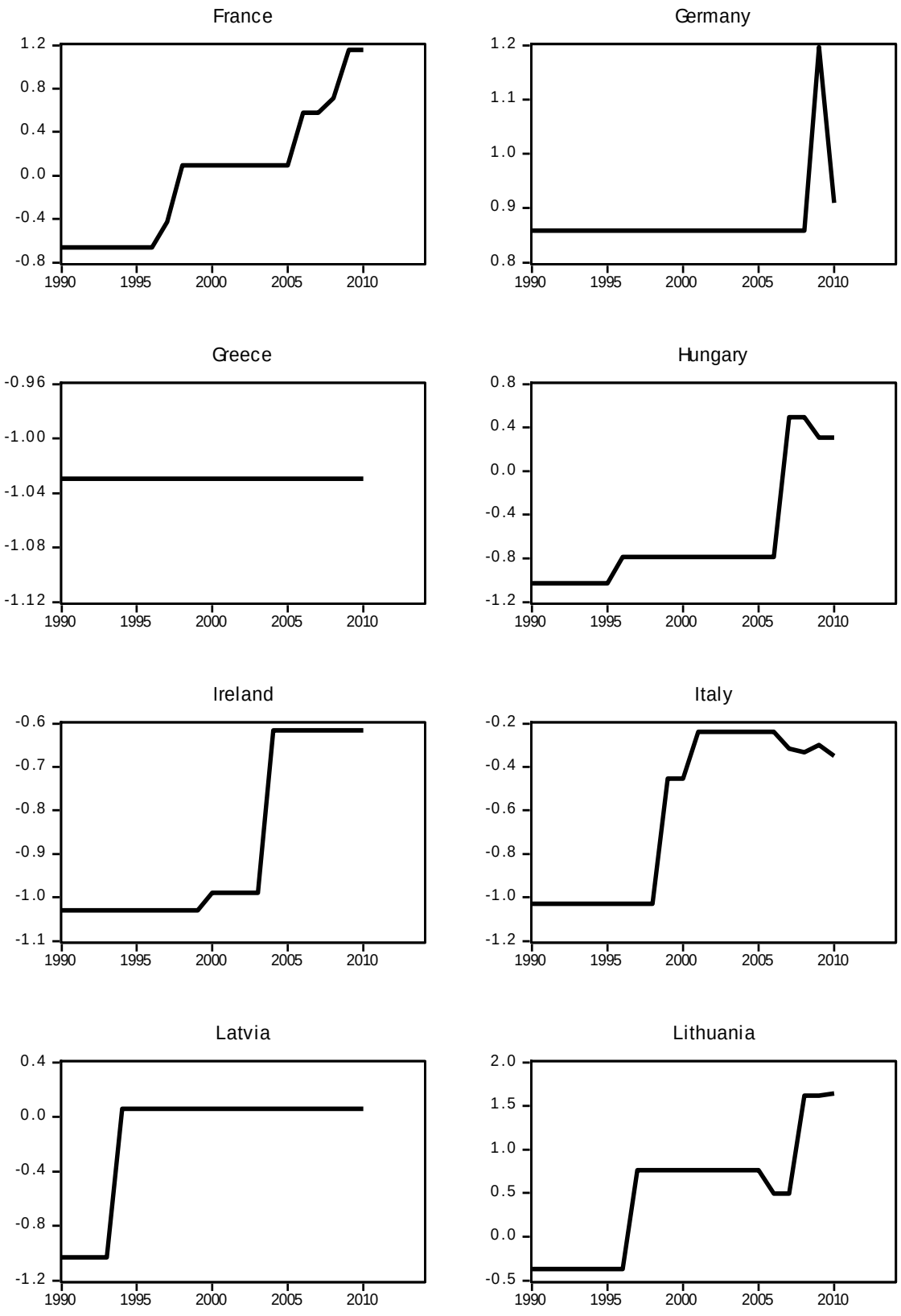


Figure A-VII: FRI by country from 1990 to 2011 (continued)

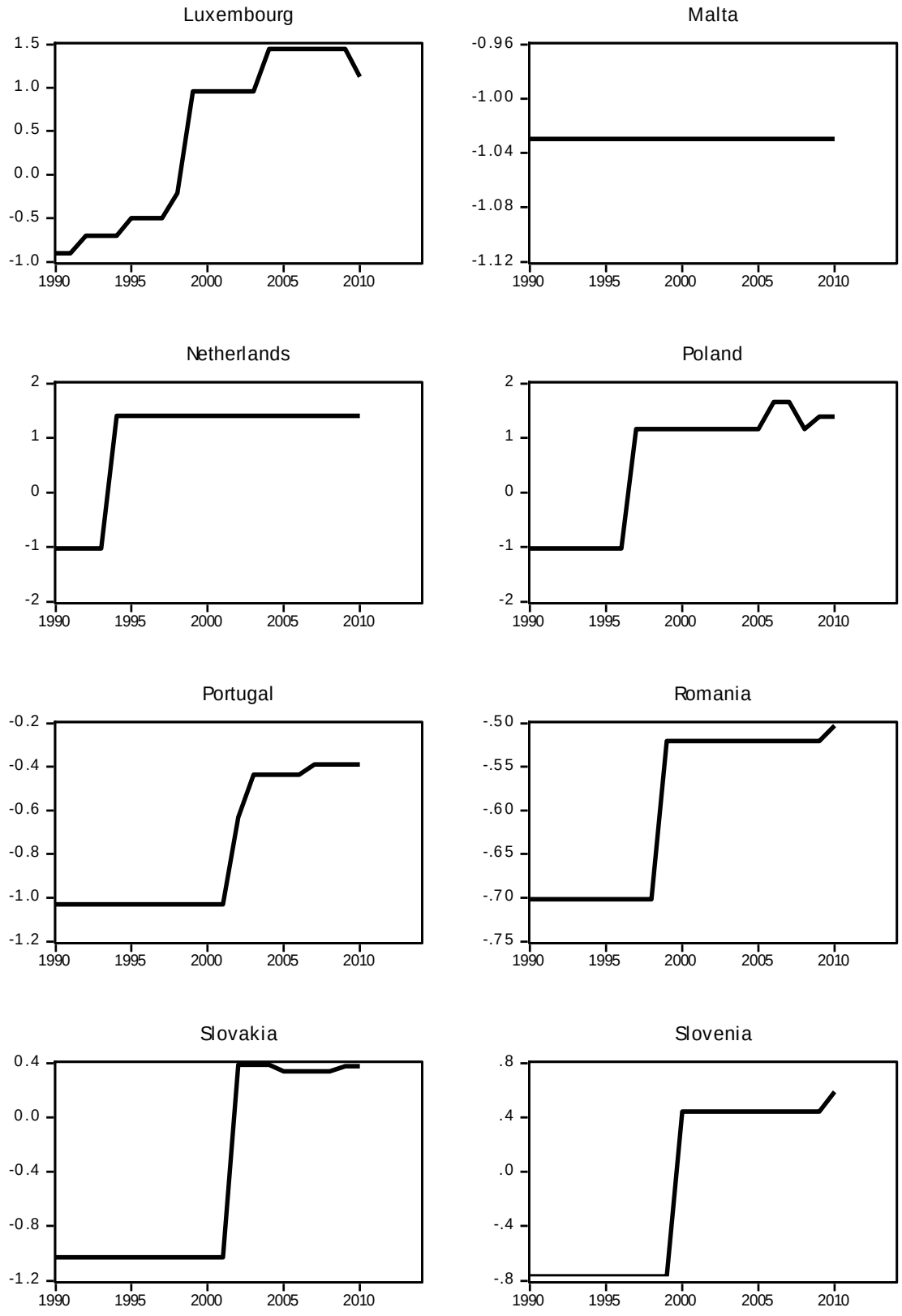
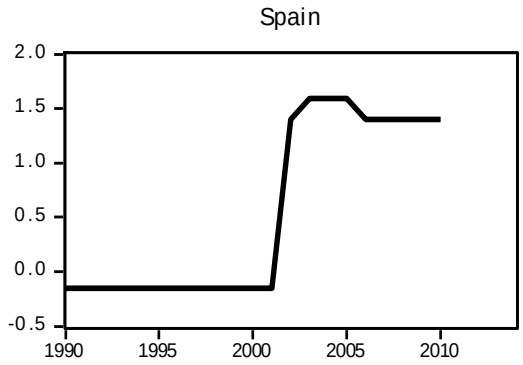
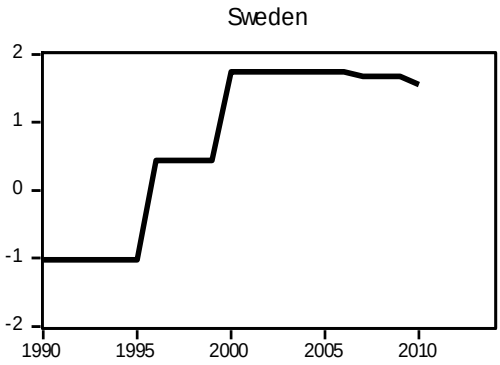


Figure A-VIII: FRI by country from 1990 to 2011 (continued)





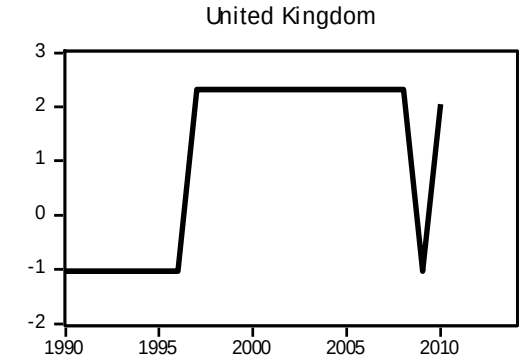


Figure A-IX: FRI by country from 1990 to 2011 (continued)

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
Shor-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 *** denote, 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 capturing the commitment of governments.

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***	-1.92**	-0.65	-3.68***
	(0.98)	(1.16)	(1.03)	(0.96)	(0.73)	(0.78)
capb	-0.06*	-	-0.05	-0.15***	-0.14***	-0.16***
	(0.03)		(0.04)	(0.03)	(0.03)	(0.03)
debt	0.00	-	0.00	0.00	0.02***	0.00
	(0.00)		(0.00)	(0.00)	(0.01)	(0.00)
cpi	0.09***	0.09***	0.09***	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	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**	-0.02**	-	-
	(0.01)	(0.01)	(0.01)	(0.01)		
i	0.42***	0.41***	0.41***	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***	-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***	-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***	-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**	-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 *** denote, 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 capturing the commitment of governments.

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 needed 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 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).

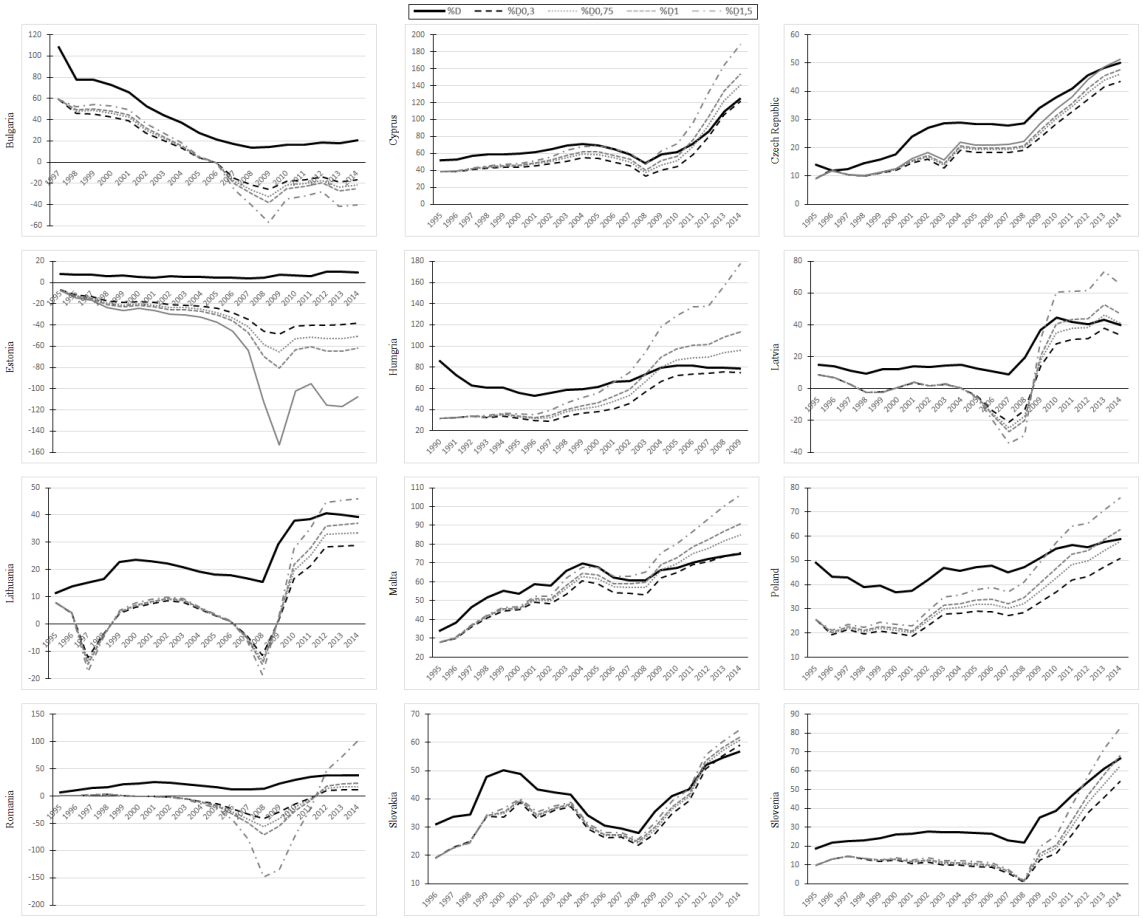


Figure D-I: Actual and rule-based expenditure in percentage of GDP for EU-10 countries

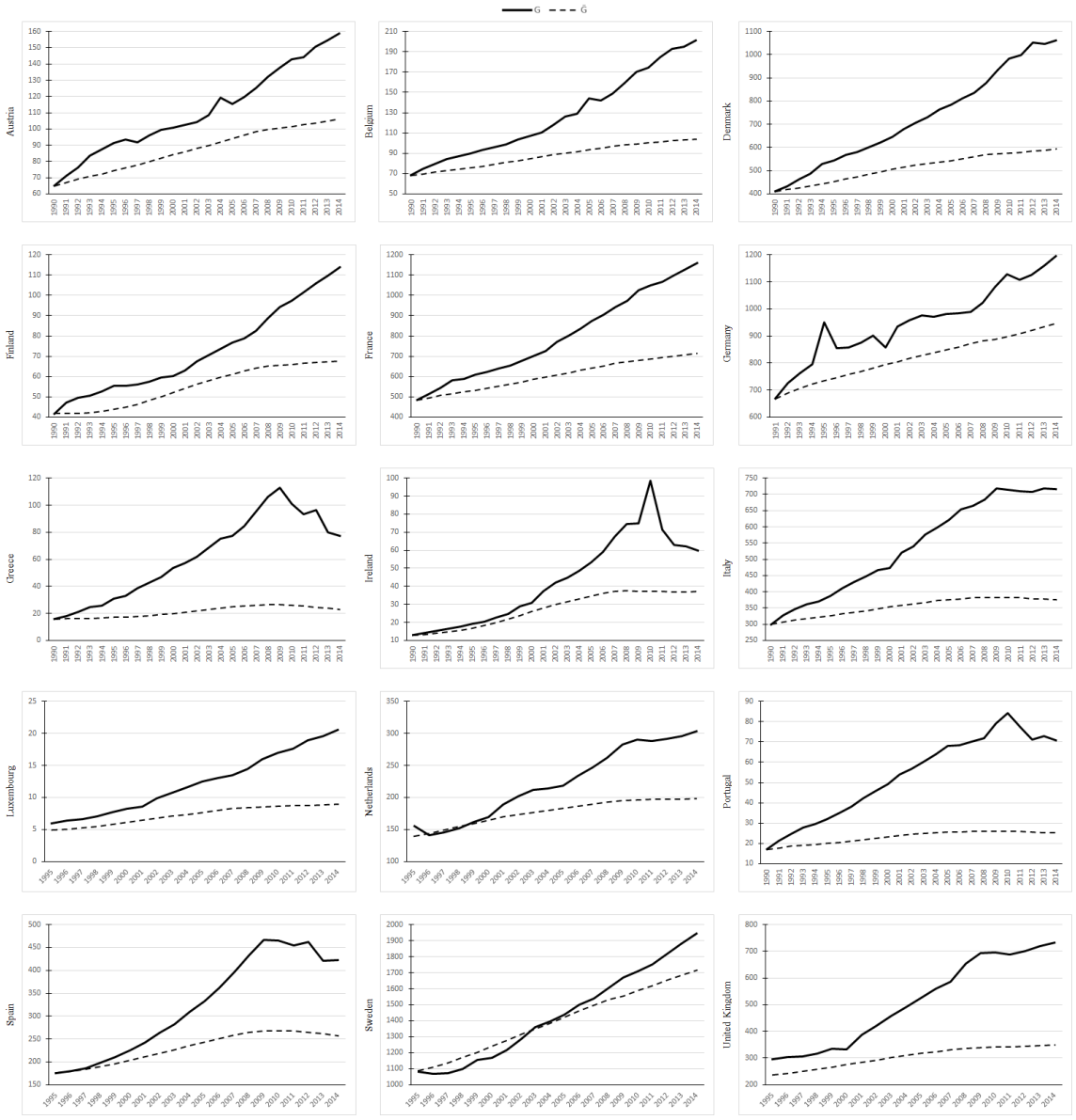


Figure D-II: Actual and rule-based expenditure in billions of national currency for EU-15 countries

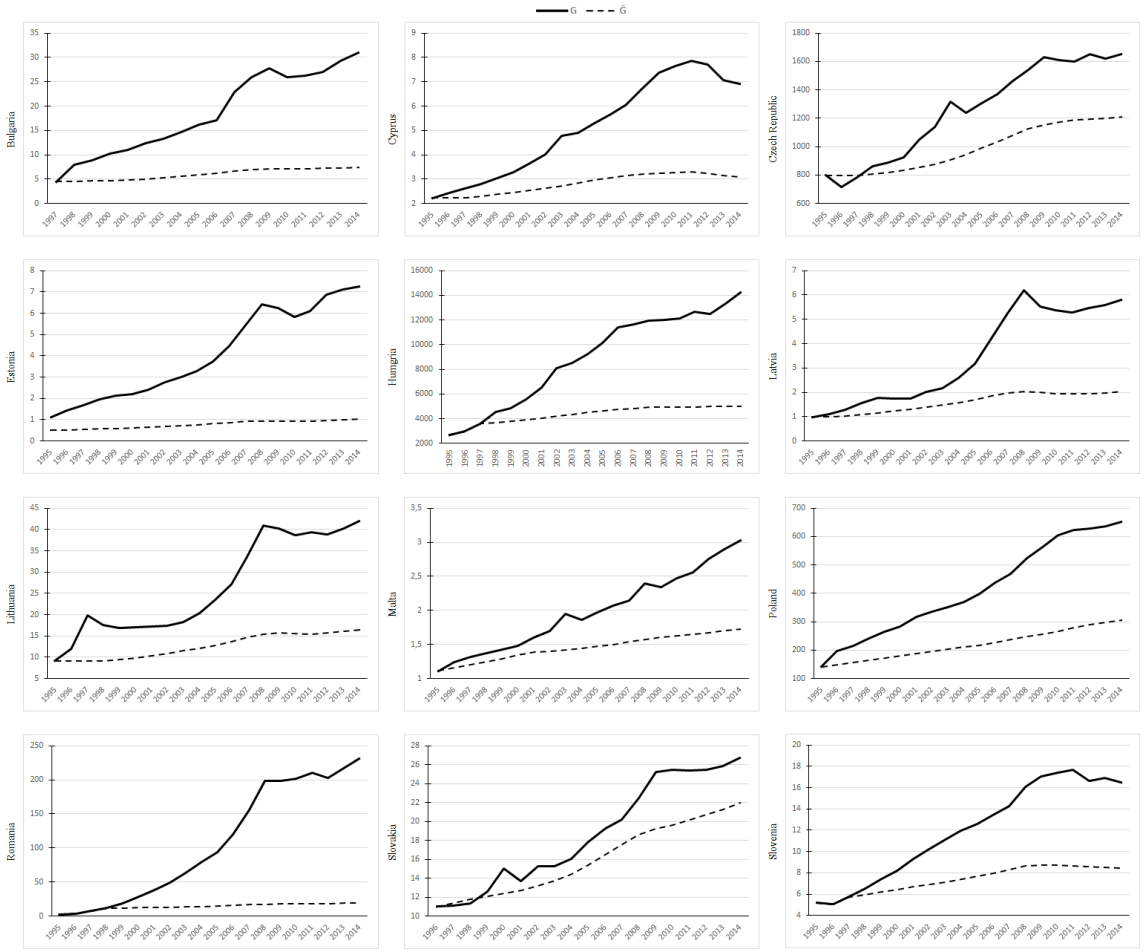


Figure D-III: Actual and rule-based expenditure in billions of national currency for EU-10 countries

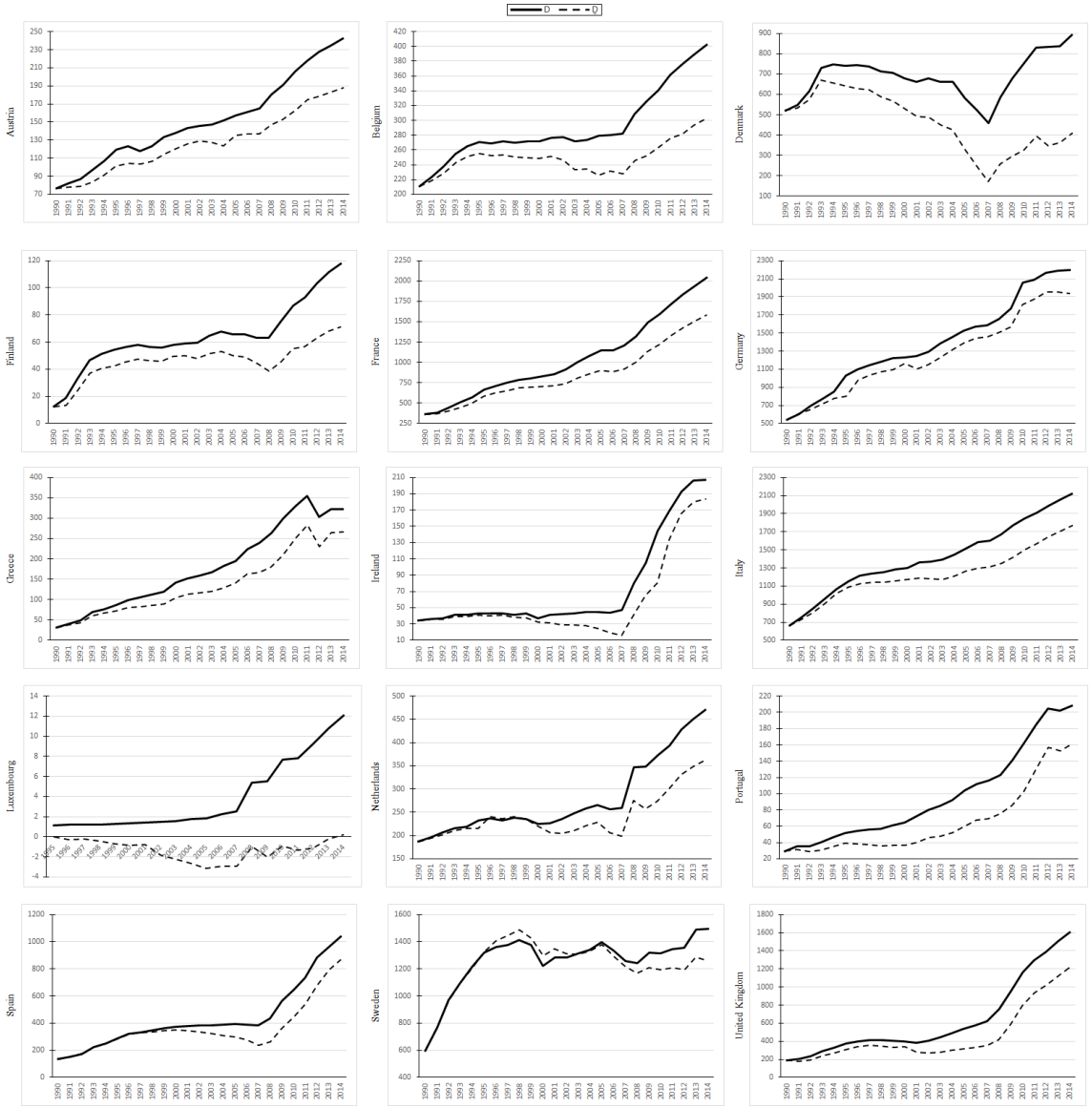


Figure D-IV: Actual and rule-based debt in billions of national currency for EU-15 countries

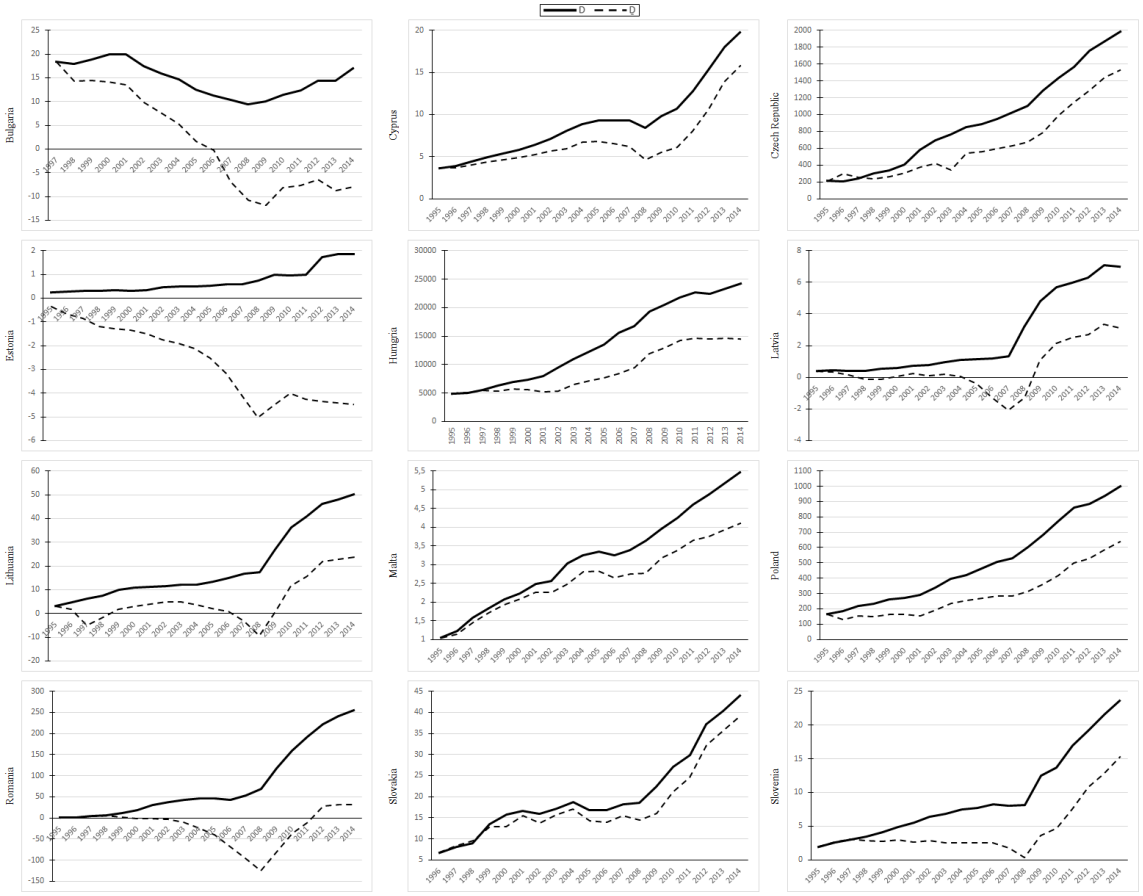


Figure D-V: Actual and rule-based debt in billions of national currency for EU-10 countries

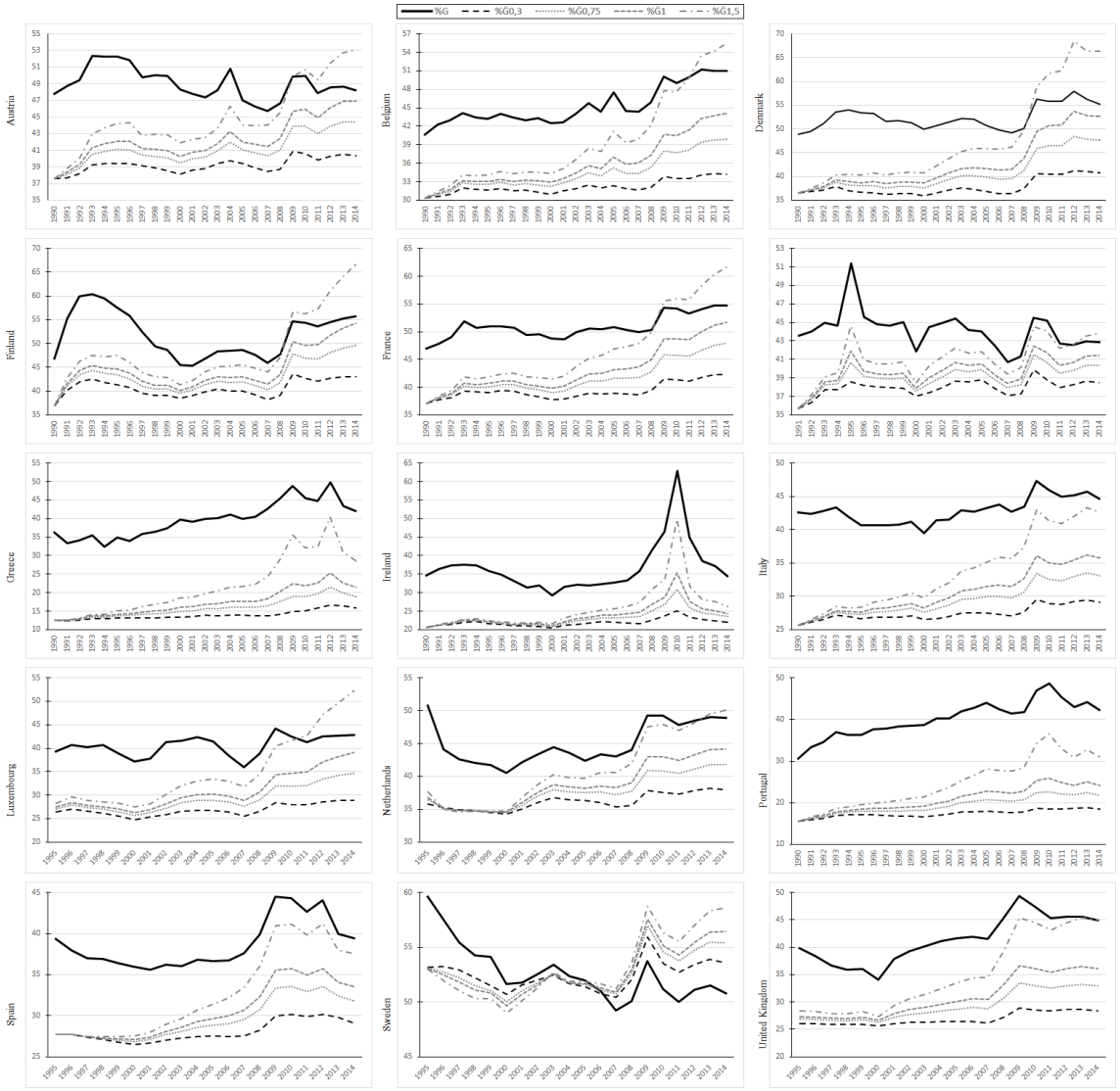


Figure D-VI: Actual expenditure and rule-based expenditure in percentage of GDP for EU-15 countries

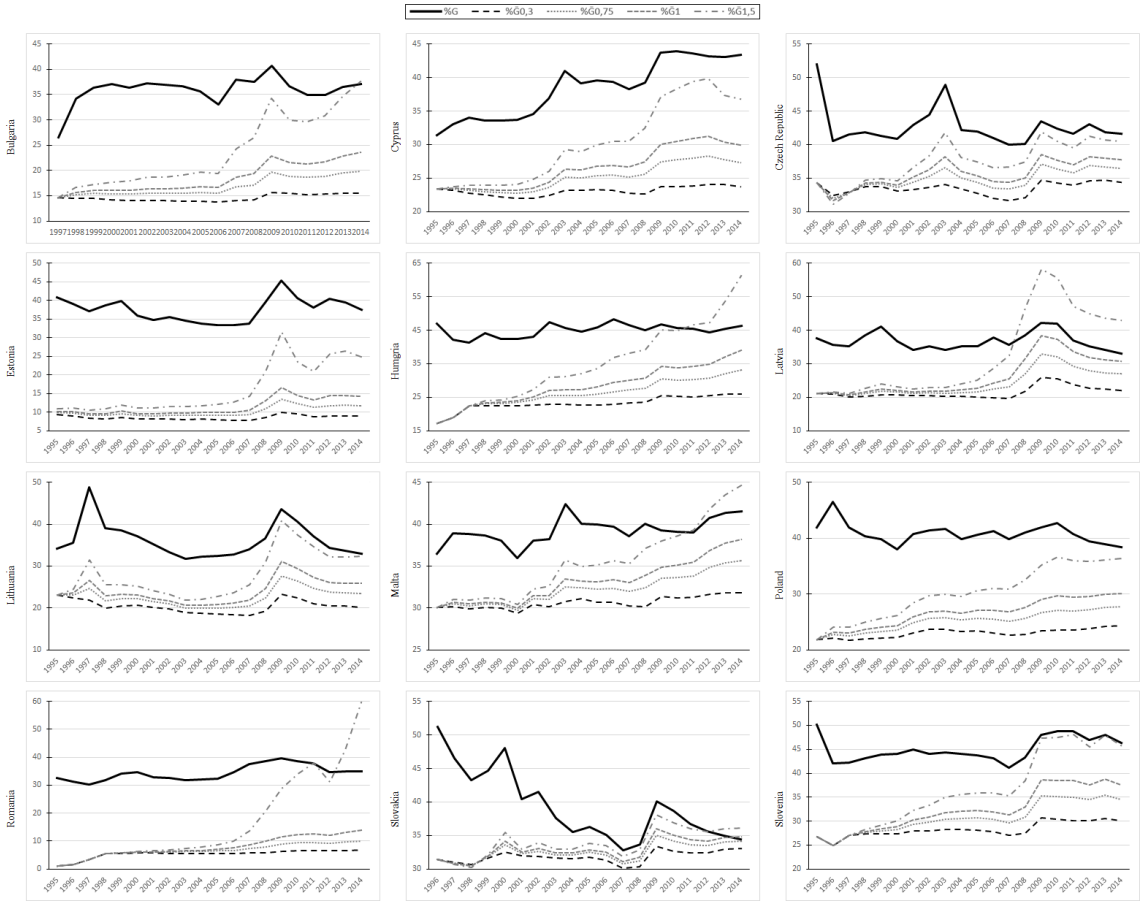


Figure D-VII: Actual expenditure and rule-based expenditure for EU-10 countries

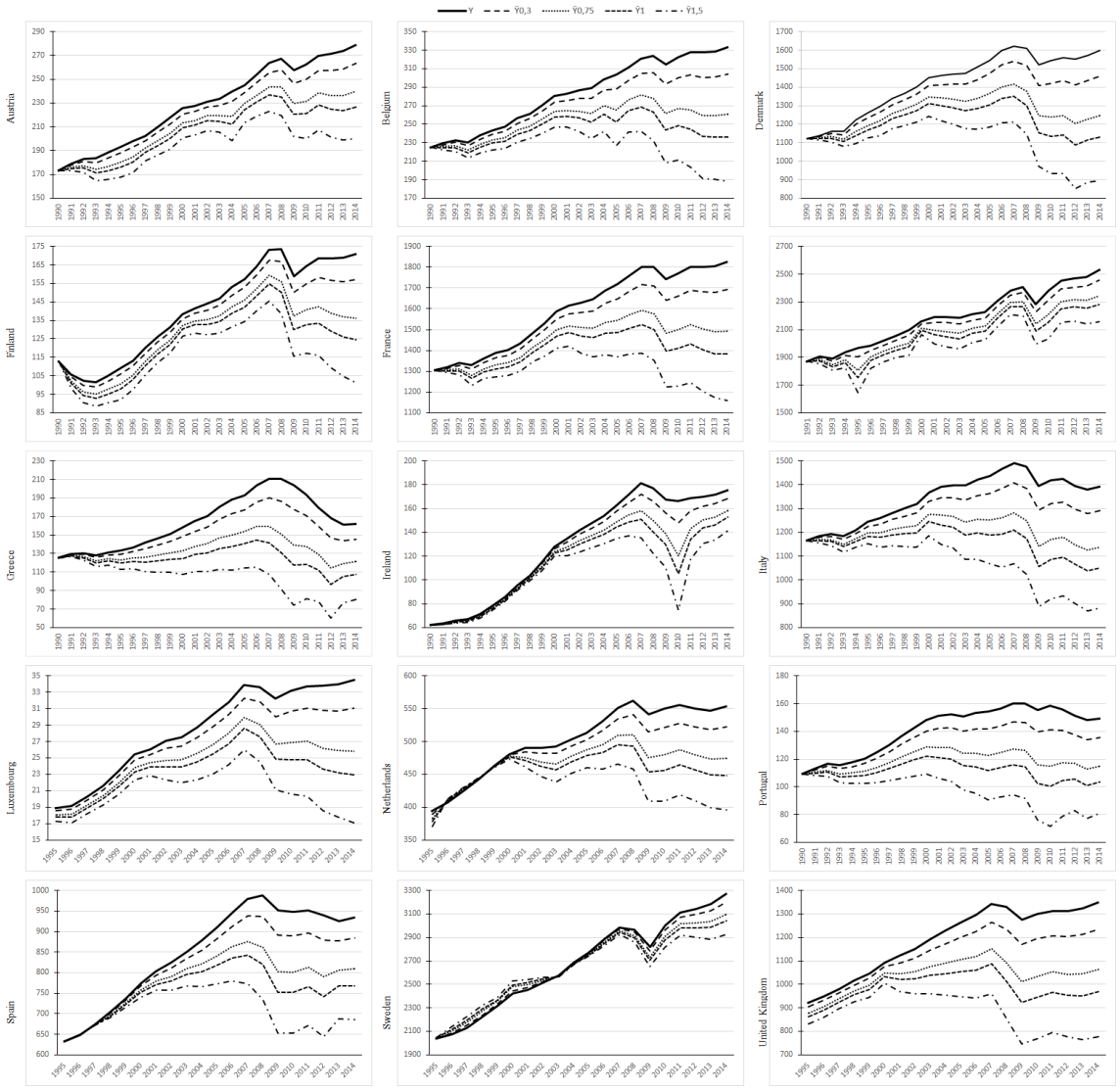


Figure D-VIII: Actual output and rule-based output by expenditure multiplier for EU-15 countries

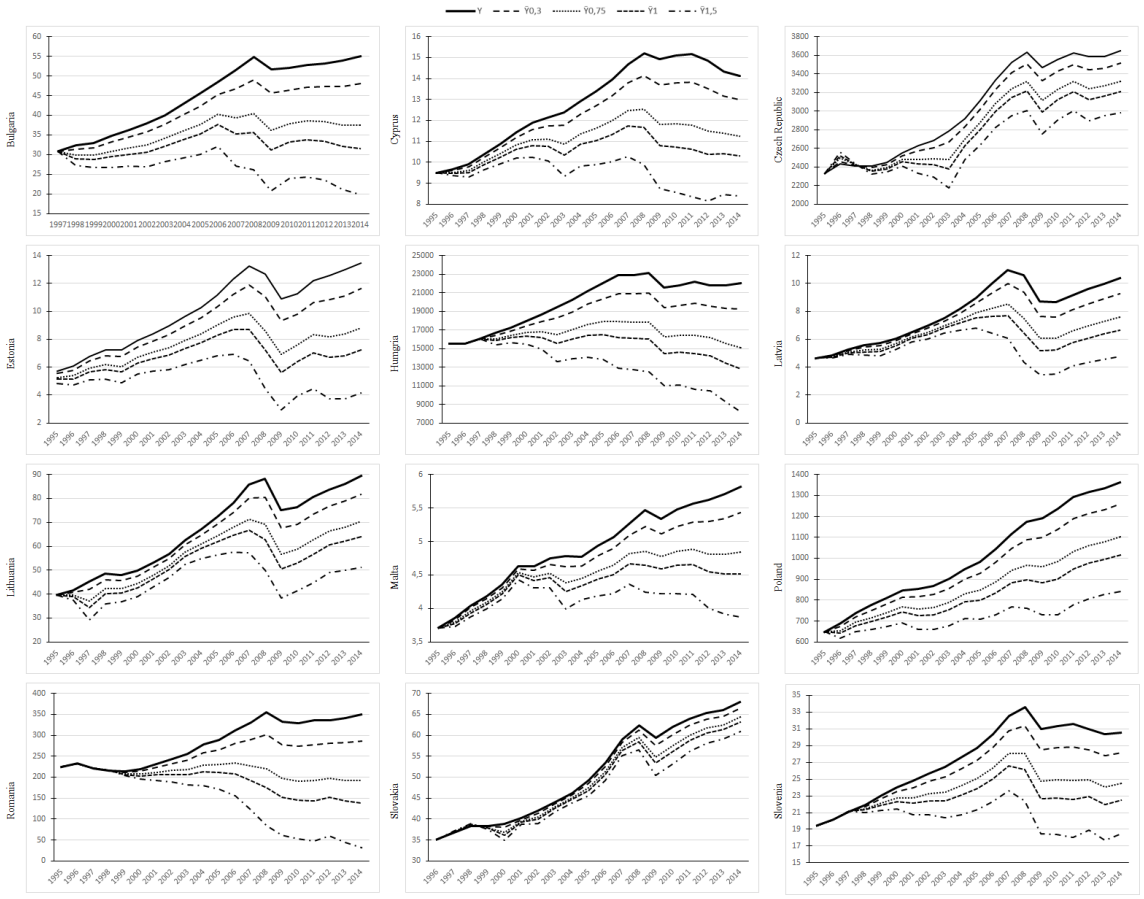


Figure D-IX: Actual output and rule-based output by expenditure multiplier for EU-10 countries

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	$\tilde{G}$	ΔG	$\tilde{I}$	$\underline{D}$	$\tilde{Y}0,3$	$\tilde{Y}0,75$	$\tilde{Y}1$	$\tilde{Y}1,5$	%D	$\%\underline{D}0,3$	$\%\underline{D}0,75$	$\%\underline{D}1$	$\%\underline{D}1,5$	%G	$\%\tilde{G}0,3$	$\%\tilde{G}0,75$	$\%\tilde{G}1$	$\%\tilde{G}1,5$
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