



INSTITUT FÜR HÖHERE STUDIEN  
INSTITUTE FOR ADVANCED STUDIES  
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# Fiscal Reaction Functions of Different Euro Area Countries

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- Introduction – sustainability of public finances
- Fiscal reaction functions
- Fiscal rules
- Estimation of fiscal reaction functions for  
7 Euro area countries



# Sustainability of public finances

- Public finances are sustainable if a government is able to **pay back its debt in the future**

## Government budget constraint

$$G_t + (1 + i_t) B_{t-1} = T_t + B_t$$

G: Public consumption

T: Taxes

B: One-period government bonds

i: Interest rate

# Sustainability of public finances

Following Balassone & Franco (2000) and Neck & Sturm (2008):

$$d_t + \frac{1 + i_t}{1 + gy_t} b_{t-1} = b_t$$

b: Government debt in relation to GDP

d: Primary balance (gov. cons. – taxes) in relation to GDP

gy: Growth rate of nominal GDP

Debt ratio **increases** if the government runs a **deficit** and

**nominal interest rate** > nominal GDP **growth**.



# Sustainability of public finances

Following Balassone & Franco (2000) and Neck & Sturm (2008):

$$\Delta b_{t+1} \equiv b_{t+1} - b_t = (r - gr)b_t + d_{t+1}$$

Debt ratio **decreases**  $(\Delta b_t) < 0$ ,

if **primary budget surplus**  $>$  **debt servicing**

$$-d_{t+1} \geq (r - gr)b_t$$



# Sustainability of public finances

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$$\Delta b_{t+1} \equiv b_{t+1} - b_t = (r - gr)b_t + d_{t+1}$$

Debt ratio **decreases** ( $\Delta b_t) < 0$ , if **primary budget surplus**  $>$  **debt servicing**

$$-d_{t+1} \geq (r - gr)b_t$$

Public finances are **sustainable** if

**increasing** debt level  $\longrightarrow$  **improving** primary budget balance



# Fiscal reaction functions

- Bohn (1998): reaction of the **primary budget balance** to changes in public debt is an indicator of sustainability of fiscal policies
- Public debt **rises** in  $t$   $\longrightarrow$  primary balance should **improve** in  $t+1$



# Fiscal reaction functions

## Some empirical literature

- Wyplosz (2006) and Staehr (2008): some evidence of positive feedback from debt to primary balance in **European countries**, but difficult to estimate precisely because of short time series
- Piergallini and Postigliola (2012): primary balance in **Italy** reacts positively to the debt level
- De Mello (2008): strong positive reaction of primary balance to lagged debt in **Brazil**





# Fiscal rules

- Fiscal rules may reinforce reaction of primary balance to past debt development
- European Commission, DG ECFIN, has compiled a dataset on fiscal rules in the 28 EU countries
- Time period 1990 – 2013
- All types of numerical fiscal rules: budget balance, debt, expenditure, and revenue rules
- All levels of government: central, regional, and local, general government, and social security

# Estimation of fiscal reaction functions

➤ 7 Euro area countries: Austria, Germany, Greece, Ireland, Italy, Portugal, Spain

➤ **Explanatory** variable: **lagged public debt**

➤ Two sets of estimations:

a) **Panel estimations** for all seven **Euro area** countries.

Dependent variables: (a) primary budget balance, (b) headline balance, (c) total public revenues, (d) total expenditures, (e) direct taxes, (f) indirect taxes, (g) public consumption, (h) public investment, (i) subsidies, (j) transfers

b) **Separate** estimations for **each country**.

Dependent variable: primary budget balance

➤ With and without fiscal rules

➤ Controlling for business cycle influence (GDP level or growth)



# Results – panel estimations

	PRIMARY BALANCE (a)	PRIMARY BALANCE (b)	HEADLINE BALANCE (a)	HEADLINE BALANCE (b)
CONSTANT	-2.816* (1.186)	-2.871* (1.263)	-6.188*** (1.322)	-3.757** (1.544)
DEBT <sub>-1</sub>	0.016 (0.013)	0.017 (0.014)	0.003 (0.015)	-0.031 (0.019)
DEBT <sub>-1</sub> · RULE <sub>-1</sub>		0.003 (0.004)		0.013*** (0.005)
REAL GDP GROWTH	0.805*** (0.095)	0.819*** (0.101)		
NOMINAL GDP GROWTH			0.480*** (7.334)	0.509*** (0.066)
ADJUSTED R <sup>2</sup>	0.323	0.315	0.360	0.405
NO. OF OBSERVATIONS	149	142	149	142

*Fixed country effects; standard errors in parentheses; \*, \*\*, \*\*\* : significant at 10, 5, 1 percent*



# Results – panel estimations

	TOTAL REVENUES (a)	TOTAL REVENUES (b)	TOTAL EX- PENDITUES (a)	TOTAL EX- PENDITUES (b)
CONSTANT	38.789*** (0.724)	38.996*** (0.824)	41.010*** (1.261)	40.231*** (1.381)
DEBT <sub>-1</sub>	0.041*** (0.008)	0.038*** (0.001)	0.070*** (0.016)	0.079*** (0.017)
DEBT <sub>-1</sub> · RULE <sub>-1</sub>		0.001 (0.002)		-0.007 (0.005)
NOMINAL GDP GROWTH	0.058 (0.033)	0.062 (0.035)		
ADJUSTED R <sup>2</sup>	0.879	0.878	0.581	0.583
NO. OF OBSERVATIONS	146	139	149	149

*Fixed country effects; standard errors in parentheses; \*, \*\*, \*\*\* : significant at 10, 5, 1 percent*

# Estimation of fiscal reaction functions

	DIRECT TAXES (a)	DIRECT TAXES (b)	INDIRECT TAXES (a)	INDIRECT TAXES (b)
CONSTANT	10.308*** (0.286)	10.595*** (0.833)	12.239*** (0.325)	12.454*** (0.338)
DEBT <sub>-1</sub>	0.013*** (0.003)	0.008** (0.004)	0.003 (0.003)	0.0005 (0.039)
DEBT <sub>-1</sub> · RULE <sub>-1</sub>		0.002* (0.001)		0.002** (0.001)
NOMINAL GDP GROWTH	0.026* (0.014)	0.030** (0.015)	0.046*** (0.016)	0.049*** (0.016)
ADJUSTED R <sup>2</sup>	0.884	0.885	0.756	0.762
NO. OF OBSERVATIONS	143	136	143	143

*Fixed country effects; standard errors in parentheses; \*, \*\*, \*\*\* : significant at 10, 5, 1 percent*



# Results – panel estimations

	PUBLIC CONS. (a)	PUBLIC CONS. (b)	PUBLIC INVEST. (a)	PUBLIC INVEST.(b)
CONSTANT	19.681*** (0.388)	19.624*** (0.446)	5.361*** (0.325)	5.381*** (0.179)
DEBT <sub>-1</sub>	-0.007 (0.004)	-0.006 (0.005)	-0.027*** (0.002)	-0.027*** (0.002)
DEBT <sub>-1</sub> · RULE <sub>-1</sub>		0.001 (0.001)		-0.0007 (0.0006)
REAL GDP GROWTH <sub>-1</sub>	-0.262*** (0.030)	-0.251*** (0.032)		
ADJUSTED R <sup>2</sup>	0.594	0.590	0.757	0.779
NO. OF OBSERVATIONS	149	142	149	142

*Fixed country effects; standard errors in parentheses; \*, \*\*, \*\*\* : significant at 10, 5, 1 percent*



# Results – panel estimations

	SUBSIDIES (a)	SUBSIDIES (b)	TRANSFERS (a)	TRANSFERS (b)
CONSTANT	1.325*** (0.108)	1.216*** (0.446)	16.662*** (0.410)	16.656*** (0.497)
DEBT <sub>-1</sub>	-0.002 (0.002)	-0.0003 (0.002)	0.057*** (0.005)	0.057*** (0.006)
DEBT <sub>-1</sub> · RULE <sub>-1</sub>		-0.001*** (0.0004)		-0.001 (0.002)
REAL GDP GROWTH			-0.451*** (0.033)	-0.457*** (0.035)
ADJUSTED R <sup>2</sup>	0.695	0.728	0.940	0.941
NO. OF OBSERVATIONS	149	142	149	142

*Fixed country effects; standard errors in parentheses; \*, \*\*, \*\*\* : significant at 10, 5, 1 percent*

# Estimation of fiscal reaction functions

## Summary of panel estimation results:

- Budget balance **improves** only **insignificantly** as a reaction to a past increase of public debt
- **Both** total **revenues** and **expenditures** rise
- Revenues: primarily **direct taxes** are used to improve public finances
- Expenditures: **public investment** and **subsidies** are reduced to improve the budget balance
- Presence of **fiscal rules slightly improves** the reaction of public finances to past debt increase





# Results – individual countries (primary balance)

	AUSTRIA (a)	AUSTRIA (b)	GERMANY (a)	GERMANY (b)
CONSTANT	4.739* (2.688)	8.151* (4.031)	-2.673 (2.013)	-2.314 (2.462)
DEBT <sub>-1</sub>	-0.098 (0.002)	-0.115 (0.064)	0.050 (0.030)	0.043 (0.040)
DEBT <sub>-1</sub> · RULE <sub>-1</sub>		0.015 (0.012)		0.002 (0.008)
NOMINAL GDP GROWTH			0.149 (0.121)	0.149 (0.121)
NOMINAL GDP LEVEL	0.00001 (0.000009)	0.000002 (0.00001)		
DUMMIES	1995, 2004, 2009	1995, 2004,02009	1995	1995
ADJUSTED R <sup>2</sup>	0.360	0.383	0.481	0.454
NO. OF OBSERVATIONS	23	22	23	22

# Results – individual countries (primary balance)

	ITALY (a)	ITALY (b)	SPAIN (a)	SPAIN (b)
CONSTANT	-5.262* (4.004)	-5.176* (4.313)	-7.270*** (1.666)	-7.119*** (1.597)
DEBT <sub>-1</sub>	0.068* (0.037)	0.062 (0.041)	0.033 (0.030)	0.015 (0.027)
DEBT <sub>-1</sub> · RULE <sub>-1</sub>		-0.015** (0.007)		0.008 (0.005)
REAL GDP GROWTH	0.431** (0.158)	0.453** (0.147)		
NOMINAL GDP GROWTH			1.007*** (0.092)	1.093*** (0.104)
ADJUSTED R <sup>2</sup>	0.293	0.453	0.864	0.876
NO. OF OBSERVATIONS	23	22	20	20

# Results – individual countries (primary balance)

	PORTUGAL (a)	PORTUGAL (b)	IRELAND (a)	IRELAND (b)
CONSTANT	-7.434*** (1.606)	-9.487*** (2.072)	-2.856* (1.447)	-2.103 (1.528)
DEBT <sub>-1</sub>	0.059*** (0.017)	0.083** (0.023)	-0.016 (0.019)	-0.031 (0.022)
DEBT <sub>-1</sub> · RULE <sub>-1</sub>		-0.010 (0.007)		0.011 (0.008)
NOMINAL GDP GROWTH	0.050*** (0.119)	0.546*** (0.118)	0.576*** (0.084)	0.661*** (0.087)
DUMMIES	2010	2010	2010	2010
ADJUSTED R <sup>2</sup>	0.685	0.708	0.897	0.905
NO. OF OBSERVATIONS	20	20	20	19

# Results – individual countries (primary balance)

	GREECE (a)	GREECE (b)
CONSTANT	-1.043 (6.135)	23.079** (11.142)
DEBT <sub>-1</sub>	-0.009 (0.049)	-0.205** (0.088)
DEBT <sub>-1</sub> · RULE <sub>-1</sub>		0.042** (0.020)
NOMINAL GDP GROWTH	0.368 (0.250)	0.207 (0.234)
ADJUSTED R <sup>2</sup>	0.685	0.447
NO. OF OBSERVATIONS	20	19

# Individual countries – summary

- **Austria:** **improvement** of primary balance when taking fiscal rule into account, but **insignificant**
- **Germany:** **improvement** of primary balance with and without fiscal rule, but **insignificant**
- **Spain:** **improvement** of primary balance with and without fiscal rule, but **insignificant**
- **Italy:** **significant improvement** of primary balance without fiscal rule, **significant deterioration** with fiscal rule

# Individual countries – summary

- **Portugal:** **significant improvement** of primary balance without fiscal rule, **insignificant deterioration** with fiscal rule
- **Ireland:** **insignificant deterioration** of primary balance without fiscal rule, **insignificant improvement** with fiscal rule
- **Greece:** **significant deterioration** of primary balance without fiscal rules, **significant improvement** with fiscal rule





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# Thank you for your attention

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