

Fiscal sustainability of peripheral EMU countries: Continued vs transitory fiscal commitment?

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Outline

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- 2 Empirical implementation
 - The data
 - Structural breaks
 - Empirical Strategy. A Time-Varying Fiscal Reaction Function
 - Kalman Filter
 - Time-varying parameter fiscal reaction functions
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Goal

Main Goal of the research.

- The aim of this paper is to test the fulfilment of the intertemporal budget constraint for European Monetary Union (EMU) countries:
 - Peripheral: Greece, Portugal, Ireland, Italy and Spain (PIIGS) .
 - Other EMU countries: Germany, France, Belgium, Netherlands, Austria, Finland
 - For peripheral countries, and particularly after the 2007 financial crisis, hanged a shadow of *default*, with a sharp increase of their sovereign debt spreads.
- The unprecedented process of public debt accumulation at these European countries, has led to questioning the sustainability of their budgetary imbalances, particularly after the Great Recession.

On Public Debt Sustainability

- Hostland & Karam, 2005 Public debt is sustainable, “when it satisfies the solvency condition **without a major correction**”
- Wyplosz (2007) public debt sustainability includes the ability of a country to **meet its debt obligations without requiring debt relief or bail-out**
- Hamilton & Flavin (1986) stationary public debt is sufficient (but not necessary) condition for sustainability of fiscal policy
- Trehan and Walsh (1988, 1991) Long-run cointegration relationship between government revenues and expenditures
- Quintos (1995) Test for possible existence of structural changes affecting the variables (Tamarit, Esteve, and Camarero, 1998)
- Afonso and Rault (2010) Introduce, in this context, **panel data** cointegration and unit root tests

Level for debt

- The Government Budget Identity

$$B_t = G_t - T_t + (1 + r_t) \times B_{t-1}$$

- G_t represents government primary expenditure, r_t is the interest rate on public debt, T_t represents the revenues of the period, B_t as the debt level for the current period.
- Government's IBC:

$$B_t = \sum \rho^i \times E_t[T_{t+i} - G_{t+i}]$$

- where $\rho = 1/(1+r) < 1$ and $\lim_{n \rightarrow \infty} \rho^n \times E_t(B_{t+n}) = 0$ (To avoid explosive debt Ponzi behaviour)

Testing for fiscal reaction functions.

- Since Trehan and Walsh (1988, 1991), “traditional” approach: co-integration vector between government revenues and expenditures, which implies the stationarity of public deficit path

$$G_t + r_t \times B_{t-1} - R_t \quad (1)$$

$$R_t = \alpha + \beta \times CG_t + u_t \quad (2)$$

- where CG_t is the total government expenditure (including debt interests)
- In this context, after imposing the cointegration vector (1,-1), deficit would be sustainable if $0 < \beta \leq 1$.

The data

Figure: Gross Debt Ratio to GDP PIIGS countries

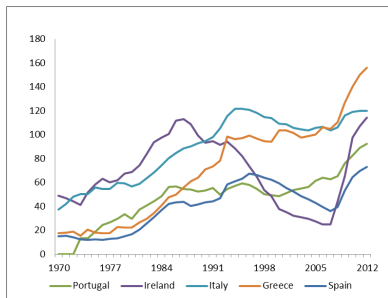
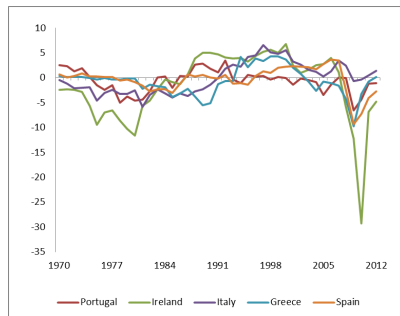


Figure: Government Primary Surplus Ratio to GDP PIIGS countries.



The data

Figure: Government Interest Spending Ratio to GDP PIIGS countries

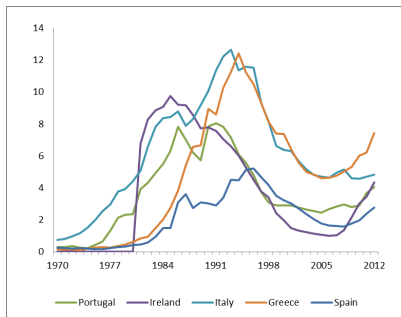
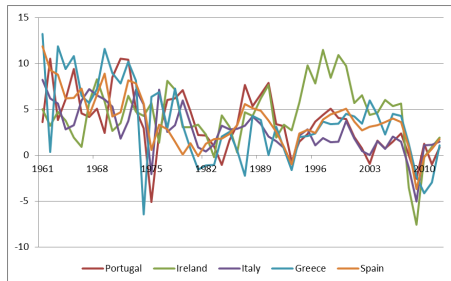


Figure: GDP Cycle component (Hodrick-Prescott) PIIGS countries



Structural Breaks and/or Unit Roots

- Perron (1989) and related literature, ignoring the eventual presence of structural breaks may lead to misleading conclusions about the order of integration of a time series
- When testing for structural breaks applying (Bai and Perron, 2003a) methodology, we find evidence in favour of multiple breaks for the Gross Debt ratio to GDP series of PIIGS countries in the period 1970-2012
- We also apply previous test, adapted to a panel data framework in (Bai & Carrion-i-Silvestre, 2009) both controlling compound effects of structural breaks and common factors on the stationarity analysis of panel data

Gross Debt relative to GDP. Structural Breaks Estimation (BIC estimates), 1970-2012. (Bai & Perron 2003)

Country	Breaks	Years
Portugal	3	1978
		1984
		2006
Ireland	3	1981
		1996
		2006
Italy	3	1977
		1984
		1991
Greece	4	1980
		1986
		1992
		2006
Spain	3	1982
		1992
		2000
43 Observations		

Bai & Perron (2003) estimations allowing for up to 4 structural breaks

Variables relative to GDP. Structural Breaks (BIC estimates), 1970-2012. (Bai & Carrion-i-Silvestre 2009) (i)

	Gross Debt	Expenditure	Revenue	Exp. (no interest)	interest	N° obs.
Portugal		1978				40
Ireland	1990 2006		1984			43
Italy	1994	1983	1982	1989	1989 1999	43
Greece	2006	1983 1990	1982 1988 2000	1982 1988	1985 1994 2005	43
Spain	1978 1998 2006	1995		1979 1985		43
Belgium	1979 1985 1993 2006	1981 1994	1979		1990 1996	43

Notes. Bai & Carrion-i-Silvestre (2009) estimations allowing for up to 4 structural breaks

Variables relative to GDP. Structural Breaks (BIC estimates), 1970-2012. (Bai & Carrion-i-Silvestre 2009) (ii)

	Gross Debt	Expenditure	Revenue	Exp. (no interest)	interest	N° obs.
Germany			1977	1992 1999	1993	43
France		1985				36
Netherlands		1990 1996	1983		1979 1985 1993 2002	38
Austria			1976	1987 1996	1987	43
Finland	1996		1976		1987 1993	43

Notes. Bai & Carrion-i-Silvestre (2009) estimations allowing for up to 4 structural breaks.

Bai&Carrion-i-Silvestre (2009) Unit Root Tests Results 1970-2012

Variable	Model 2. Trend Break Model						T	N	m
	Z	P_m	P	Z*	P_m^*	P^*			
GrossDebt	-0.90	0.97	39.78*	1.664**	-0.3493	29.20	43	16	4
Prim.Surplus	-2.37***	3.12***	56.94***	-2.37***	3.12***	56.94***	43	16	4
Surplus	1.18	1.35*	42.84*	1.18	1.35*	42.84*	43	16	4
Expenditure	0.40	-0.86	25.16	1.03	-1.28*	21.77	43	16	4
Exp.exc.int	-0.68	0.15	33.22	-0.64	-0.34	29.31	43	16	4
Revenues	-1.55*	1.16	41.28*	-0.33	0.68	37.46	43	16	4
Interests	-0.40	1.72*	45.79**	0.75	-0.26	29.91	43	16	4

Panel: empirical strategy

- Bohn (2007) suggests that all of the sustainability conditions, be they strong, weak, or absurdly weak, imply the transversality condition and the IBC.
 - Following Bohn, we focus our analysis on the primary surplus response to an increase in debt
 - Due to the apparent non-stationarity (even after allowing for multiple structural breaks) of the debt-ratio and interest expenditure, together with the stationarity of the Primary surplus to GDP ratio, we can't apply cointegration techniques to test for the fiscal reaction function:

State Transition Equation

$$\xi_{t+1} = \mathbf{F} \times \xi_t + \mathbf{A} \times \mathbf{Z}_t + u_t$$

$(r \times 1) \quad (r \times r) \quad (r \times 1) \quad (r \times s) \quad (s \times 1) \quad (r \times 1)$

- Unobservable vector
- Autoregressive parameters matrix
- Parameters for control variables
- $u_t \sim N(0, Q)$
- $E(u_{t+1}, u'_{t+1}) = Q$

Measurement Equation

$$y_t = \mathbf{B}' \times x_t + \mathbf{H}' \times \xi_t + w_t$$

$(n \times 1)$ $(n \times k)$ $(k \times 1)$ $(n \times r)$ $(r \times 1)$ $(n \times 1)$

- Dependent variables vector
- Vector of regressors
- Unobservable vector
- $w_t \sim N(0, R)$
- $E(w_t, w_t') = R$

Time-varying parameter model

$$y_t = \mathbf{B}' \times x_t + \mathbf{H}'(x_t) \times \xi_t + w_t$$

$(n \times 1)$ $(n \times k)$ $(k \times 1)$ $(n \times r)$ $(r \times 1)$ $(n \times 1)$

- **H Vector not fixed**

Additional Assumptions:

- $H'(x_{it}) = x_{it}$
- $\xi_t = (\beta_{it} - \bar{\beta}_i)$
- $\bar{\beta}_i = \bar{\beta}$
- Optional restrictions for autoregressive parameters matrix and gaussian errors matrices of both measurement and transition equations

Kalman Filter

- We estimate a time-varying fiscal reaction function for the Euro-countries, where:

$$PS_{it} = \bar{\beta}_{0i} + \bar{\beta}_{1i} * PS_{i,t-1} + \bar{\beta}_{2i} * GD_{i,t-1} + (\beta_{2it} - \bar{\beta}_{it}) * GD_{i,t-1} \\ + \bar{\beta}_{3i} * GVAR_{it} + \bar{\beta}_{4i} * YVAR_{it} + \omega_t$$

- Nondebt determinants of the primary surplus:
 - level of temporary government spending (GVAR) and
 - a business cycle indicator (YVAR). In addition,
 - we include an intercept and the lag of the primary balance/GDP ratio.
 - The varying component parameter of the debt/GDP ratio is estimated though Kalman Filter with a transition: $\xi_{i,t} = (\beta_{i2t} - \bar{\beta}_{it})$
 - Whose transition is defined by :

$$\xi_{i,t+1} = \Phi \xi_{i,t} + v_{t+1}$$

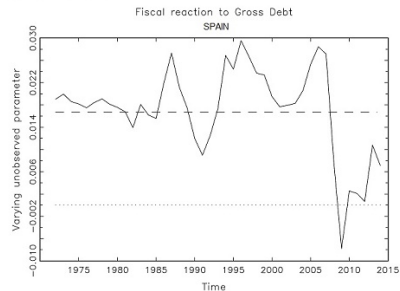
$$E[v_{t+1}, v'_{t+1}] = Q$$

TVP Fiscal Reaction Function 1970-2014

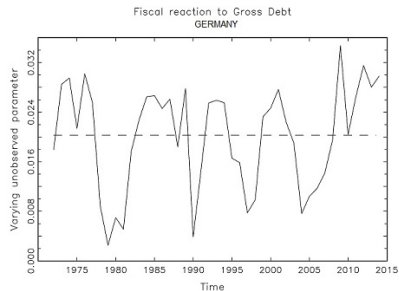
	Intercept	L-Surplus	L-Grossdebt	YVAR	GVAR
Germany	-0.631** (-2.176)	0.004 (0.064)	0.020*** (2.744)	-0.149*** (-3.771)	-0.988*** (-17.910)
Portugal	-1.593*** (-2.666)	0.093 (0.718)	0.0126 (0.811)	0.056 (0.852)	-0.739*** (-5.470)
Ireland	-5.347*** (-5.272)	0.270*** (4.198)	0.033 (0.899)	-0.263*** (-2.917)	-1.001*** (-15.957)
Italy	-5.936*** (-4.625)	0.229 (1.049)	0.065*** (4.301)	0.173* (1.671)	-0.608*** (-3.456)
Greece	-1.336** (-2.168)	0.322** (2.334)	0.011 (0.812)	-0.060 (-0.739)	-0.677*** (-6.196)
Spain	-0.979* (-1.832)	0.604*** (4.339)	0.016 (1.224)	0.126 (1.235)	-0.546*** (-3.612)
France	0.048 (0.170)	0.137 (1.124)	-0.010 (-0.949)	0.026 (0.289)	-0.681*** (-5.302)
Belgium	-5.113*** (-2.710)	0.165 (1.495)	0.063*** (2.737)	-0.211* (-1.952)	-0.927*** (-9.838)
Netherlands	1.004*** (2.735)	0.027 (0.297)	-0.004 (-0.358)	-0.199** (-2.072)	-0.954*** (-10.685)
Austria	-0.681 (-1.311)	0.633 (6.247)	0.014 (1.526)	0.039 (0.3547)	-0.458 (-3.697)
Finland	3.904*** (3.637)	0.304** (2.307)	-0.050* (-1.864)	-0.044 (-0.540)	-0.678*** (-6.236)
Observations	43				
Notes: t-tests in parentheses					
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$					

TVP Fiscal Reaction Function 1970-2014

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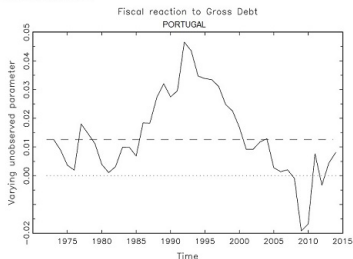


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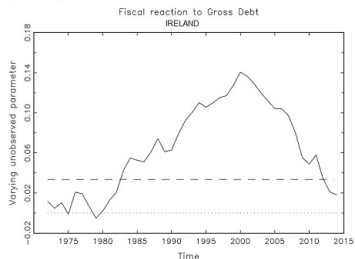


TVP Fiscal Reaction Function 1970-2014

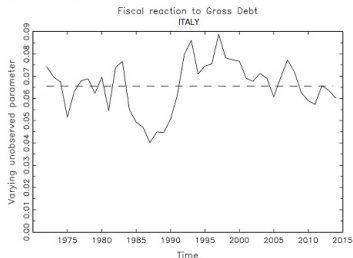
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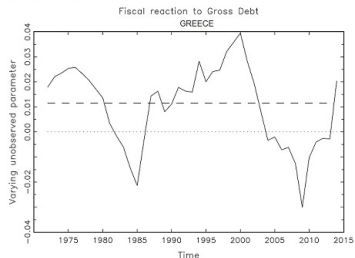
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Take-aways

- 1 Evidence favouring the existence of (different kinds of) fiscal responses of primary surplus to debt accumulation for the country panel.
- 2 Time.-series analysed affected by multiple structural change breaks.
- 3 Different degree of response between PIIGS and rest of the countries. Peripheral countries react mostly in a non-permanent pattern (perhaps forced by financial constraints, responding more to interest payments increase and less to debt-increase).
- 4 Less counter-cyclical response showed by PIIGS.
- 5 Time-Varying reaction heterogeneity between countries,
- 6 In general, Peripheral EMU countries show patterns of isolated episodes of reaction to debt (i.e., no permanent component).