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

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# Outline

# Goal

## Main Goal of the research.

- The aim of this paper is to test the fulfilment of the intertemporal budget constraint for the case of some peripheral European Monetary Union (EMU) countries:
  - Greece, Portugal, Ireland, Italy and Spain (PIIGS) .
    - For these countries, and particularly after the 2007 financial crisis, hangs the 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.

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# 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
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- Afonso and Rault (2010) Introduce, in this context, panel data cointegration and unit root tests

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# 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:

$$B_t = \sum \rho^i \times E_t[T_{t+i} - G_{t+1}]$$

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

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# 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

$$G_t + r_t \times B_{t-1} - R_t \tag{1}$$

$$R_t = \alpha + \beta \times CG_t + u_t \tag{2}$$

- 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 $0 < \beta \leq 1$.

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# The data

Figure: Gross Debt Ratio to GDP PIIGS countries

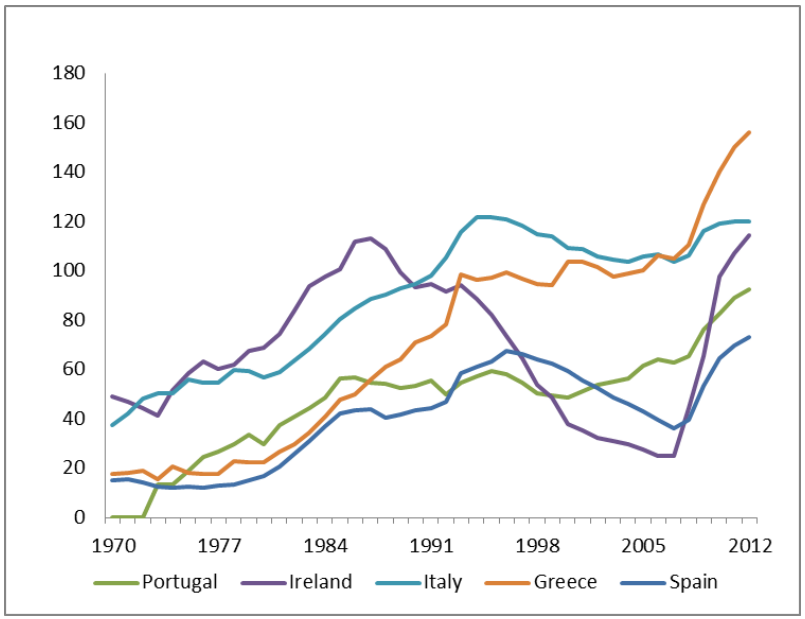
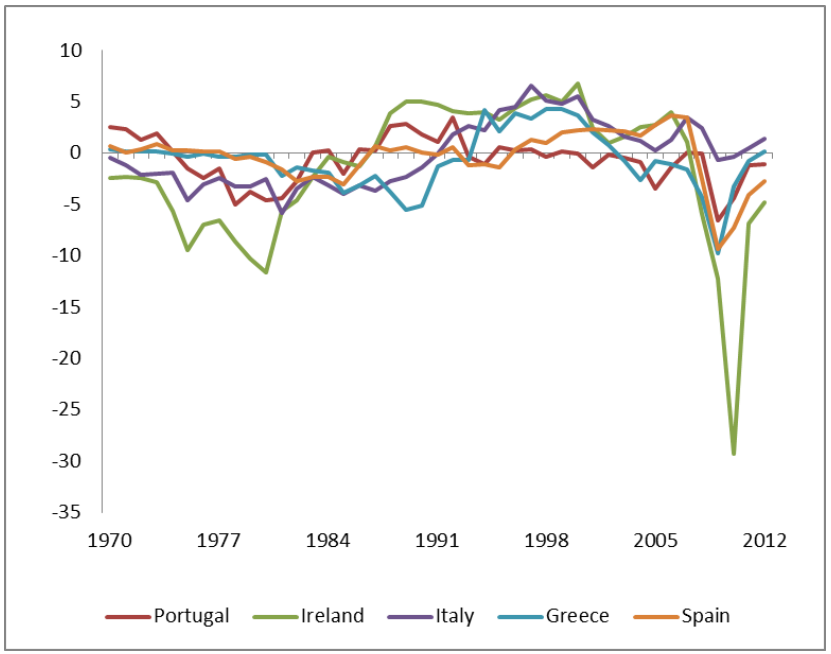



Figure: Government Primary Surplus Ratio to GDP PIIGS countries.



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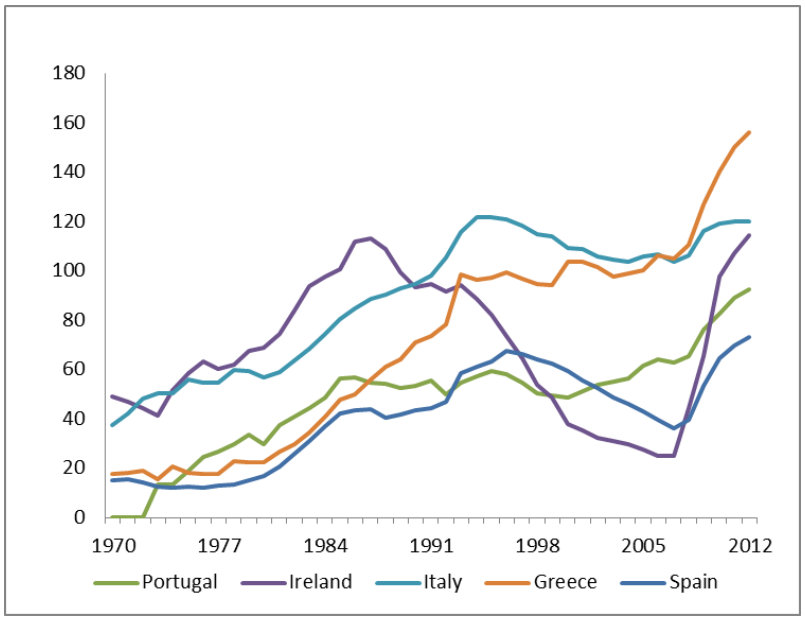


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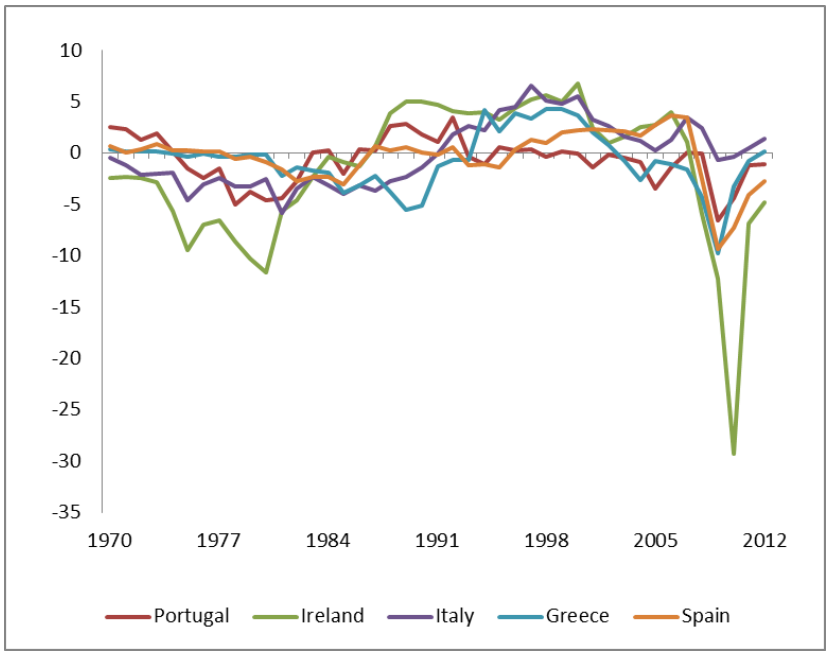

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Figure: Government Interest Spending Ratio to GDP PIIGS countries

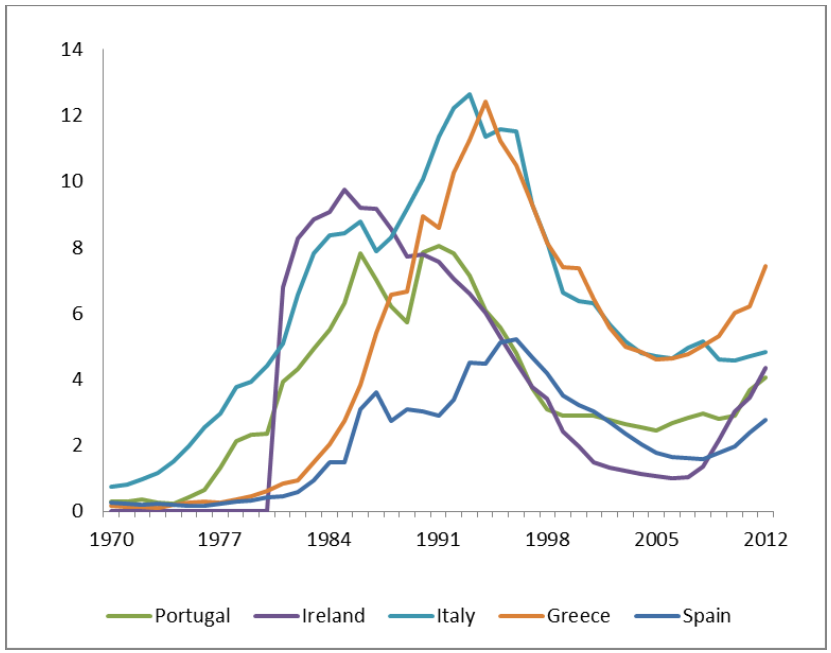
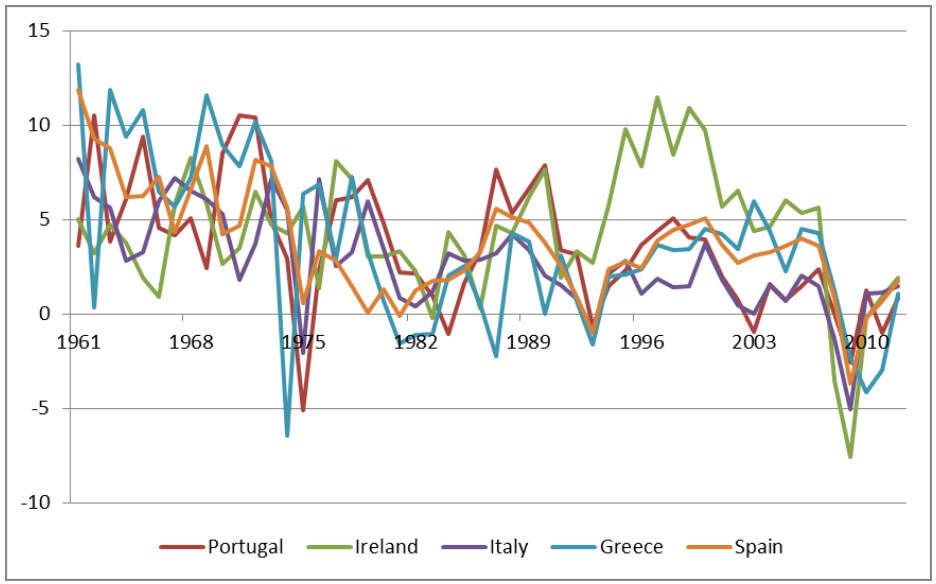



Figure: GDP Cycle component (Hodrick-Prescott) PIIGS countries



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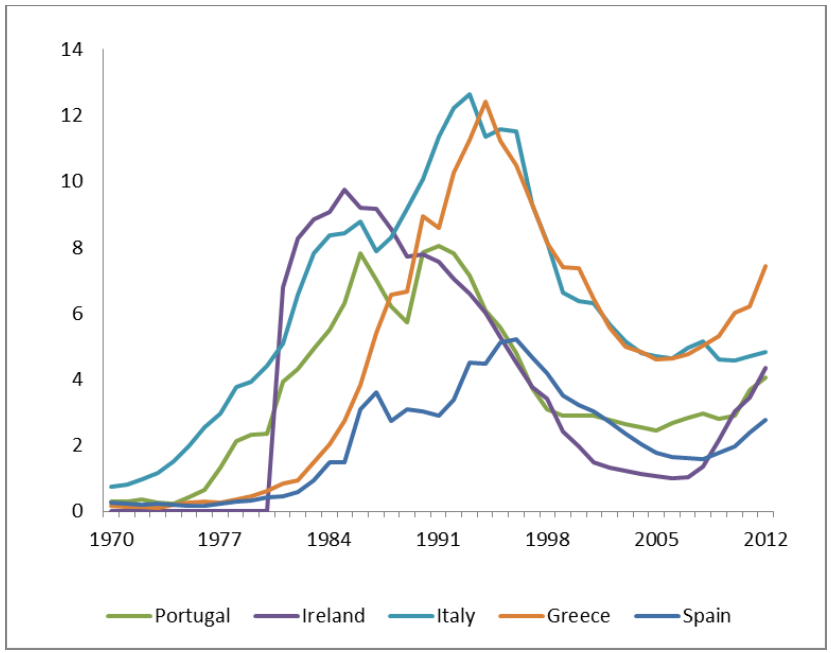


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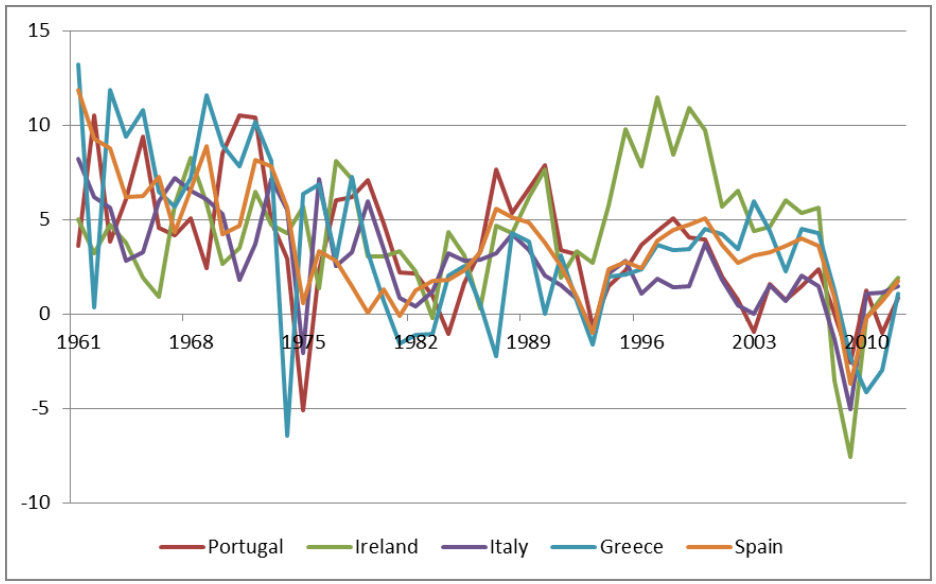

# Structural Breaks and/or Unit Roots

- 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

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

| Country | Breaks | Years |
|---|---|---|
| Portugal | 3 | 1978<br>1984<br>2006 |
| Ireland | 3 | 1981<br>1996<br>2006 |
| Italy | 3 | 1977<br>1984<br>1991 |
| Greece | 4 | 1980<br>1986<br>1992<br>2006 |
| Spain | 3 | 1982<br>1992<br>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 | Nº obs. |
|---|---|---|---|---|---|---|
| Portugal | | 1978 | | | | 40 |
| Ireland | 1990<br>2006 | | 1984 | | | 43 |
| Italy | 1994 | 1983 | 1982 | 1989 | 1989<br>1999 | 43 |
| Greece | 2006 | 1983<br>1990 | 1982<br>1988<br>2000 | 1982<br>1988 | 1985<br>1994<br>2005 | 43 |
| Spain | 1978<br>1998<br>2006 | 1995 | | 1979<br>1985 | | 43 |
| Belgium | 1979<br>1985<br>1993<br>2006 | 1981<br>1994 | 1979 | | 1990<br>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 | Nº obs. |
|---|---|---|---|---|---|---|
| Denmark | 1977<br>1983 | | | | 1978<br>1984 | 42 |
| Germany | | | 1977 | 1992<br>1999 | 1993 | 43 |
| France | | 1985 | | | | 36 |
| Netherlands | | 1990<br>1996 | 1983 | | 1979<br>1985<br>1993<br>2002 | 38 |
| Austria | | | 1976 | 1987<br>1996 | 1987 | 43 |
| Finland | 1996 | | 1976 | | 1987<br>1993 | 43 |
| Sweden | 1977<br>1984<br>1996 | 1993 | | | 1994 | 43 |
| United Kingdom | 1988<br>2006 | | | 1993 | 2002 | 43 |
| United States | 1981<br>1993<br>2000<br>2006 | 1978 | | | 1978<br>1985<br>1997<br>2003 | 43 |
| Japan | 1996 | | | 1979 | 1990 | 43 |

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# Root Tests Results 1970-2012

| Variables | Z tests | P (Normal) | Pm (Chi-square) |
|---|---|---|---|
| GrossDebt | -0.900*** | 0.972*** | 39.782*** |
| Primary Surplus | -2.366 | 3.117 | 56.943 |
| Surplus | 1.185*** | 1.354** | 42.836* |
| Total Expenditure | 0.402*** | -0.855*** | 25.158*** |
| Exp. Exc. interest. | -0.683*** | 0.152*** | 33.218*** |
| Total Revenues | -1.550** | 1.159*** | 41.278** |
| Interests | -0.400*** | 1.724* | 45.794** |

# Panel: empirical strategy

- The panel specification is estimated using two-stage instrumental variables estimation with country fixed effects.
- 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

$$Primsurplus_{it} = \alpha Grossdebt_{it-1} + \delta_1 Cycle_{it} + \delta_2 Interest_{it} + \varepsilon_{it}$$

  - 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:

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# Panel Estimation. 1970-2012

| | (1) All_countries | (2) All_countries2 | (3) No_Piigs | (4) Piigs |
|---|---|---|---|---|
| LD.GrossDebt | 0.0993*** | 0.110*** | 0.0701*** | 0.149*** |
| | (0.0192) | (0.0220) | (0.0173) | (0.0168) |
| CycletoGDP | 0.121** | 0.125** | 0.170** | 0.0549 |
| | (0.0544) | (0.0514) | (0.0557) | (0.0497) |
| D.Interest | 0.240* | | -0.192 | 0.414** |
| | (0.123) | | (0.352) | (0.108) |
| Observations | 630 | 630 | 428 | 202 |
| $R^2$ | 0.364 | 0.362 | 0.465 | 0.416 |

# Panel Estimation. 1970-2007.

| | (1) All_countries | (2) All_countries2 | (3) No_Piigs | (4) Piigs |
|---|---|---|---|---|
| LD.grossdebt | 0.0553** | 0.0764*** | 0.0892*** | 0.0781** |
| | (0.0241) | (0.0183) | (0.0153) | (0.0280) |
| cycletogdp | 0.133** | 0.140** | 0.178*** | 0.0239 |
| | (0.0591) | (0.0519) | (0.0543) | (0.0369) |
| D.interest | 0.413* | | -0.353 | 0.679** |
| | (0.218) | | (0.357) | (0.205) |
| N | 550 | 550 | 373 | 177 |
| R2 | 0.299 | 0.287 | 0.358 | 0.433 |

# 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 adition,
  - 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: $\xi_{i,t} = (\beta_{i2t} - \bar{\beta}_{it})$
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- 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 adition,
  - 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 :

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

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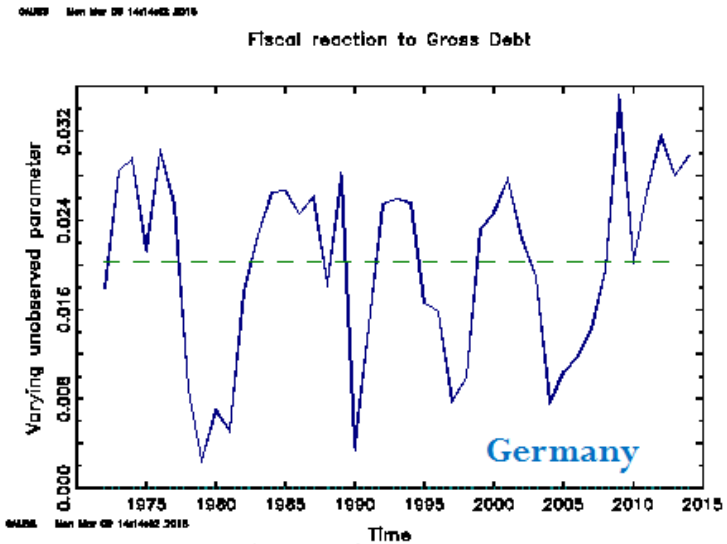
# TVP Fiscal Reaction Function 1970-2014

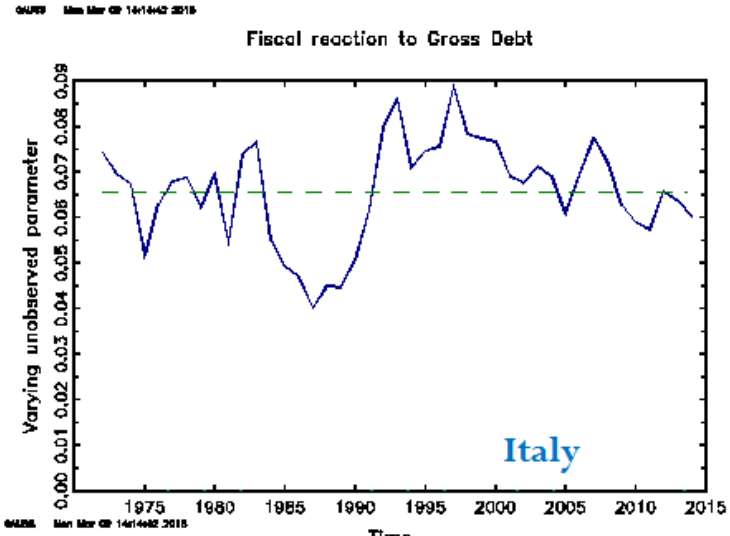
| | Intercept | L-Surplus | L-Grossdebt | YVAR | GVAR |
|---|---|---|---|---|---|
| Germany | -0.631** | 0.004 | 0.020*** | -0.149*** | -0.988*** |
| | (-2.176) | (0.064) | (2.744) | (-3.771) | (-17.910) |
| Portugal | -1.593*** | 0.093 | 0.0126 | 0.056 | -0.739*** |
| | (-2.666) | (0.718) | (0.811)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

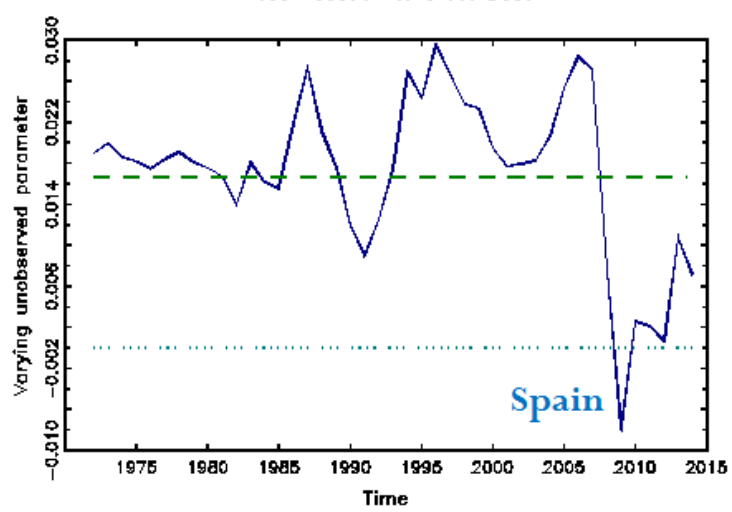
Notes: t-tests in parentheses

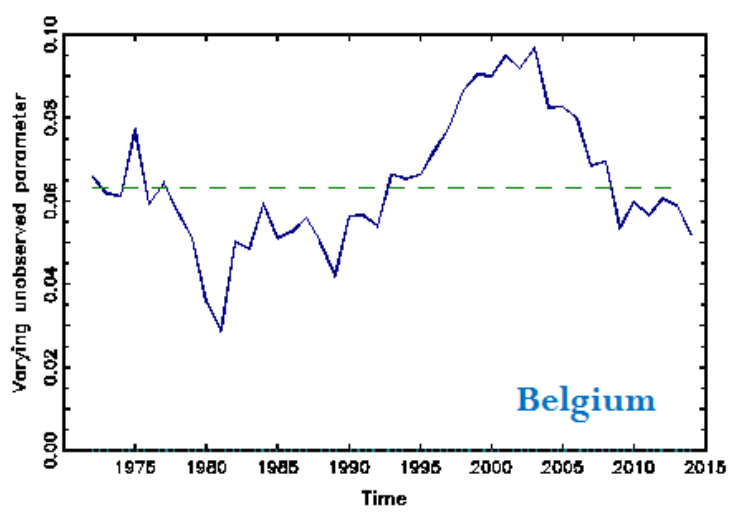
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

# TVP Fiscal Reaction Function 1970-2014



# Take-aways

1. Evidence favouring the existence of a fiscal response of primary surplus to debt accumulation for the 16-country panel
2. Different degree of response between PIIGS and rest of the countries. PIIGS react in the short run mostly forced by financial constraints, responding more to interest payments increase and less to debt-increase.
3. Less counter-cyclical response showed by PIIGS.
4. We identify a change in behaviour after the financial crisis. in general (but in particular in the PIIGS), the countries analysed tend to intensify its myopic behaviour.
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