

SIGNALLING FISCAL STRESS IN THE EURO AREA A COUNTRY-SPECIFIC EARLY WARNING SYSTEM

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In a nutshell

- The European Commission includes the so-called “S0 – indicator” in the Debt Sustainability Monitor as an early detection indicator of fiscal stress in the short term.
- The signalling approach basically consists of four steps:
 - First, fiscal stress needs to be defined.
 - Second, a set of “leading indicators” for fiscal stress is selected.
 - Third, thresholds for each variable are calculated.
 - Fourth, the variables are then aggregated into composite indices for signalling fiscal stress.
- In this paper, we simply consider country-specific thresholds as opposed to common thresholds across countries.
- This innovation significantly increases signalling power of the approach.

Literature review



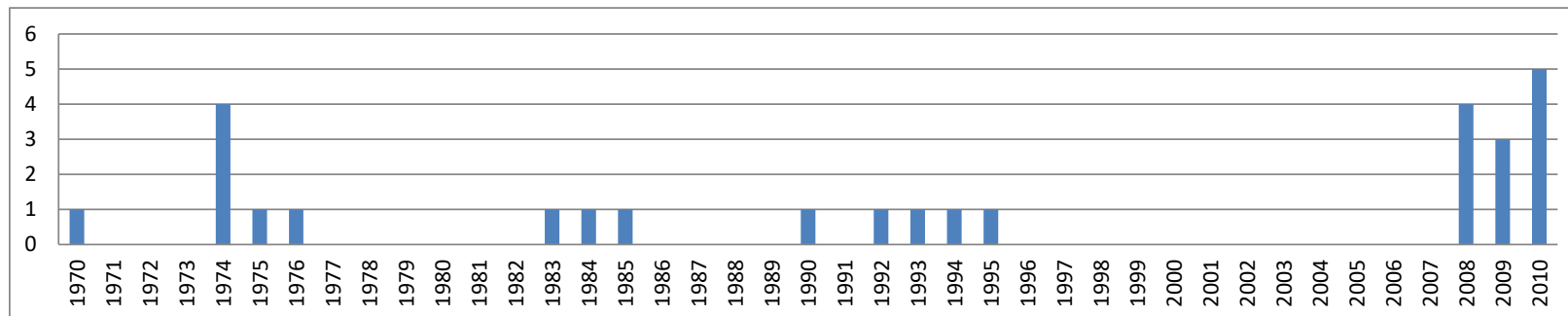
	Signalling approach	Logit/probit models	Other approaches
Currency crises	Kaminsky and Reinhart (1998) Kaminsky et al. (1998) Bruggemann and Linne (2002)	Berg and Pattillo (1999) Kumar et al. (2002) Mulder et al. (2002)	
Financial crises		Bussiere and Fratzscher (2002) Lo Duca and Peltonen (2013) Hemming et al. (2013)	
Fiscal crises	Berti et al. (2013) Baldacci et al. (2011) Hernandez de Cos et al. (2014)	Manasse et al. (2003)	
Economic crises	Alessi and Detken (2011)		Babecky et al. (2011)

STEP 1: Fiscal stress definition

- We first need to define a series of fiscal stress episodes.
- We follow Baldacci et al (2011) and Berti et al (2013).
- A fiscal stress episode takes place if any of the following four criteria is satisfied:
 - inflation rate above 35%
 - significant sovereign bond yield spreads
 - *2 s.d. above country-specific mean*
 - public debt default/restructuring/rescheduling
 - large-scale IMF-supported programme
- The dataset covers 1970-2010 and was compiled by the European Commission in the context of the 2011 Public Finance Report:
 - We thank Katia Berti for kindly sharing the original dataset and Stephanie Pamies for a recent update – not used so far.

STEP 1: Fiscal stress episodes

- A total number of 27 crisis episodes is included in our analysis.
 - We focus on 11 EMU countries.
- Fiscal stress episodes are concentrated in the mid-seventies and at the end of the sample horizon in the context of the sovereign debt crisis in several euro area Member States.
- We only consider the first year of each crisis episode.



STEP 2: Leading indicators

Fiscal variables/fiscal index	Financial variables/financial index
Average yearly change in projected age-related expenditures as % of GDP over 30 years (Not included in DSM)	Change (3 years) in nominal unit labour costs
Balance, % of GDP	Change (3 years) of real effective exchange rate, based on exports deflator
Change in expenditure of general government, % of GDP	Construction, % value added
Change in final consumption expenditure of general government, % of GDP	Current account, 3-year backward moving average, % of GDP
Change in gross debt, % of GDP	Debt (loans and securities other than shares), households and non-financial corporations (Not included in DSM)
Cyclically adjusted balance, % of GDP	Gross domestic product at current market prices per capita
Gross debt, % of GDP	Leverage (financial liabilities) financial corporations (Not included in DSM)
Interest rate-growth rate differential	Net international investment position, % of GDP
Net debt, % of GDP	Net saving: corporations (Not included in DSM)
Old-age dependency ratio 20 years ahead (Not included in DSM)	Net saving: households
Primary balance, % of GDP	Private sector credit flow (households and non-financial corporations), % of GDP
Short-term debt general government, % of GDP	Real GDP growth
Stabilising primary balance, % of GDP	Real short-term interest rates, GDP deflator
	Short-term debt, non-financial corporations, % of GDP

Note that the European Commission slightly modified the list of variables in subsequent updates of the S0 indicator:

Gross financing needs, % of GDP (Now included in DSM)	Private sector debt, % of GDP Yield curve Short term debt, households, % of GDP
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STEP 3: Country-specific thresholds (I)

- Given a crisis definition and a set of variables:
 - A signal for fiscal stress/crisis in the year ahead is sent if a given variable is above (or below) a certain threshold.
 - The threshold is determined by minimizing the total misspecification error (TME) i.e. maximizing the signalling power
 - The key innovation with respect to the original S0 indicator is that we estimate a different threshold for each country c and variable i :

$$t_{ic}^* = \arg \min_{t_{ic} \in T_{ic}} [TME_{ic}(t_{ic})] = \arg \min_{t_{ic} \in T_{ic}} \left[\frac{FN_{ic}(t_{ic})}{\#fs} + \frac{FP_{ic}(t_{ic})}{\#Nfs} \right]$$

	Fiscal stress episode (fs)	No fiscal stress episode (Nfs)
Fiscal stress signal	True positive	False positive- FP (Type I error)
No fiscal stress signal	False negative- FN (Type II error)	True negative

STEP 3: Country-specific thresholds (II)



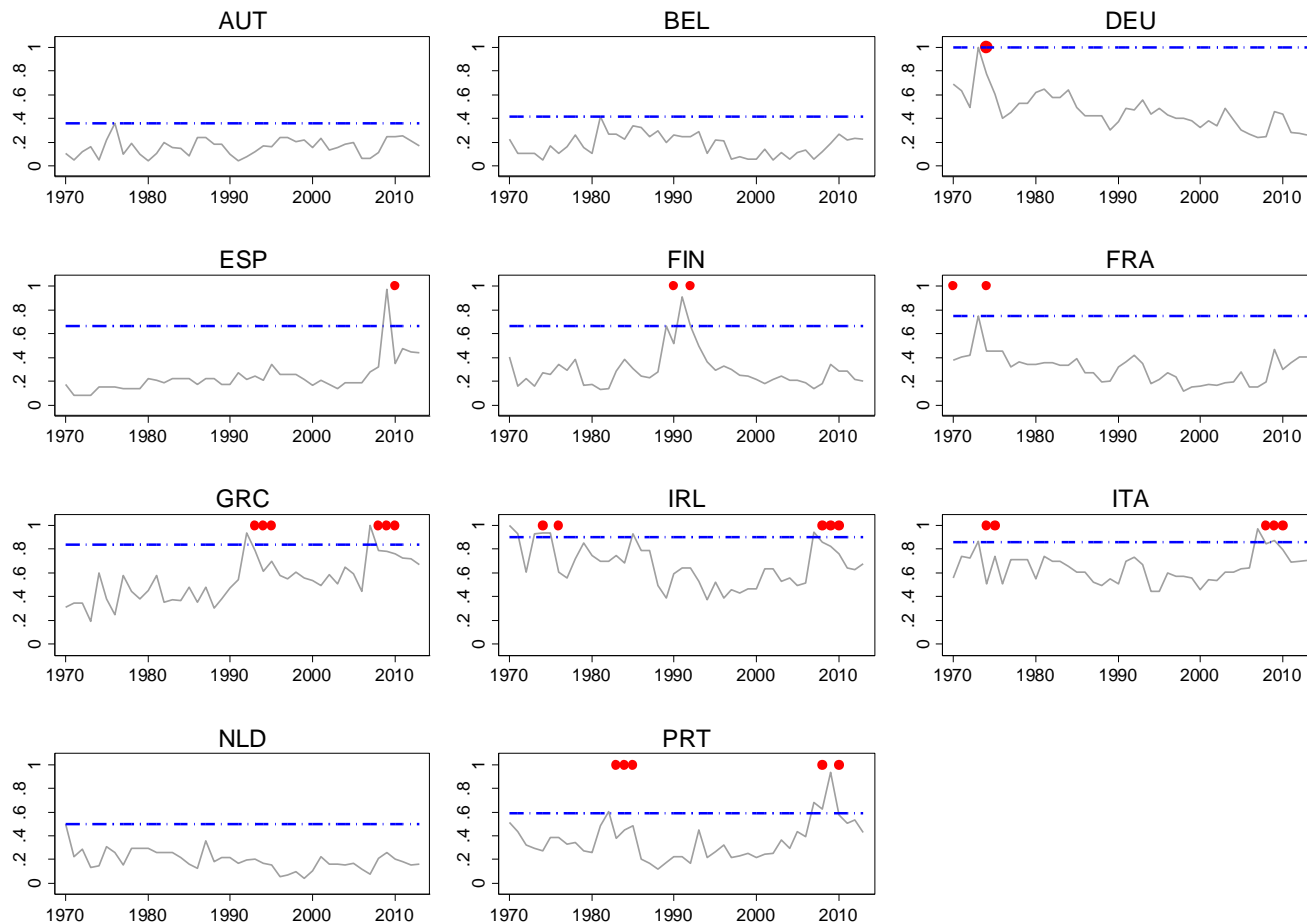
	Gross debt, % GDP (+)	Change in gross debt, % GDP (+)	Change in public expenditure, % GDP (+)	Primary balance, % GDP (-)
AUT	72.26	6.02	4.36	-1.99
BEL	134.24	12.44	6.66	-7.39
DEU	17.69	-0.43	0.59	2.23
ESP	53.26	13.41	4.51	-8.34
FIN	14.49	6.41	8.92	0.91
FRA	81.70	10.60	-0.06	-4.80
GRC	78.37	-0.69	1.49	-0.65
IRL	25.01	-2.85	-0.14	1.12
ITA	50.26	-3.03	-1.19	-4.06
NLD	78.48	12.92	5.31	-3.58
PRT	68.27	3.51	5.13	-0.21
Common	103.62	6.59	-2.39	-0.65

* The threshold of Belgium results from the fact that Belgium never experienced fiscal stress (based on the definition of fiscal stress applied here), while Germany experienced a fiscal stress episode in 1974.

STEP 4: The overall index



- An overall index can be constructed as a weighted mean of the signals sent by all variables with weights given by their signalling power.



STEP 4: The overall index and its signalling power



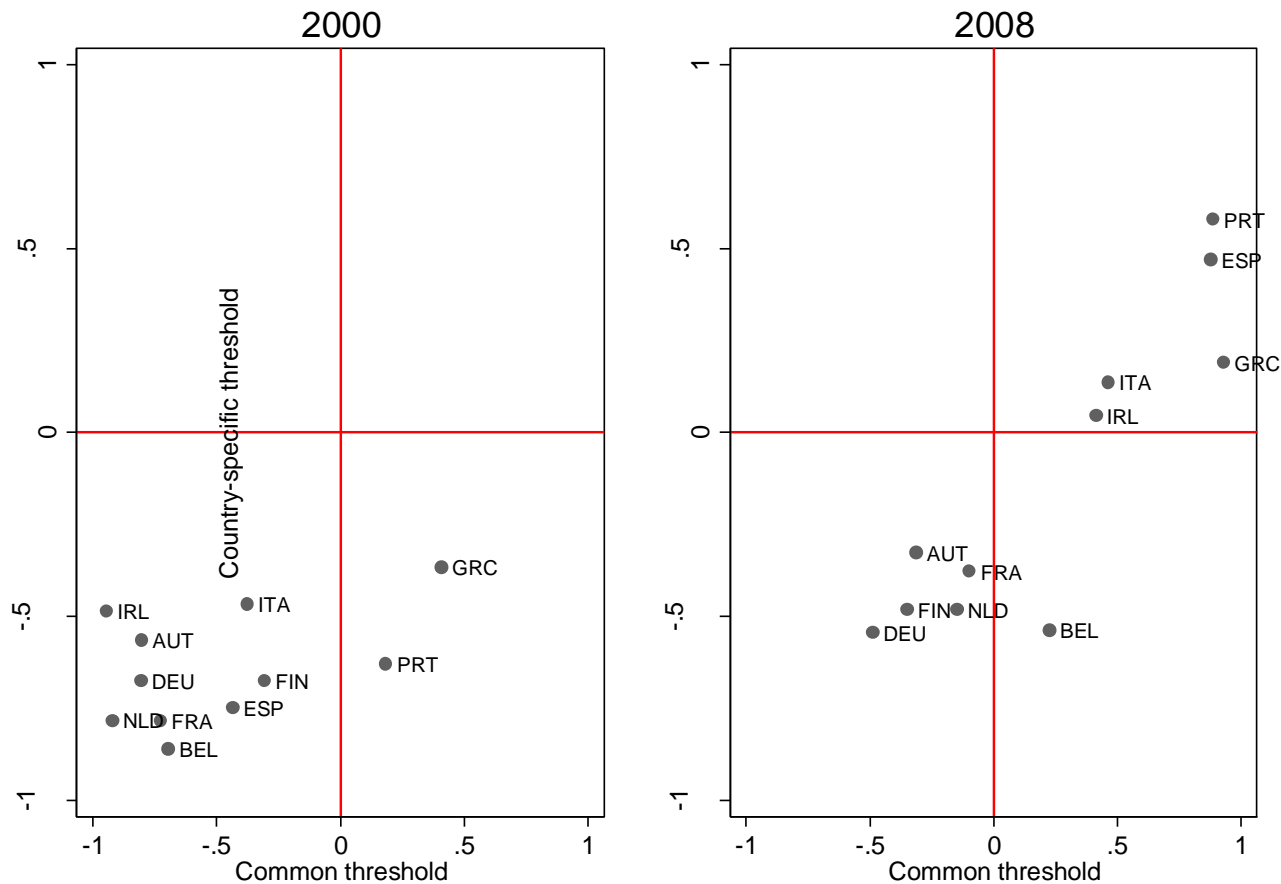
			Overall index	Fiscal index	Financial index
In-sample	Common	Sig. Power	0.56	0.22	0.50
		Type I	0.24	0.15	0.26
		Type II	0.20	0.64	0.24
	Country-specific	Sig. Power	0.95	0.88	0.87
		Type I	0.05	0.09	0.06
		Type II	0.00	0.04	0.07
Out-of-sample	Common	Sig. Power	0.42	0.13	0.47
		Type I	0.40	0.05	0.36
		Type II	0.18	0.82	0.18
	Country-specific	Sig. Power	0.77	0.58	0.79
		Type I	0.18	0.24	0.16
		Type II	0.06	0.18	0.06

Notes: Type I error is the ratio of false positives to number of no-crisis observations. Type II error is the ratio of false negatives to number of crisis observations. Signaling power is defined as $1 - \text{Type I} - \text{Type II}$. The percentage of true positives can be recovered as $1 - \text{Type II}$; the percentage of true negatives is $1 - \text{Type I}$.

Country-specific versus common threshold signals



- We plot the deviation (in %) between the index and the identified thresholds using common and country-specific thresholds.
- A positive value indicates a signal of fiscal stress.



Concluding remarks

- The use of country-specific thresholds in the signalling approach for fiscal stress seems to improve its signaling power.
- However, four limitations are worth highlighting:
 - All predictions of early warning indicators are based on historical crises observations, but future crises events and their triggers might differ fundamentally from past crises.
 - Data availability and quality can strongly reduce the signalling power of early warning indicators in real time.
 - Even if upcoming fiscal crises are correctly signalled, there might not be enough time left to counteract the critical developments.
 - The existence of feedback effects from fiscal stress episodes to the variables combined in the EWS are not taken into account.