

Fundamentals and contagion mechanisms in the euro area sovereign bonds markets

“The euro area sovereign crisis: monitoring spillovers and contagion”

CFE 2011, London, 17th December 2011

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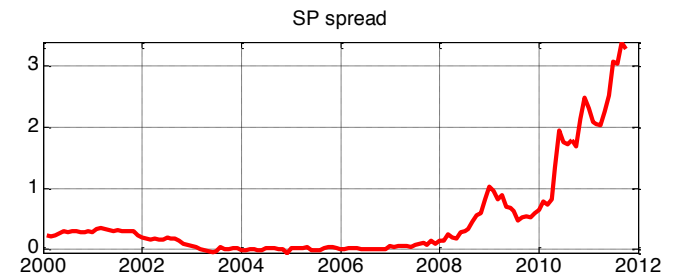
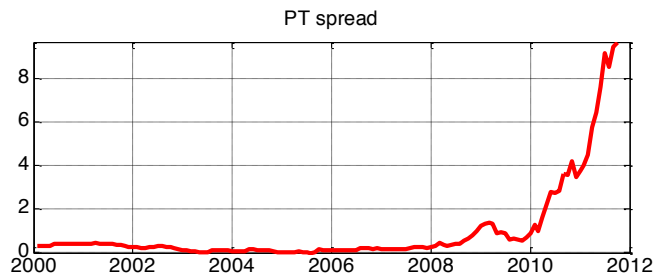
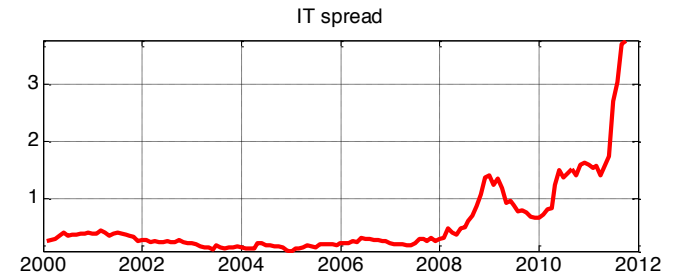
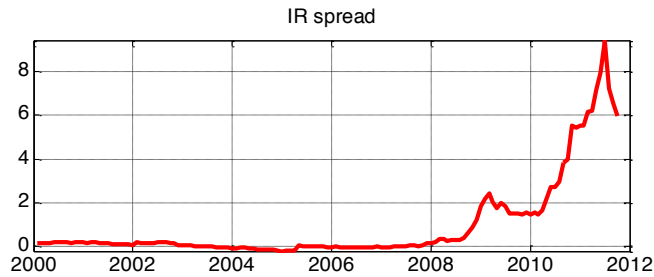
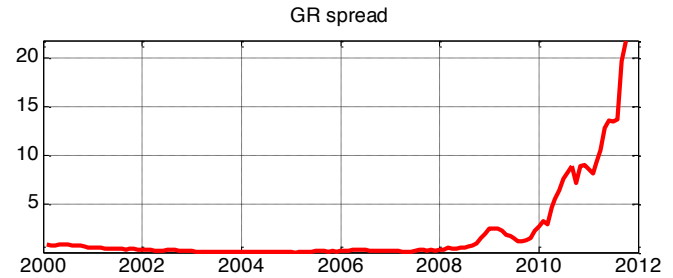
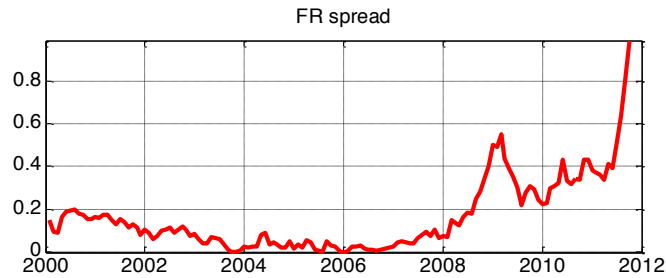
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Motivation: euro area spreads



Motivation

- Facts:
 - very large swings **hardly compatible with linear models**
 - relatively small parallel changes in fiscal fundamentals
 - Strong comovements **across countries**
- Obvious questions:
 - **What** determines these movements?
 - To what extent are they justified by the evolution of fiscal **fundamentals** in each country?
 - Can we disentangle the role of **common** factors and **contagion** effects?

Selected literature on the euro area

- Panel analyses, fixed effects
 - Pre crisis: Bernoth, von Hagen and Schuknecht (2004), Schuknecht, von Hagen and Wolswijk (2009), Manganelli and Wolswijk (2009)
 - Post crisis: Schuknecht, von Hagen and Wolswijk (2010), Afonso, Arghyrou and Kantonikas (2011)
- Time series with no-arbitrage restrictions
 - Ang and Longstaff (2011), only CDS data
- Other time series approaches:
 - Fornari (2011)

Our approach

- Starting point: **debt crises can be self-fulfilling**. They are more likely at relatively high levels of debt [and shorter maturity structure] (Cole and Kehoe, 2000)
- Our approach:
 - define the “crisis” as a regime (different from “normal”)
 - explicitly allow for probability of crisis regime to depend on **fiscal fundamentals** ...
 - ... but also allow for exogenous changes in investors’ **risk aversion** (a common factor)
 - ... and cross-country **contagion** (the occurrence of the crisis regime in another country)

Our approach

- Advantages:
 - Good empirical fit
 - Allows for nonlinear effects: difference between fluctuations **within** a regime and transitions **between** normal and crisis regimes
 - Ability to identify a certain form of cross-country contagion
- Drawbacks:
 - **Reduced form model**
 - Lacks strong theoretical restrictions
 - No policy implications

The model (I)

- **Spreads** of EA countries bonds at different maturities with respect to German bonds returns: y_{it}
- Each of the country spreads is modelled as VAR: **Panel VAR** framework
- Each country VAR has **level** and **volatility** affected by a discrete **regime** variable: **Markov Switching** panel VAR
- Common parameters (**pooled**) and **country specific** parameters
- Transition probabilities **not constant** in time
- Amisano and Fagan (2011), Amisano, Bragoli, Colavecchio and Fagan (2011).

The model (II)

- Each country ($i=1,2,..m$) vector \mathbf{y}_{it} ($n \times 1$) of spreads modelled as VAR with regime shifts:

$$\mathbf{y}_{it} = \mathbf{c}_{s_{it}} + \mathbf{A}_{s_{it}} \mathbf{y}_{it-1} + \boldsymbol{\Sigma}_{i,s_{it}}^{1/2} \mathbf{v}_{it}, i = 1, 2, \dots, m$$

- Note that all coefficients can be allowed to vary across regimes:
 - Intercept (level)
 - Autoregressive coefficients (persistence)
 - Covariance matrix (volatilities/correlations)

The model (III)

- **Transition** probabilities across regimes depend on
 - Country specific **fundamentals**
 - **Common** observable factors
 - Persistence of own regime
 - Other countries regime dynamics (**contagion**)

The model (IV)

- Transition probs as a **probit** function:

$$p(s_{it} = 1 | \mathbf{s}_{t-1}, \mathbf{z}_{it-1}) = \Phi(\gamma_{i1} + \gamma_{i2} \times s_{it-1} + \gamma_{i3} \times (\bar{s}_{it-1}) + \boldsymbol{\gamma}' \mathbf{z}_{it-1} + \eta_{it})$$

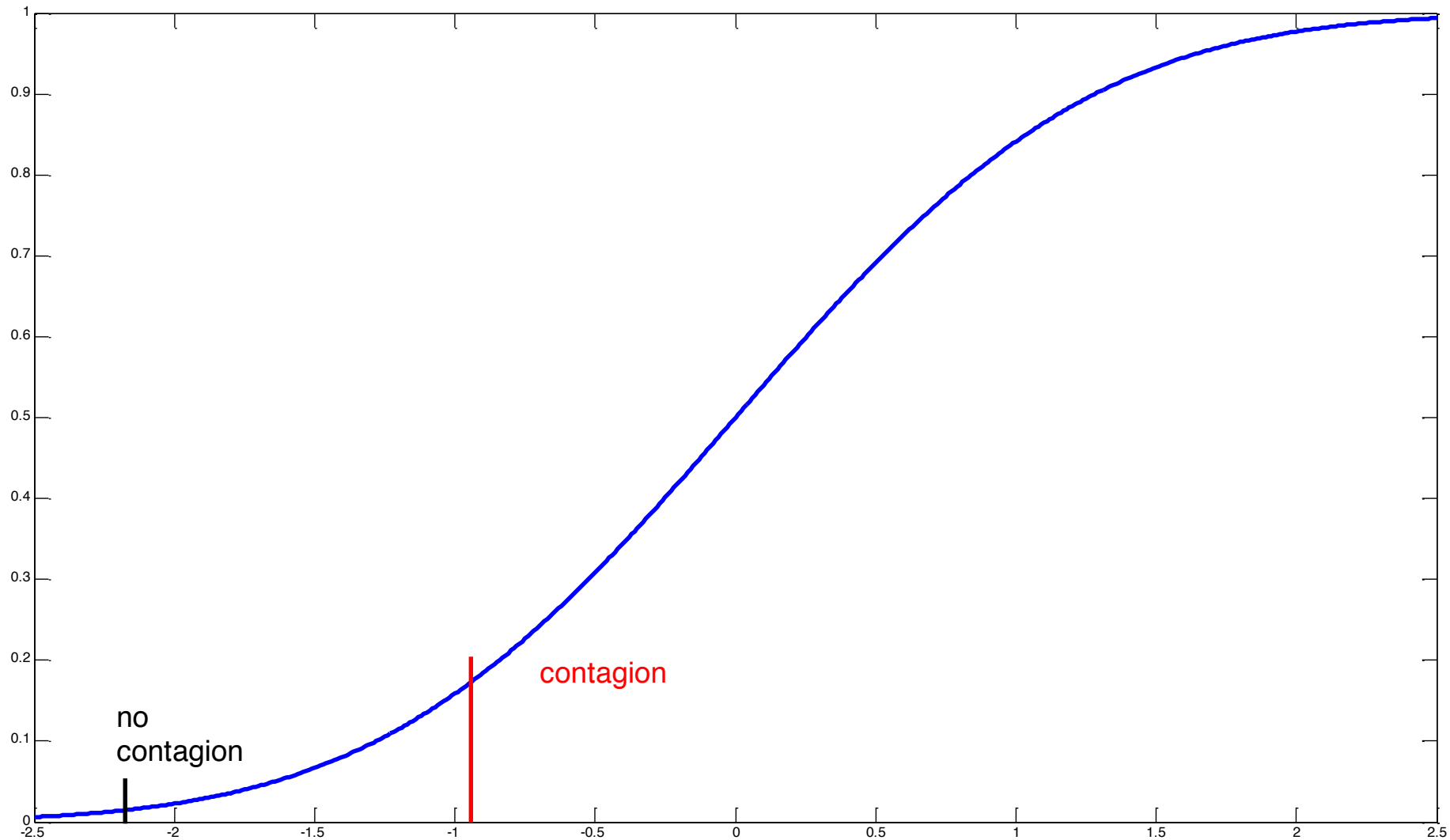
$$\Phi(\eta) = \int_{-\infty}^{\eta} \frac{1}{\sqrt{2\pi}} \exp\left\{-\frac{1}{2} z^2\right\} dz$$

$$\bar{s}_{it-1} = \begin{cases} I\left(\sum_{j \neq i} s_{jt} > 0\right) \text{ (type 1 contagion)} \\ \sum_{j \neq i} s_{jt} \text{ (type 2 contagion)} \end{cases}$$

$$\eta_{it} \sim NID(0,1)$$

$$\text{Cov}(\eta_{it}, \eta_{j\tau}) = 0, \forall i \neq j, t, \tau$$

The model (V)



The model (V)

- Some comments on transition probabilities
 - When $\gamma = 0$ and $\gamma_{i3} = 0$, we have time homogeneous Markov Switching process with each country evolving independently
 - When $\gamma_{i3} \neq 0$ we have **contagion** from other countries
 - Type 1 mechanism: operates when at least one other country is in crisis regime
 - Type 2 mechanism: more other countries in distress exert a stronger pull towards crisis.
 - Shocks η_{it} and variations in fundamentals (Δz_{it}) have **nonlinear** effects

The model (VII)

- Parameters in the country specific VAR can be either pooled, country specific or **partially pooled** (random effects)
- Parameters in the transition probabilities (the gammas):
 - **Slope** parameters (γ) **pooled**
 - Other parameters are country specific ($\gamma_{i1}, \gamma_{i2}, \gamma_{i3}$) or (partially) pooled

The model (VI)

- Estimation carried out using **Bayesian** inference
- **Proper priors** on all parameters
- **Simulation based** approach (details in Amisano and Fagan, 2011)
- Gibbs sampling + data augmentation to simulate state variables
- MCMC algorithm works quite well

Summing up

- Spillover/contagion enters in transition probs as **lagged** other country states and **shocks**
- Specific questions: role of **fundamentals**, **common** factors, on regime allocation for spreads
- This method: **nonlinear** framework, shocks can have different effects depending on starting values and shock values
- No prefiltering of the data: **Bayesian VAR**

Potential drivers of transitions

- Global **risk appetite**. BAA-AAA spread
- Business cycle variables (IP): not relevant
- **Fiscal** fundamentals (govt net lending as % GDP)
- Monthly data from 2001:m1 to 2011:m10 for 6 countries: FR, GR, IT, IE, PT, SP

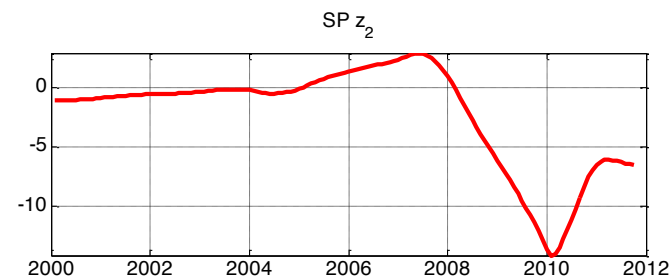
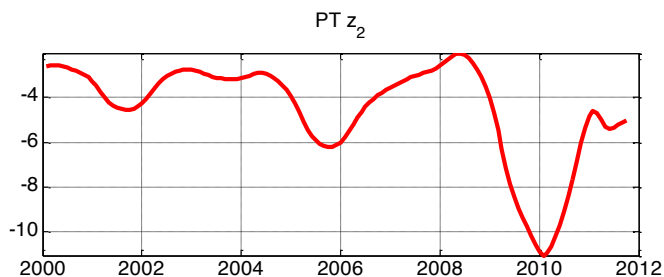
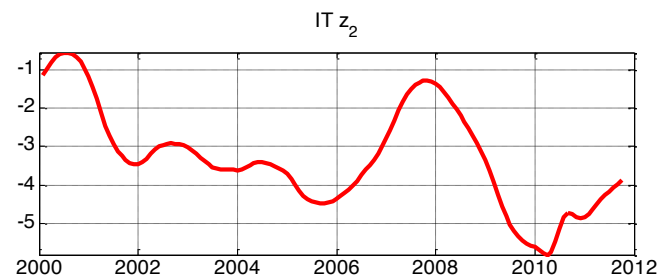
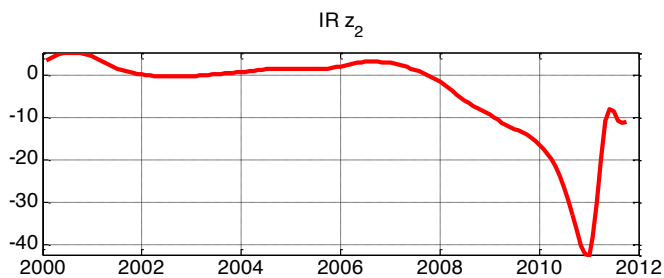
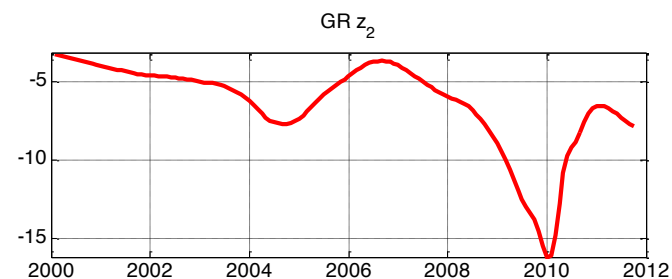
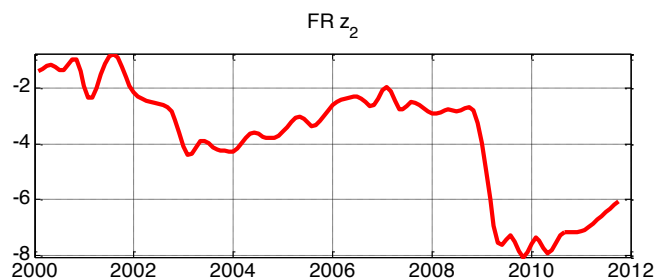
Potential drivers of transitions

Attitude with respect to risk (BAA-AAA spread)



Potential drivers of transitions

Fiscal fundamentals



Preliminary results: summary

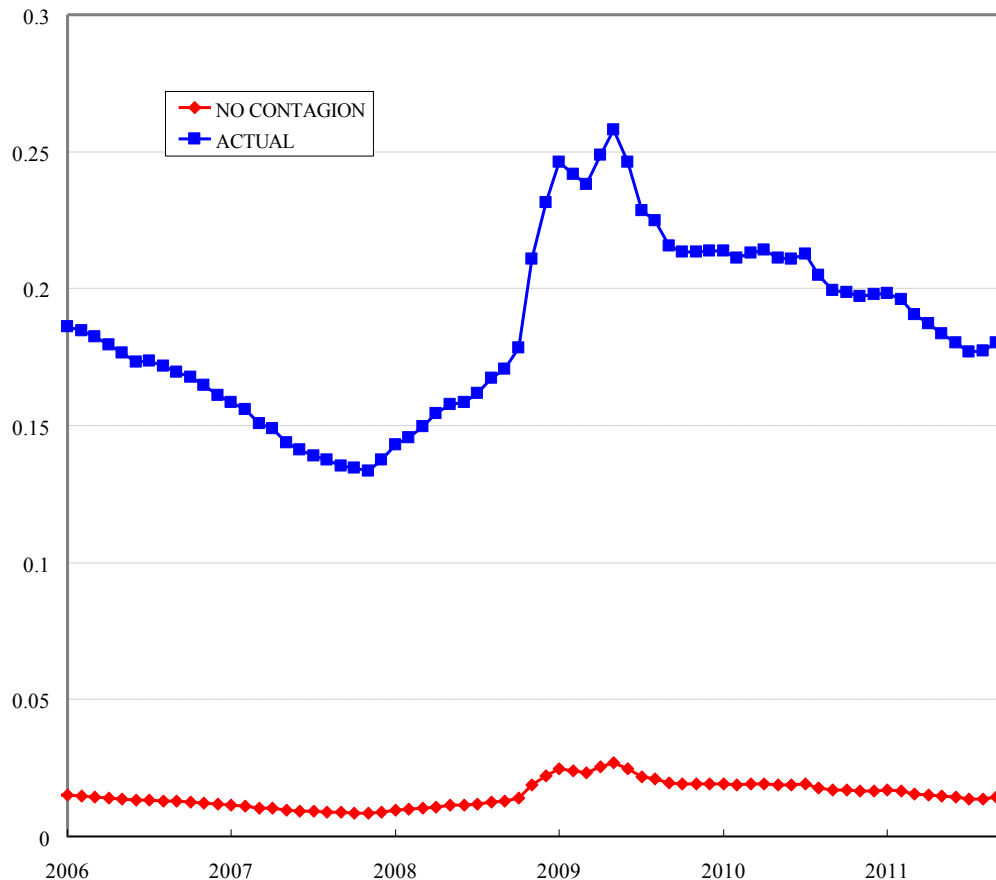
- Cross-country analysis: FR, GR, IE, IT, PT, SP
- **3 factors**: net Gov. lending (in % of GDP); risk aversion;; lagged cross-country “contagion”
- All countries have 2 regimes,
- **RA and fiscal** fundamentals very **relevant**
- Lagged other country regimes **relevant**

Preliminary results: summary

		prior type	prior mean	prior std	posterior mean	posterior std
gamma(1,i)	intercept	Gaussian	-1.5	1	-2.17	0.16
gamma(2,i)	lag own state	Gaussian	3	1	2.47	0.26
gamma(3,i)	lag other countries	Gaussian	0.5	1	1.28	0.22
gamma(1)	RA	Gaussian	0	1	0.06	0.1
gamma(2)	Fiscal	Gaussian	0	1	-0.33	0.15

What drives changes in regimes? The case for Italy: contagion (I)

- Probs to move into crisis regime

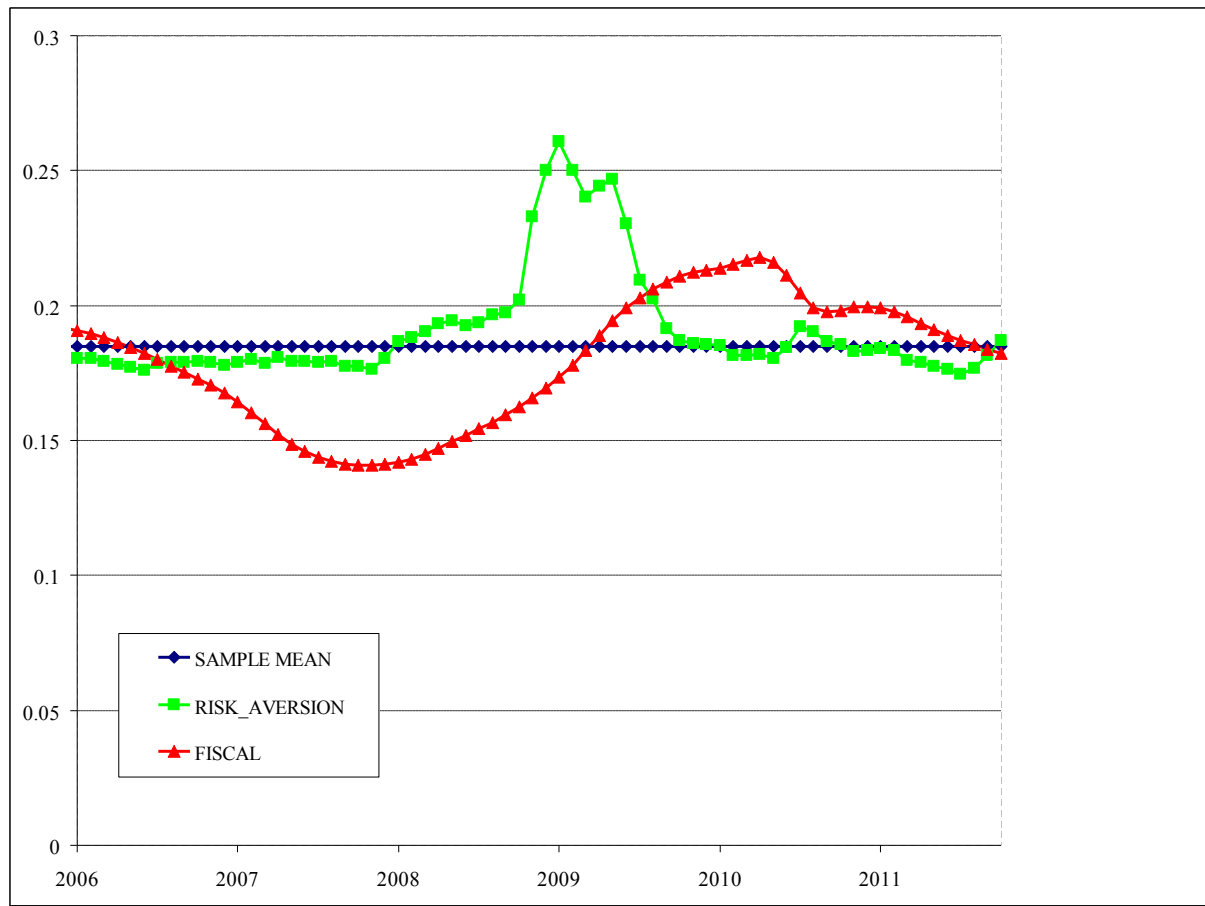


What drives changes in regimes? The case for Italy: contagion (I)

- contagion: huge shift from 1% to over 20%
- Deteriorations of fundamentals amplified by contagion (nonlinear model)

What drives changes in regimes? The case for Italy: fundamentals (II)

- Probs to move into crisis regime



What drives changes in regimes? The case for Italy: fundamentals (II)

- Probs to move into crisis regime
 - risk aversion (right): from 18% to more than 25%
 - Fiscal variable (right): risk alleviating effect until 2008.

Ways ahead

1. Other variables: stock of debt
2. Role of non-conventional measures, if data available, to conduct counterfactuals: effects of SMP.
3. Different model specification: robustness and interpretations
4. Feed back from spread regime into fiscal fundamentals
5. Relative importance of shocks