# Union Debt Management

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# Intro

What types of debt should governments issue?

- Angeletos (2002), Buera and Nicolini (2004).
  - Issue only **Long term Debt**
    - ...allows to benefit from **fiscal hedging**- negative (positive) covariance between spending levels /deficits and long bond prices (interest rates).

- Chari Kehoe (1999), Siu (2004), Lustig, Sleet and Yeltekin (2008)
  - **Nominal bonds are better.**
    - ... allows to use inflation to stabilize debt.

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  - **Nominal bonds are better.**
    - ... allows to use inflation to stabilize debt.

BUT...

- these are **closed economy** models and we are wary to draw safe conclusions
  - Inflation not necessarily useful in CA...
  - $Cov(i_t, def_t) \approx 0$ if shocks are idiosyncratic...

This paper: **Debt Management in Currency Areas.**

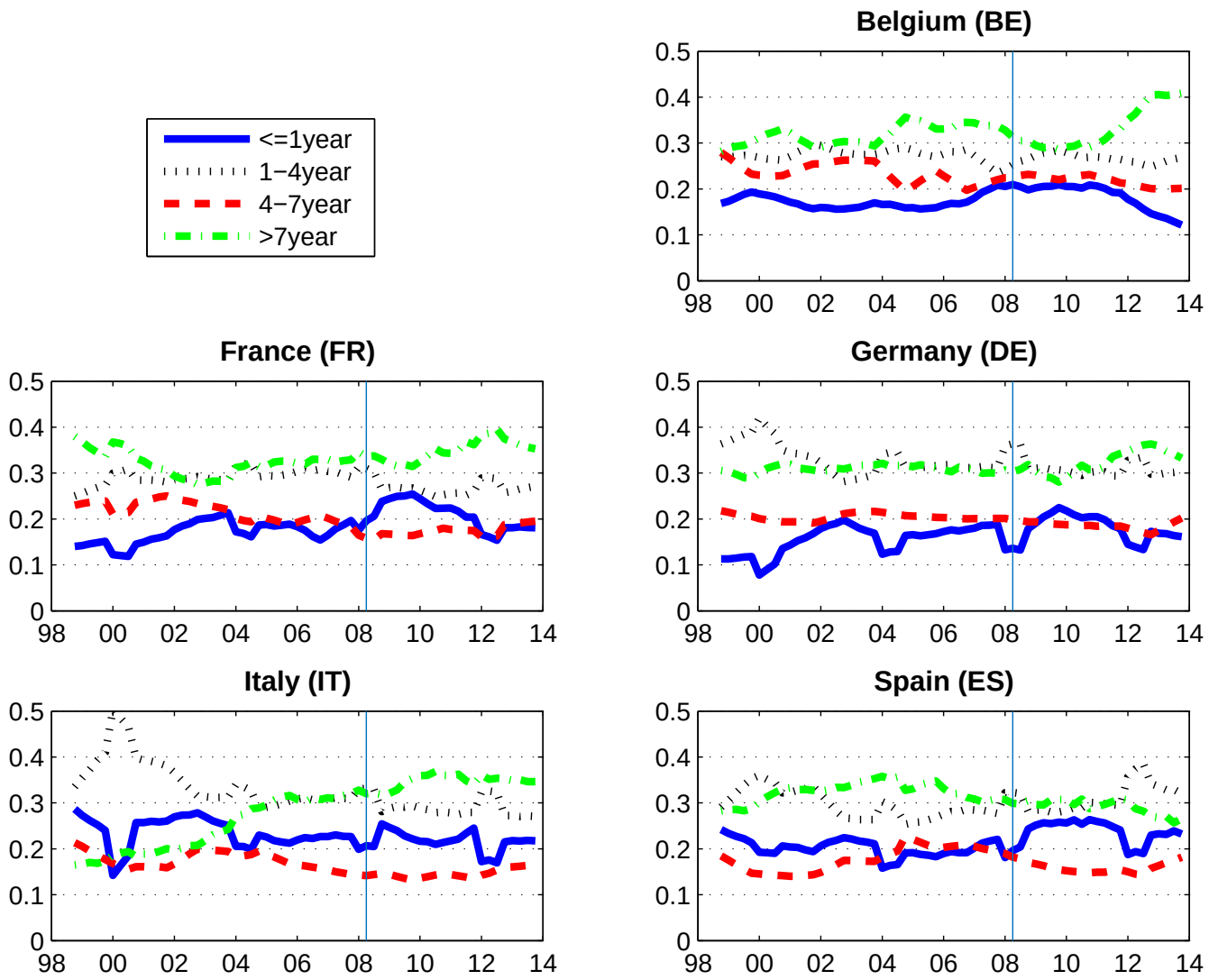
- Our argument has **2 layers:**
  1. **Data:** 5 countries in Euro area 1999-2008. Panel VARs document i) strong fiscal hedging against aggregate shocks, ii) no hedging against idiosyncratic shocks.
  2. **Model:** 2 countries, Ramsey policy equilibrium under complete markets. Conclusions i) nominal debt cannot complete markets. ii) governments **should issue inflation indexed real debt**.

# Literature

This paper...

- ... is part of a growing literature on government DM
  - **Data:** Brendt, Sleet and Yeltekin (2012), Faraglia Marcet and Scott (2008).
  - **Models:** Ramsey Policy: Angeletos (2002), Buera and Nicolini (2004), Faraglia, Marcet, Oikonomou and Scott (2018), Bhandari, Evans, Golosov and Sargent (2018), Debortoli, Nunes and Yared (2017)...
- ...is related to recent debate/papers on **Fiscal Transfers** (Fahri and Werning (2017),...) and **GDP indexed debt**.
  - In our model (without frictions): DM does exactly what fiscal transfers and GDP bonds do.
  - In the presence of frictions, DM is an important additional policy margin.

# DM in the Euro area



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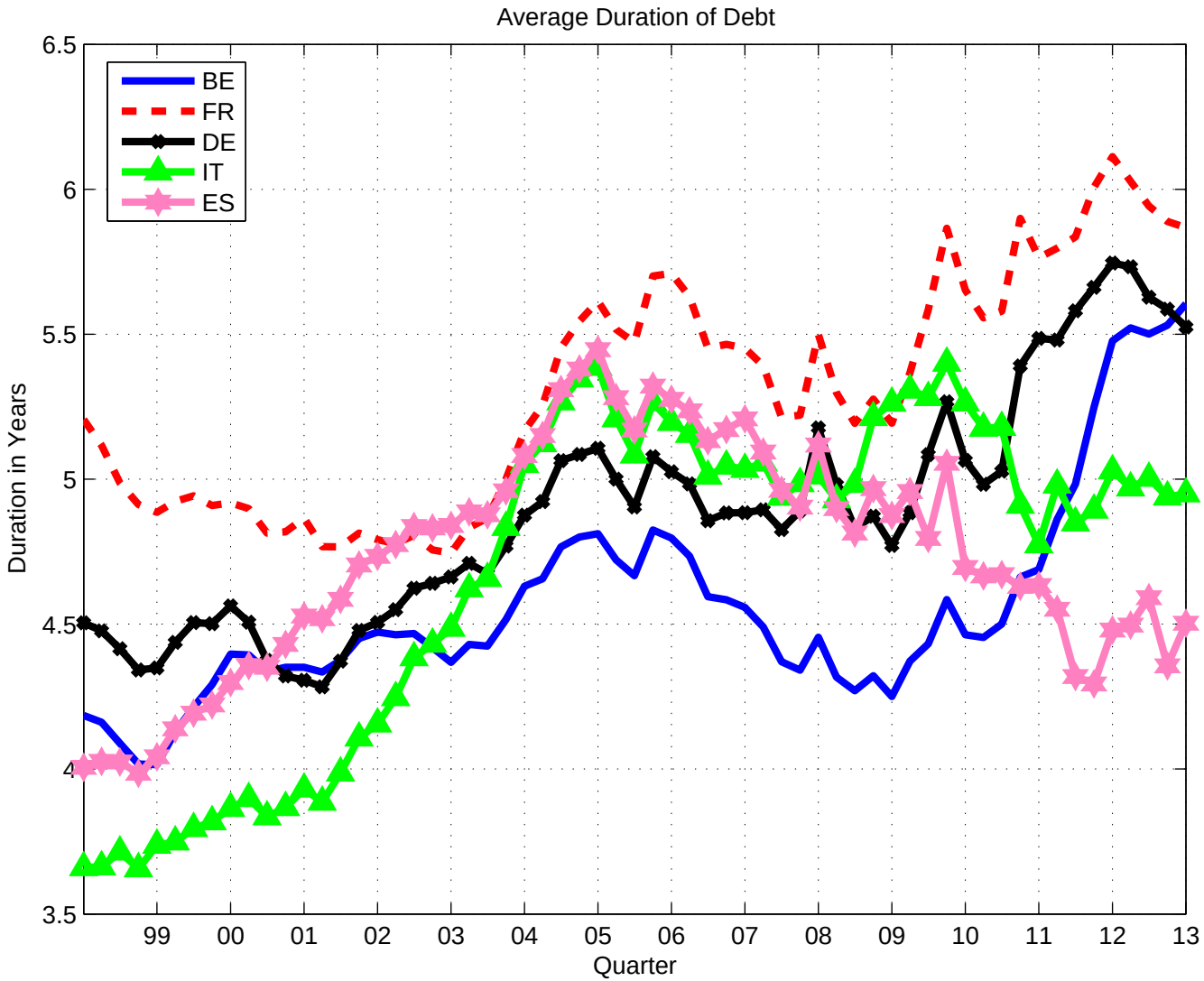

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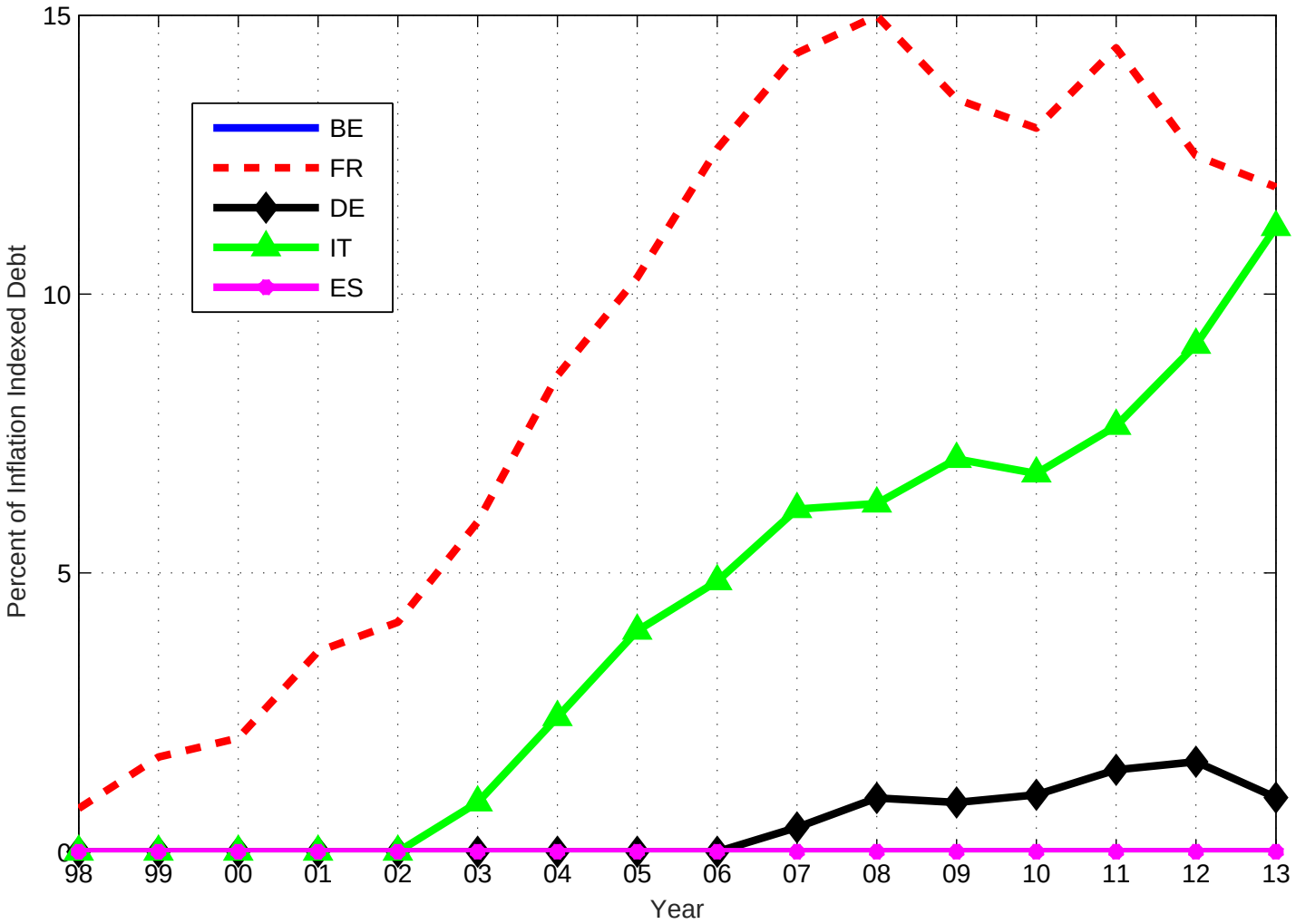

# Fiscal Hedging

What we are after...

$$\underbrace{\frac{b_{t-1,S}}{\pi_t} + \sum_{j\geq 2} q_t^{j-1} \frac{b_{t-1,L,j}}{\pi_t}}_{\text{Market Value of Debt}} = \underbrace{E_t \sum_{k=0}^{\infty} \prod_{i=1}^{k} \frac{1}{r_{t+i}} S_{t+k}}_{\text{present value of surpluses}} \qquad (1)$$

If a rise in spending lowers bond prices $q_t^{j-1}, j > 1$ (or $cov(q_t^{j-1}, S_t) > 0$) then governments benefit from issuing long term bonds.

This also works with holding period returns:

$$\sum_{j\geq 1} \frac{q_t^{j-1}}{\pi_t q_{t-1}^j} \frac{q_{t-1}^j b_{t-1,j}}{D_{t-1}} = \sum_{j\geq 1} \underbrace{R_{t-1,t}^j}_{return} \underbrace{w_{t-1}^j}_{share} = \frac{1}{D_{t-1}} E_t \sum_{k=0}^{\infty} \prod_{i=1}^{k} \frac{1}{r_{t+i}} S_{t+k} \tag{2}$$

where $D$ is the market value of debt.

If a spending shock lowers $R_{t-1,t}^j$ governments experience a capital gain (investors experience a loss).

## Return Variables: Definition

- We have the full portfolios of the 5 countries, maturities quarters 1 to 120 paying coupons.
  - We strip the coupons...
  - Price zero coupon bonds by yields from BIS.

    Denote the share of debt of maturity $j$ by $w_t^{j,i}$ and the price $q_t^{j,i}$
  - Holding period returns on maturity $j$ bonds are

$$R_{t-1,t}^{j,i} = \frac{q_t^{j-1,i}}{q_{t-1}^{j,i}} \frac{P_{t-1}}{P_t} - 1$$

  - Construct **composite portfolios:**

$$\mathcal{R}_{(t-1,t,\underline{j},\bar{j})} \equiv \frac{1}{\sum_{j=\underline{j}}^{j=\bar{j}} w_{t-1}^{j,i}} \sum_{j=\underline{j}}^{j=\bar{j}} R_{t-1,t}^{j,i} w_{t-1}^{j,i}$$

    for maturities $\underline{j}$ to $\bar{j}$.

# Empirical Analysis: Data and Variables

Our VARs will shock variables

$$\mathcal{R}_{(t-1,t,\underline{j},\bar{j})} \equiv \frac{1}{\sum_{j=\underline{j}}^{j=\bar{j}} w_{t-1}^{j,i}} \sum_{j=\underline{j}}^{j=\bar{j}} R_{t-1,t}^{j,i} w_{t-1}^{j,i}$$

If a positive spending shock **decreases** $\mathcal{R}$, this provides evidence of **fiscal hedging**.

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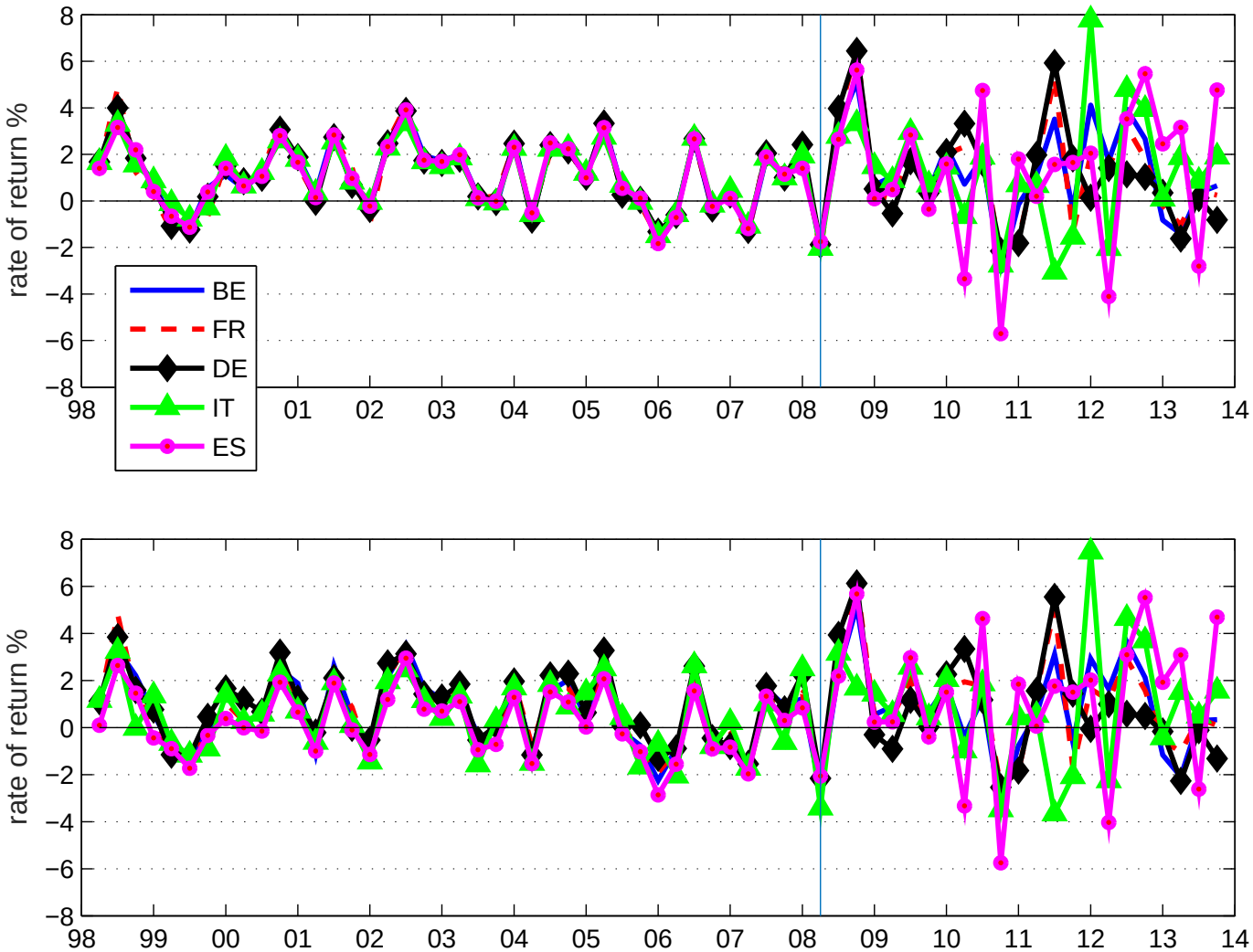
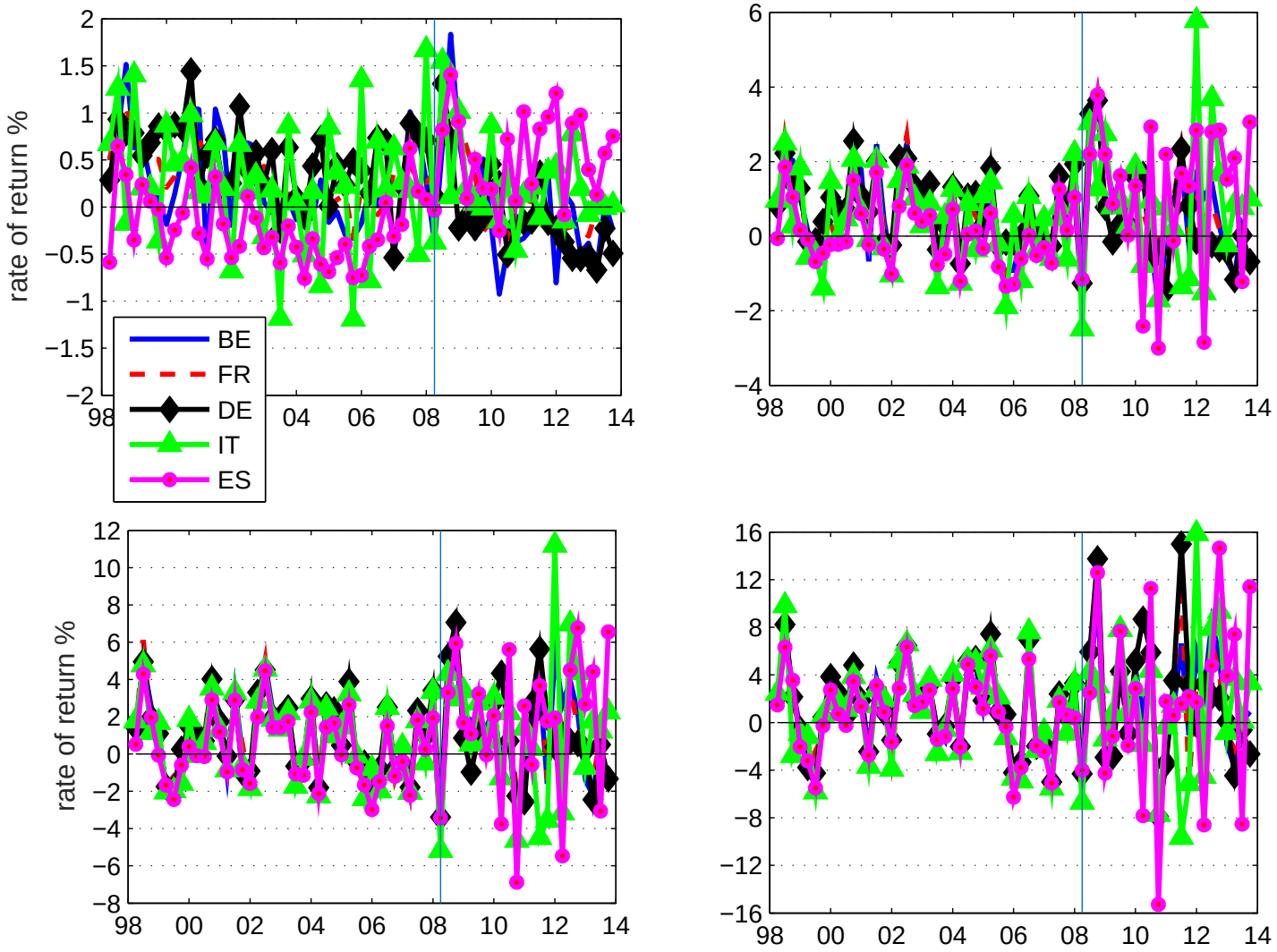
# Empirical Analysis: Returns on Aggregate Portfolios



# Empirical Analysis: Returns Various Maturity Segments



# Empirical Analysis: Identification

Our baseline VAR is

$$\mathcal{X}_t = \mathcal{B}(L)\mathcal{X}_{t-1} + \nu_t, \quad \nu_t = \mathcal{M}\epsilon_t \tag{3}$$

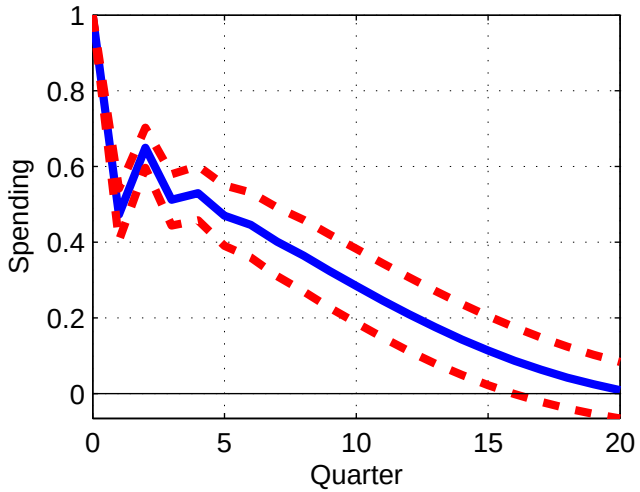
where $\mathcal{X}_t^i \equiv \left(\widetilde{g}_t^a, \widetilde{g}_t^i, \widetilde{Y}_t^i, \widetilde{P}_t^i, \mathcal{R}^i_{(t-1,t,\underline{j},\bar{j})}\right)$.

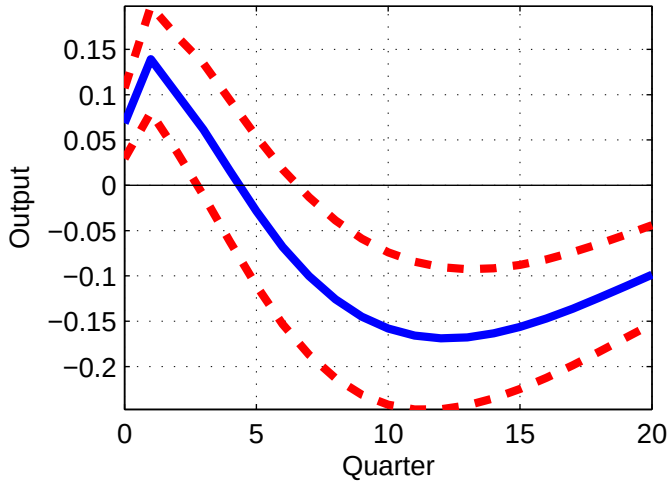
- $\widetilde{g}_t^a$ is weighted average spending. $\widetilde{g}_t^i$ is country specific spending

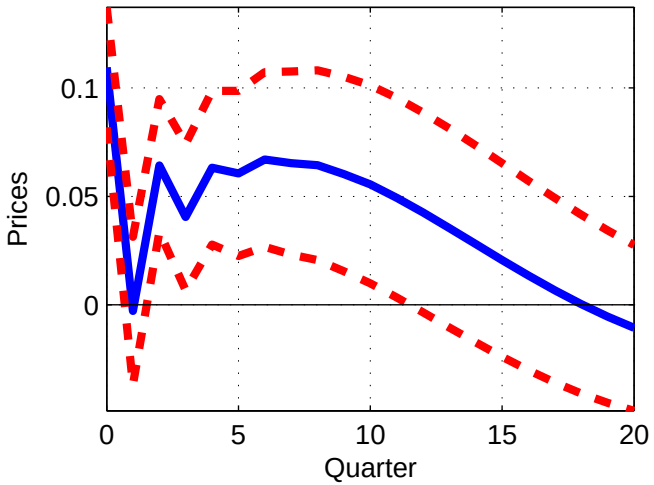
**Identification through Cholesky.**

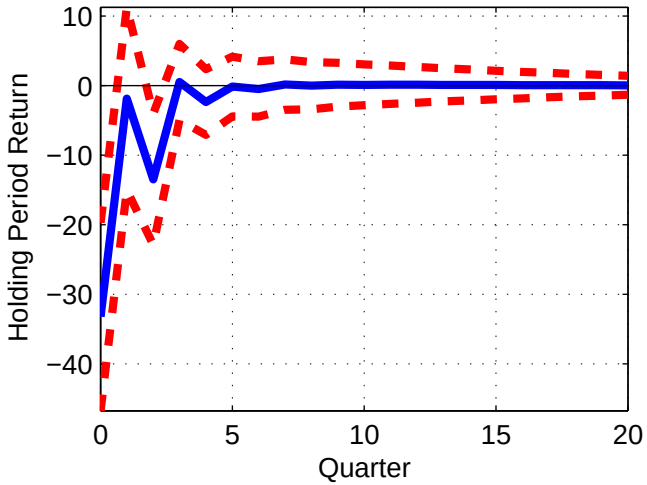
1. i) spending responds with lags to innovations in output and prices (e.g. Blanchard and Perotti (2002))
2. ii) idiosyncratic shocks do not change $\widetilde{g}_t^a$ in $t$ since they enter as the second variable in the VAR (**identification consistent with the model.**)

# Empirical Analysis: Results



**Returns and Spending Shocks: Impact effects (Pooled-Panel VAR)**

| | **All shocks** | | **Aggregate** | | **Idiosyncratic** | |
|---|---|---|---|---|---|---|
| All maturities | $-33.8^{\star}$ | (0.01) | $-86.3^{\star}$ | (0.00) | $-13.4$ | (0.40) |
| $\leq 1$ year | $-15.2^{\star}$ | (0.00) | $-9.3^{\star}$ | (0.18) | $-17.3^{\star}$ | (0.00) |
| 1-4 years | $-28.6^{\star}$ | (0.00) | $-57.9^{\star}$ | (0.00) | $-17.0^{\star}$ | (0.08) |
| 4-7 years | $-49.0^{\star}$ | (0.01) | $-127.2^{\star}$ | (0.00) | $-18.1$ | (0.38) |
| $> 7$ years | $-50.2^{\star}$ | (0.10) | $-156.9^{\star}$ | (0.01) | $-8.4$ | (0.81) |

# Empirical Analysis: Results

**Returns and Spending Shocks (Average of Country Responses)**

| | **All shocks** | | **Aggregate** | | **Idiosyncratic** | |
|---|---|---|---|---|---|---|
| All maturities | $-16.5$ | (0.76) | $-84.8^{\star}$ | (0.12) | 19.1 | (0.79) |
| $\leq 1$ year | $-1.0$ | (0.92) | $-11.3$ | (0.42) | 2.6 | (0.85) |
| 1-4 years | $-7.6$ | (0.83) | $-61.7^{\star}$ | (0.09) | 15.6 | (0.72) |
| 4-7 years | $-29.5$ | (0.67) | $-128.6^{\star}$ | (0.08) | 19.9 | (0.82) |
| $>7$ year | $-25.3$ | (0.82) | $-147.9^{\star}$ | (0.21) | 43.4 | (0.77) |

# Empirical Analysis: Results

**Nominal Returns and Spending Shocks (Pooled Panel)**

| | **All shocks** | | **Aggregate** | | **Idiosyncratic** | |
|---|---|---|---|---|---|---|
| All maturities | $-20.8^{\star}$ | (0.13) | $-74.0^{\star}$ | (0.00) | 1.0 | (0.95) |
| $\leq 1$ year | $-3.8^{\star}$ | (0.05) | $-51.7^{\star}$ | (0.13) | 13.5 | (0.76) |
| 1-4 years | $-16.1^{\star}$ | (0.05) | $-47.3^{\star}$ | (0.01) | $-2.8$ | (0.77) |
| 4-7 years | $-35.9^{\star}$ | (0.05) | $-115.2^{\star}$ | (0.00) | $-3.7$ | (0.86) |
| $> 7$ years | $-37.1^{\star}$ | (0.30) | $-144.3^{\star}$ | (0.03) | 6.0 | (0.86) |

# Empirical Analysis: Results

**Extending to the crisis years (Pooled Panel)**

| | **All shocks** | | **Aggregate** | | **Idiosyncratic** | |
|---|---|---|---|---|---|---|
| All maturities | $-36.1^{\star}$ | (0.02) | $-90.9^{\star}$ | (0.00) | 10.8 | (0.53) |
| $\leq 1$ year | $-18.5^{\star}$ | (0.00) | $-15.1$ | (0.02) | $18.5^{\star}$ | (0.00) |
| 1-4 years | $-30.0^{\star}$ | (0.00) | $-46.2^{\star}$ | (0.01) | $-19.6^{\star}$ | (0.06) |
| 4-7 years | $-51.8^{\star}$ | (0.01) | $-126.8^{\star}$ | (0.00) | $-17.7$ | (0.41) |
| $> 7$ years | $-66.3^{\star}$ | (0.04) | $-195.3^{\star}$ | (0.00) | $-5.9$ | (0.88) |

+ numerous additional robustness checks in paper.

# Empirical Analysis: Results

Key result: Strong Fiscal Hedging in the EA, but only in response to aggregate shocks.

# Model.

- The model is an extension of ABN (currency union as opposed to a closed economy).
- Assumes that optimal and fiscal policies are set optimally and in a coordinated manner.
- Assumes complete financial markets...
  The Backus and Smith (1993), Kollmann (1995) condition holds

$$\kappa \frac{U^B_{C,t}(s^t)}{U^A_{C,t}(s^t)} = \frac{P^B_{c,t}(s^t)}{P^A_{c,t}(s^t)}$$

  where $P^i_{c,t}$ is CPI in $i$.
  Due to this, bond prices are perfectly correlated across countries and do not respond to idiosyncratic fiscal shocks.

# Can we complete the market with nominal bonds and idiosyncratic shocks?

| % Sticky Prices | $\nu = 5\%$ | $\nu = 10\%$ | $\nu = 25\%$ | $\nu = 50\%$ | $\nu = 75\%$ |
|---|---|---|---|---|---|
| | | | *Portfolios* | | |
| $B_n^{A,1}$ | 38917 | 19721 | 7269 | 9369 | 5227 |
| $B_n^{A,40}$ | -85569 | -43363 | -15984 | -20618 | -11494 |
| | | | *Long Bond Prices* | | |
| $q_n^{A,39}(\overline{g})$ | 0.4548 | 0.4548 | 0.4548 | 0.4548 | 0.4548 |
| $q_n^{A,39}(\underline{g})$ | 0.4548 | 0.4548 | 0.4548 | 0.4548 | 0.4547 |

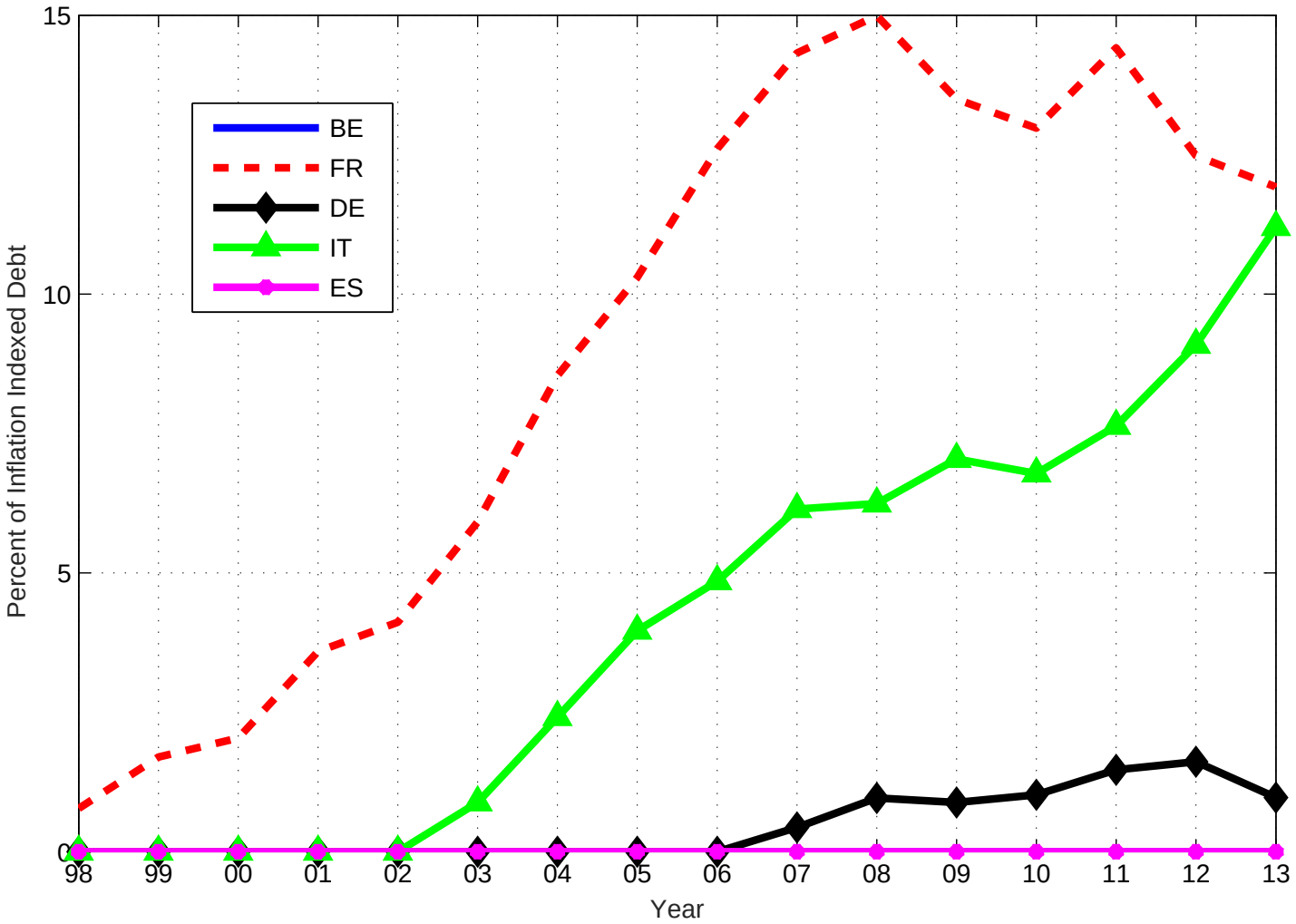
No! $cov(q_n, def) \approx 0$. There is effectively no variability in nominal bond prices that governments can exploit to complete the market.
Also, inflation is not useful here... i) Prices are sticky and inflation is distortionary. ii) Even in the case of flexible prices because there is one interest rate you cannot use inflation to stabilize debt.

# Can we complete the market with inflation indexed bonds?

| % Sticky Prices | $\nu = 5\%$ | $\nu = 10\%$ | $\nu = 25\%$ | $\nu = 50\%$ | $\nu = 75\%$ |
|---|---|---|---|---|---|
| | | | *Portfolios* | | |
| $B_r^{A,1}$ | -30.7 | -41.2 | -42.9 | -48.2 | -64.1 |
| $B_r^{A,40}$ | 89.6 | 90.6 | 94.5 | 106.1 | 140.9 |
| | | | *Bond Prices* | | |
| $q_r^{A,39}(\overline{g})$ | 0.453 | 0.453 | 0.453 | 0.453 | 0.453 |
| $q_r^{A,39}(\underline{g})$ | 0.457 | 0.457 | 0.457 | 0.457 | 0.456 |

Yes! Long bond prices covary negatively with deficits and governments can exploit this to complete the market. The optimal DM strategy is similar to Angeletos (2002), Buera and Nicolini (2004)/ Issue long and finance short.

# Inflation Indexed Debt in the Euro area



# Responses of Inflation Indexed Bonds to Spending Shocks in France

| | Nominal bonds | | | |
|---|---|---|---|---|
| | **Aggregate** | | **Idiosyncratic** | |
| 1998-2008 | $-84.8^{\star}$ | (0.10) | $-12.1$ | (0.92) |
| 1998-2013 | $-118.6^{\star}$ | (0.04) | $-114.9$ | (0.35) |
| 1998-2018 | $-91.7^{\star}$ | (0.09) | $-13.5$ | (0.91) |
| | **Real Bonds** | | | |
| | **Aggregate** | | **Idiosyncratic** | |
| 1998-2008 | $-94.7^{\star}$ | (0.14) | $-224.3^{\star}$ | (0.12) |
| 1998-2013 | $-100.3^{\star}$ | (0.11) | $-254.2^{\star}$ | (0.04) |
| 1998-2018 | $-77.8^{\star}$ | (0.16) | $-170.8^{\star}$ | (0.15) |

# Summary/ Extensions/ Conclusions.

- Governments in a CA should focus on issuing **inflation indexed long term bonds** to complete the markets, however,
  - the model abstracts from possibly **important frictions...**
    - real debt is **less liquid** and therefore **costly**.
    - More generally, markets are incomplete...
  - the model abstracts from equity, household portfolios..
    - introducing more shocks to the model gives role to hedging motives of households.
  - interplay between DM and fiscal transfers is worth exploring.