Managing fiscal policy with non-Ricardian consumers in large open economies: A DSGE model for the Euro area and the U.S.

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Motivation

- Which factors determine fiscal policy (FP) efficacy?

Active FP is useful if consumers *do not behave* in a Ricardian way.

- Why do REP came once again to the research agenda?

(i) the U.S. at then end of 2007 was evaluating to decrease its public deficit: ↓G, ↑Tax.

(ii) the Euro area partners have found very hard to meet the Maastricht criteria and the limits imposed by the stability and growth pact (Germany and France were above targets in 2004 because of the small growth rate)

The big EU players had problems.

Objective and methods

To introduce fiscal policy in a DSGE model of two large open economies to address minimal parameter requirements that lead to REP rejection.

Ultimately it means:

to judge the relative efficacy of monetary and fiscal policy rules under different shares of myopic agents

How? Through

(1) VAR estimation for the EA-12 aggregate, similar results reported by Galí et al. (2007). The REP does not hold in the United States (U.S.) postwar data;

(2) Building a DSGE model, to conduct:

stochastic numerical simulations (IRFs). Several scenarios; two extreme (1) all consumers are myopic and (ii) all consumers are fully rational;

Bayesian estimation U.S. and EA-12 (as equally large countries)

Hypothetized REP at work

- Our working hypothesis is that universe of consumers comprise two types: financially constrained and unconstrained; if the Ricardian equivalence proposition (REP) applies:

(a) Unconstrained → Corr (C, G) < 0;

(b) Constrained/ myopic → Corr (C, G) > 0.

- Now, consider a contractionary fiscal policy (e.g., a cut in public spending) in:

a closed economy, it might lead to :

↑ in *aggregate* private consumption (to come back again to an intertemporal balance, because it is no longer necessary to save as much as before);

iff adjustment of unconstrained consumers dominates.

The reverse is the case *if* myopic agents are majority and their adjustment effect dominates

an open economy, *in addition* spillover effects will impact on the foreign economy, producing contractive influence on the foreign GDP.

VAR analysis evidence

In general, VAR evidence for macro aggregates supports the conclusion that the **REP does not hold**.

- In a closed economy:

dC/dG>0

(no study reports a negative sign, though)

- In an open economy:

Similar as the close economy, **plus spillover effects**:

dC/dG>0 → dIM/dY>0→ dEX*/dY>0 →(↑ AD*, C*) dY*/dY>0 → dC*/dY>0

These spillovers have been measured by Giuliodori and Beetsma (2005). They are **pure** in the sense that expansionary public expenditure would not raise imports. Imports go up because of consumers solely.

An unrestricted VAR

Many structural models could give support to a reduced form VAR structure:

$$\mathbf{y}_t = \Gamma_0 + \Gamma_1 \mathbf{y}_{t-1} + \Gamma_2 \mathbf{y}_{t-2} + \Gamma_3 \mathbf{y}_{t-3} + \Gamma_4 \mathbf{y}_{t-4} + \boldsymbol{\varepsilon}_t$$

- We estimate the fiscal policy effects through the dynamic multiplier for the EA-12. The 1-period ahead dynamic multiplier (j →i):

$$\frac{\partial \mathbf{y}_{t+1}^{(i)}}{\partial \mathbf{y}_t^{(j)}} = \Gamma_1^{(i,j)}.$$

DATA: quarterly EU12 aggregates, 1991Q1-2006Q4:
(i) general government spending (also net of military expenditures),
(ii) gross domestic product,
(iii) private consumption, and
(iv) general government budget deficit.

EU-12 VAR estimates

Table 1

	Private Consumption		GDP	
Quarter	Government spending	Excluding military expending	Government spending	Excluding military expending
1^{st}	0.061(0.04)	0.059(-0.11)	0.047(0.51)	0.044(0.15)
2^{nd}	0.148	0.143	0.139	0.132
3^{rd}	0.177	0.168	0.206	0.196
4^{th}	0.252(0.09)	0.237(0.24)	0.274(0.31)	0.261(-0.12)
5^{th}	0.299	0.280	0.344	0.329
6^{th}	0.278	0.255	0.374	0.359
7^{th}	0.249	0.221	0.413	0.398
8^{th}	0.198(0.19)	0.166(0.32)	0.434(0.28)	0.417(0.34)

Note: Authors' calculations for the EU12 aggregates, in brackets appear figures estimated by [Galí *et al.* , 2007a] and reported in Table 1, page 233.

Relaxing REP assumptions in a DSGE model

1. Horizon = infinite. For finite life durations, we require that: (a) parents care about the utility of their children in overlapping models (altruism, Barro 1974); (b) the agent faces uncertainty about how long he will survive (Blanchard 1985);
2. there is no uncertainty of the future income streams;
3. the output (+ population; pay-as-you-go) does not growth enough if to allow the government to roll-over the debt;
4. individuals are fully rational;
5. borrowing differential rates is insignificant;
6. the new debt is sold entirely to home consumers;
7. taxes are non-distortionary.

DSGE models are in the very beginning, e.g., Galí *et al.* (2007)

A DSGE model to replicate VAR findings

- Active agents: consumers, government and central bank (CB).

(i) Two types of consumers:

$j \in [0,1]$ and $j^* \in [0,1]$

$j^r \in [0,1]$ $j^{r*} \in [0,1]$

(ii) Government and CB act independently.

- Two countries and (varieties) goods types:

Home varieties and output: $h \in [0,1] \rightarrow Y_H \equiv \int_0^1 y_H(i)di$

Foreign varieties and output: $f \in [0,1] \rightarrow Y_F \equiv \int_0^1 y_F(i^*)di^*$

- Price and wage stickiness
- Bonds trading (complete makets): j and j* agents

Intratemporal demand structure

- Any agent j verifies at any time s:

$$P_s C_s^j = \int_0^1 p_{H,s}(h) c_{H,s}^j(h) dh + \int_0^1 \mathcal{E}_s p_{F,s}^*(f) c_{F,s}^j(f) df.$$

Where C is given by a CES aggregator:

$$C_s^j \equiv \left[\varphi^{\frac{1}{\eta_C}} \left(C_{H,s}^j \right)^{\frac{\eta_C - 1}{\eta_C}} + (1-\varphi)^{\frac{1}{\eta_C}} \left(C_{F,s}^j \right)^{\frac{\eta_C - 1}{\eta_C}} \right]^{\frac{\eta_C}{\eta_C - 1}},$$

$$C_{H,s}^j \equiv \left[\int_0^1 c_{H,s}^j(h)^{\frac{\theta_h - 1}{\theta_h}} dh \right]^{\frac{\theta_h}{\theta_h - 1}}, \text{ and } \quad C_{F,s}^j \equiv \left[\int_0^1 c_{F,s}^j(f)^{\frac{\theta_f - 1}{\theta_f}} df \right]^{\frac{\theta_f}{\theta_f - 1}}.$$

Prices (similarly, for P_F and P): $$P_{H,s} = \left[\int_0^1 p_{H,s}(h)^{1-\theta_h} dh \right]^{\frac{1}{1-\theta_h}},$$

Intratemporal demands

- Tradable aggregates:

$$C_{H,s} = \frac{\varphi}{(1-\varphi)}\left[\frac{\mathcal{E}_s P^*_{F,s}}{P_{H,s}}\right]^{\eta_C} C_{F,s}$$

- Varieties demands

$$c^j_{H,s}(h) = \left[\frac{p_{H,s}(h)}{P_{H,s}}\right]^{-\theta_h} C^j_{H,s}, \qquad g_{H,s}(h) = \left[\frac{p_{H,s}(h)}{P_{H,s}}\right]^{-\theta_h} G_{H,s},$$

Optimal consumer's problem

- Intertemporal utility (CRRA)

$$\breve{U}_t^j = E_t \sum_{s=t}^{\infty} \beta^{s-t} \left[= \frac{\left(C_s^j\right)^{1-\sigma}}{(1-\sigma)\left(C_{s-1}^j\right)^{b(1-\sigma)}} + \chi \left(\frac{M_s^j}{P_s} \right)^{\varepsilon} - \frac{z_s \left(N_{H,s}^j\right)^{1+\iota}}{1+\iota} \right],$$

- s.t.

$$\frac{(1-\tau_w) W_{H,s}^j N_{H,s}^j}{P_s} + T_s^j + \frac{(1-\tau_D)(D_{H,s}^j + D_{XH,s}^j + D_{MH,s}^j)}{P_s} +$$

$$\geqq C_s^j + \frac{M_s^j - M_{s-1}^j}{P_s} + \frac{1}{P_s}\left(\frac{B_{s+1}^j}{1+I_s} - B_s^j \right) + \frac{1}{P_s}\left(\frac{\mathcal{E}_{s+1} B_{s+1}^{*j}}{1+I_s^*} - \mathcal{E}_s B_s^{*j} \right).$$

- FOCs come from differentiation of the Lagrangean w.r.t. C, N, M_{+1}, B_{+1} , W

Constrained consumer problem, aggregation

- The CBC of the rule-of-thumb consumer is:

$$C_s^r = \frac{(1-\tau_w)W_{H,s}N_{H,s}^r}{P_s} + T_s^r,$$

Therefore, FOCs are w.r.t. C and N

- Bearing in mind that the share λ^r represents rule-of-thumb consumers, it follows:

$$N_{H,s}^{aggr} \equiv \lambda^r \int_0^1 (N_{H,s}^r)^{j^r} dj^r + (1-\lambda^r) \int_0^1 N_{H,s}^j dj. \quad \rightarrow \quad N_s = \int_0^1 N_{H,s}^{aggr}(i) di.$$

$$C_s^{aggr} \equiv \lambda^r \int_0^1 (C_s^r)^{j^r} dj^r + (1-\lambda^r) \int_0^1 C_s^j dj.$$

Calvo pricing and wage setting

- Maximization of firm *i*'s market value (no FDI) leads to:

$$\breve{P}_{H,t}(i) = \frac{\theta_h}{(\theta_h - 1)} \frac{E_t \sum_{a=0}^{\infty} (\varphi_H \beta)^a \frac{\Gamma_{t+a}(i)}{\Gamma_t(i)} \left[MC_{H,t+a}\left(y_{H,t+a}(i)\right)\left(P_{H,t+a}\right)^{\theta_h} Y_{H,t+a} \right]}{E_t \sum_{a=0}^{\infty} (\varphi_H \beta)^a \frac{\Gamma_{t+a}(i)}{\Gamma_t(i)} \left[Y_{H,t+a}\left(P_{H,t+a}\right)^{\theta_h} \right]}$$

Price aggregation:

$$P_{m,t}(i) = \left[\varphi_m \left(P_{m,t-1}(i)\right)^{1-\theta_n} + (1-\varphi_m)\left(\breve{P}_{m,t}(i)\right)^{1-\theta_n} \right]^{\frac{1}{1-\theta_n}},$$

- Wages (FOC and aggregation)

$$W_t^j = \left[\varphi_W \left(W_{t-1}^j\right)^{1-\gamma} + (1-\varphi_W)\left(\breve{W}_t^j\right)^{1-\gamma} \right]^{\frac{1}{1-\gamma}}.$$

Assets & goods equilibrium conditions

- Bonds

$$B_{g,s} = (1-\lambda^r)\left(\int_0^1 B_s^j dj + \mathcal{E}_s \int_0^1 B_s^{*j^*} dj^*\right).$$

- Resource constraints:

$$Y_{H,s} = \varphi\left[\frac{P_{H,s}}{P_s}\right]^{-\eta_c}(C_s + G_s) + (1-\varphi)\left[\frac{P_{H,s}}{\mathcal{E}_s P_s^*}\right]^{-\eta_c}(C_s^* + G_s^*),$$

$$Y_{F,s} = \varphi\left[\frac{P_{F,s}^*}{P_s^*}\right]^{-\eta_c}(C_s^* + G_s^*) + (1-\varphi)\left[\frac{\mathcal{E}_s P_{F,s}^*}{P_s}\right]^{-\eta_c}(C_s + G_s)$$

Fiscal and monetary rules

- GBC (fiscal instrument: transfers)

$$\tau_t^w\left[\int_0^1 W_{H,s}^j N_{H,s}^j dj\right] + \int_0^1 \left(M_{s+1}^j - M_s^j\right) dj + \frac{1}{(1+I_s)}\left(\int_0^1 B_{s+1}^j dj - \int_0^1 B_s^j dj\right)$$
$$+ \frac{1}{(1+I_s)}\left(\int_0^1 \mathcal{E}_{s+1} B_{s+1}^{j*} dj - \int_0^1 \mathcal{E}_s B_s^{j*} dj\right) \geq \int_0^1 T_s^j dj + P_s G_s.$$

Fiscal Rule (exogenous public expenditure)

$$T_s = \left(\frac{\int_0^1 B_s^j dj}{P_s}\right)^{\phi_b} \left(\frac{P_{H,s} G_s}{P_s}\right)^{\phi_g} (Y_{H,s})^{\phi_y},$$

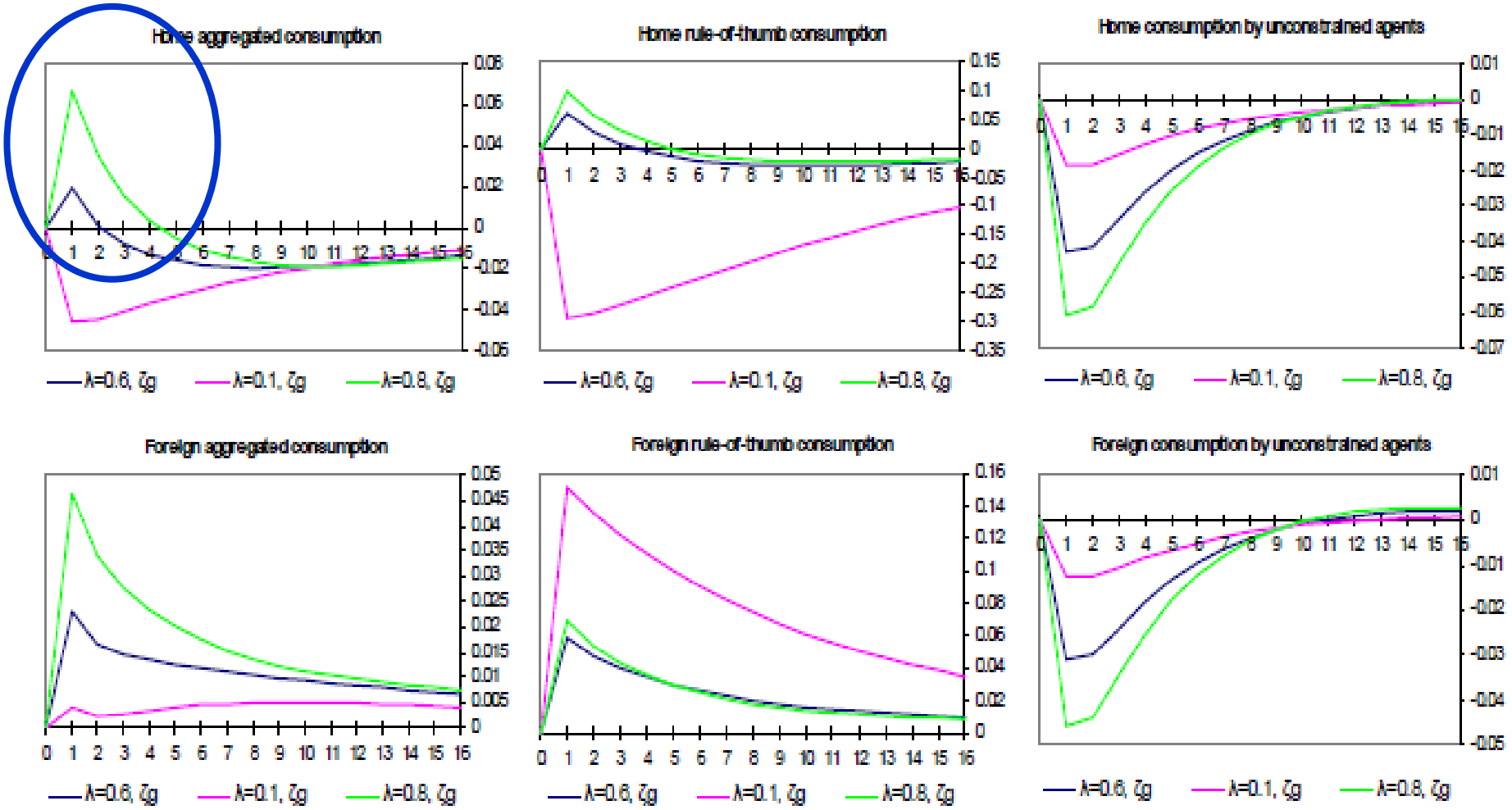
Monetary rule (Taylor):

$$r_{t,t+1} = (1-\lambda_3) r_{t,t+1}^d + \lambda_3 r_{t-1,t} + \varepsilon_{rt}^I,$$

Driving shocks

- productivity shocks;
- monetary demand shock (increase in the demand of money by the public);
- willingness to work shock, which affects the Euler condition through disincentives to additional working hours;
- expansionary budgetary policy shock shifting demand of rule-of-thumb consumers (spreads over to the economy aggregates).

Public spending shock



Public expenditure shock

- Robustness checks reveal that $\lambda^r < 0.45$ will produce IRFs with negative consumption deviation in a period of 4 years. According to Mankiw (2000) a higher value that this threshold is quite likely.
- Comparing models comprising only optimizer consumers with other that includes rule-of-thumb consumers we conclude:

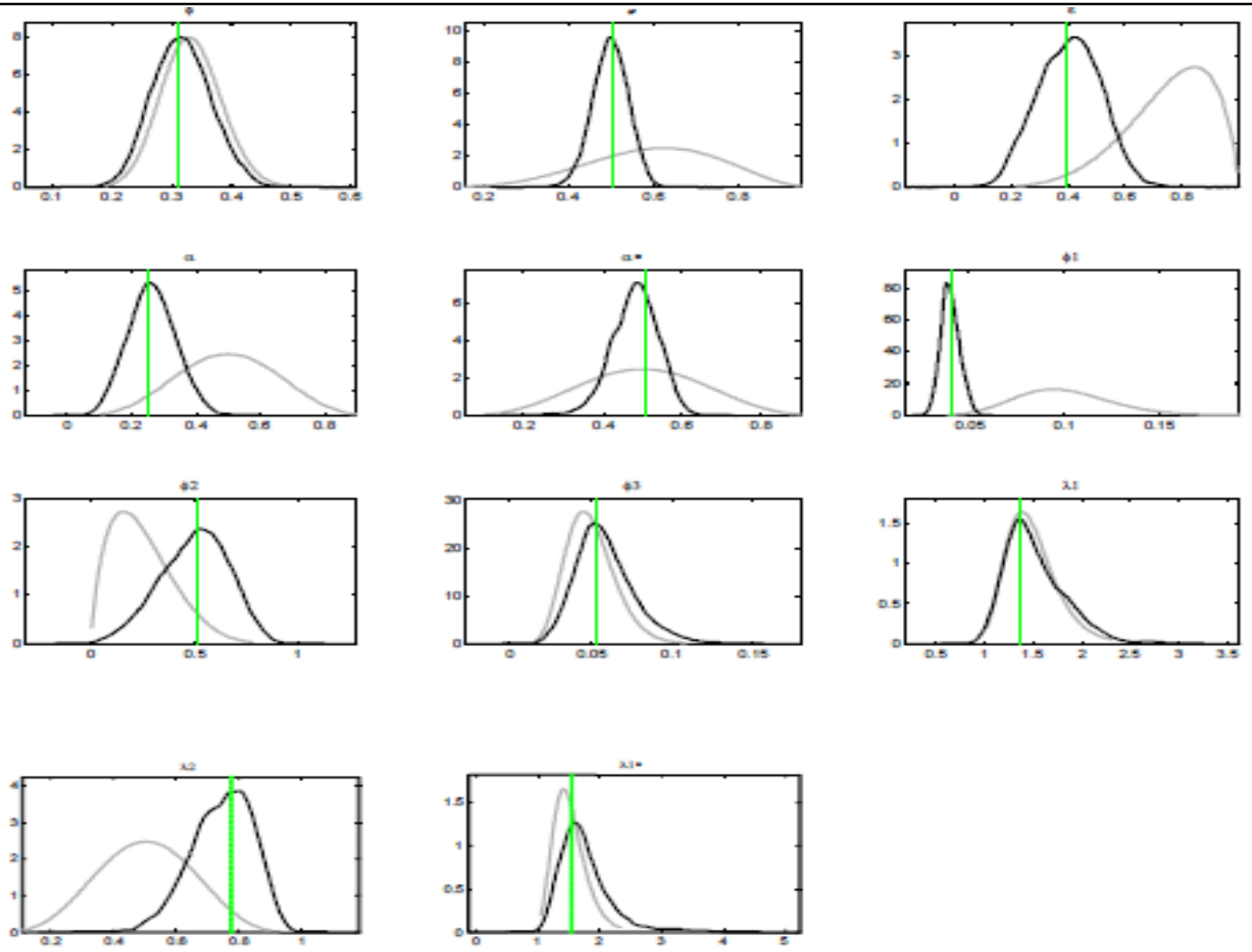
consumption reacts positively to an expansionary shock in public expenditure.

Bayesian estimation (1)

Log data density is 520.98.

Parameters	Prior mean	Prior SD	Density	Post mean	Post mean 90% conf. interval lower	upper
ι	$\frac{1}{3}$	0.05	β	0.3167	0.2363	0.3950
φ	0.60	0.15	β	0.5016	0.4315	0.5676
ρ_A	0.75	0.15	β	0.3996	0.2162	0.5741
α	0.50	0.15	β	0.2574	0.1394	0.3816
α^*	0.50	0.15	β	0.4813	0.3922	0.5774
ϕ_1	0.10	0.025	β	0.0402	0.0316	0.0479
ϕ_2	0.25	0.15	β	0.4934	0.2262	0.7649
ϕ_3	0.05	0.015	β	0.0583	0.0307	0.0876
λ_1	1.50	0.25	inv Γ	1.5001	1.0594	2.0066
λ_1^*	1.50	0.25	inv Γ	1.7102	1.1173	2.2830
λ_2	0.50	0.15	β	0.7415	0.5850	0.8966

Bayesian priors and posteriors (2)



Conclusions

- The results from replicating the model are consistent with those reported in the VAR literature if and only if the rule-of-thumb consumers share is over 50 per cent.
- The empirical efforts are centered then in how to identify such a parameter given the available data. If the conjecture of Mankiw (2000) is true, then fiscal authorities of the U.S. and Euro-12 would not be concerned about the efficacy of their policies. In fact, estimating λ^r depends on the specific GE model. The current research in the area is aiming at findin such a correct model.