The Effects of Housing Prices and Monetary Policy in a Currency Union

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Motivation

During the last two decades, the economic importance of the housing sector has reached unprecedented levels, refreshing the debate on:

- The role that the sector plays in amplifying economic volatility (Aoki et. al., 2004; Iacoviello, 2005)

- The drivers of housing cycles (Iacoviello and Neri, 2010)

- The appropriate policy response (Mishkin, 2007; Basel III).

The debate has been of special interest in those countries that do not have their own monetary policy (EMU and fixed exchange rates).

Motivation

We focus on the case of Spain, where house prices and residential investment went through a large boom since it joined the EMU:

- Large decline of interest rates

- Increased demand for housing due to demographic factors:
    - Immigration

    - Baby-boom generation

fuelled residential investment in particular, and also economic growth.

Question: Could the house price boom-and-bust cycle have been avoided if Spain had not belonged to the EMU?
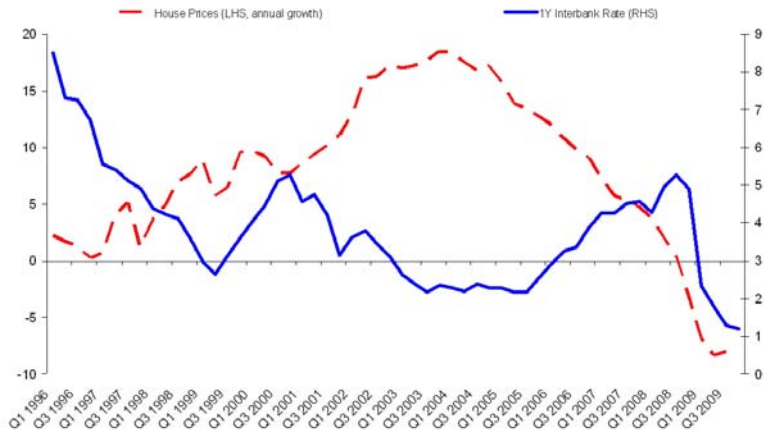
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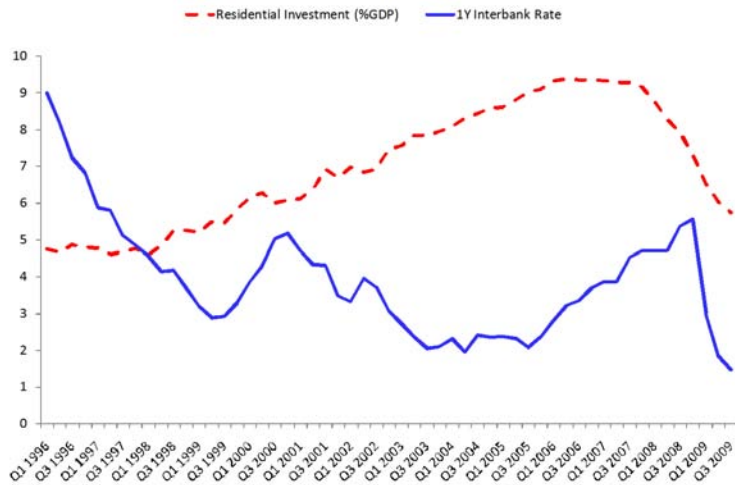Figure: Nominal house prices and interest rates.

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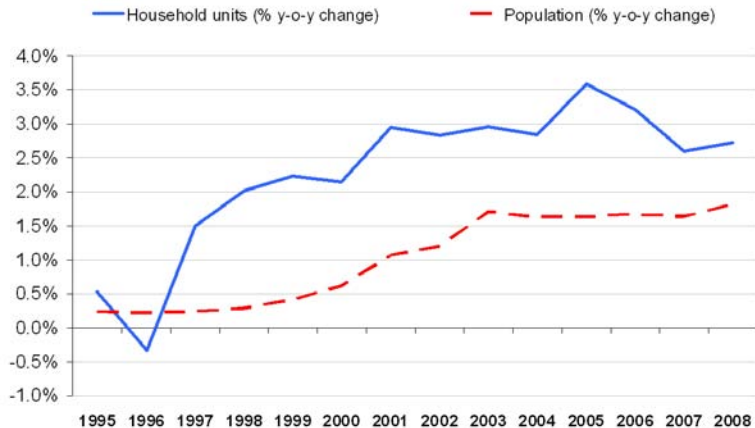Figure: Residential Investment and interest rates.

Motivation
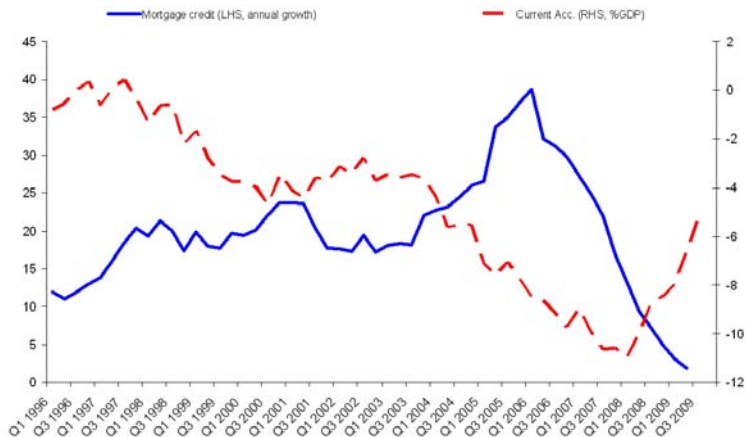

Figure: Demographic patterns

Motivation

Figure: Mortgage credit and the current account.

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5. The effects of financial and labour market rigidities.

VAR estimation

We estimate:

$$Y_t = C + \sum_{j=1}^{L} A_j Y_{t-j} + B u_t$$

where Y_t is a $kx1$ vector of observable variables, between 1997:01 to 2008:04, with:

1. real household consumption of final goods in Spain,
2. real residential investment in Spain,
3. real GDP in Spain
4. the reference 3-month interbank rate, and
5. real house prices in Spain.

We use the recursive identification scheme of Christiano, Eichenbaum and Evans (1999) to identify the effects of the interest rate shock.

We assume that housing prices respond contemporaneously to interest rate changes and to demand shocks.

VAR, Impulse responses. Interest rate Shock
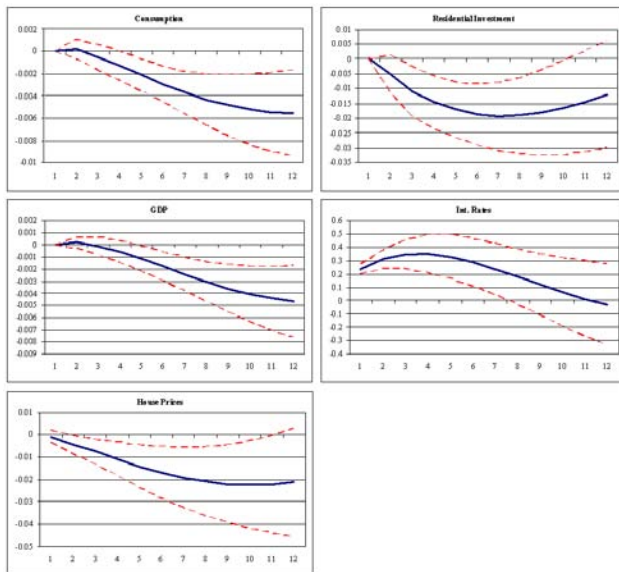
VAR, Impulse responses functions. Housing demand shock
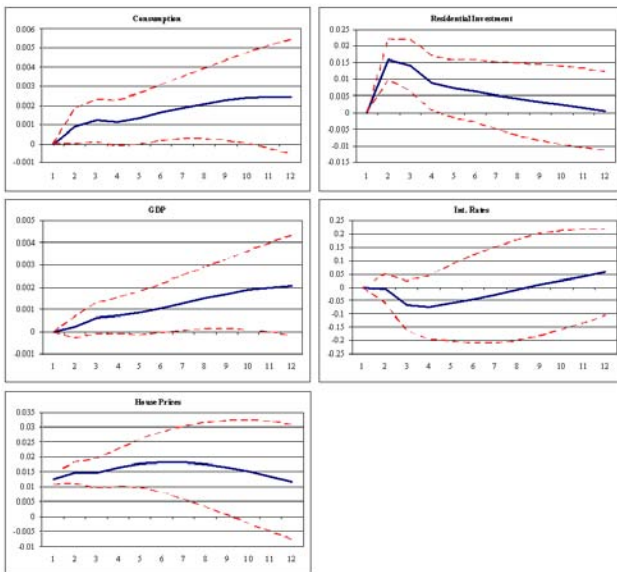
VAR: Robustness exercises

1. Include HICP inflation and real GDP growth in the euro area to control for endogenous response of euro area monetary policy.

2. Extend the sample period to 1980-2008.

3. Introduce sign restrictions as in Jarocinski and Smets (2008), Cardarelli et al (2009)

   $->$ The main message does not change.

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The model

The theoretical framework consists of a DGE 2 country 2 sector model in a single currency area where:

- The countries are of size n and $1 - n$.

- Each of them produces durable goods, D, and nondurable goods, C, under monopolistic competition and nominal (price and wage) rigidities.

- It is assumed that only the nondurable goods are tradable.

- Two shocks: a durables (housing) demand shock (HD), a monetary policy shock (MP)

The model: Households

Each household j in the home country maximizes:

$$E_0 \left\{ \sum_{t=0}^{\infty} \beta^t \left[\gamma \log(C_t^j - \varepsilon C_{t-1}) + (1-\gamma)\xi_t^D \log(D_t^j) - \frac{\left(L_t^j\right)^{1+\eta}}{1+\eta} \right] \right\} \quad (1)$$

consumption of nondurables index:

$$C_t^j = \left[\tau^{\frac{1}{\iota_C}} \left(C_{H,t}^j \right)^{\frac{\iota_C-1}{\iota_C}} + (1-\tau)^{\frac{1}{\iota_C}} \left(C_{F,t}^j \right)^{\frac{\iota_C-1}{\iota_C}} \right]^{\frac{\iota_C}{\iota_C-1}}, \text{ where } \iota_C > 0 \quad (2)$$

imperfect substitutability of labor supply across sectors (Iacoviello and Neri, 2010):

$$L_t^j = \left[\alpha^{-\iota_L} \left(L_t^{C,j} \right)^{1+\iota_L} + (1-\alpha)^{-\iota_L} \left(L_t^{D,j} \right)^{1+\iota_L} \right]^{\frac{1}{1+\iota_L}}, \text{ where } \iota_L > 0 \quad (3)$$

The model: Households

Budget constraint:

$$P_t^C C_t^j + P_t^D I_t^{Dj} + P_t^A A_t^j + B_t^j \leq$$

$$\tilde{R}_{t-1} B_{t-1}^j + \frac{W_t^C L_t^{C,j}}{X_t^C} + \frac{W_t^D L_t^{D,j}}{X_t^D} + \left(R_t^A + P_t^A \right) A_{t-1}^j + \Pi_t^j \qquad (4)$$

Domestic interest rate and the union-wide interest rate are related as follows:

$$\tilde{R}_t = R_t - \vartheta \exp \left[\psi \left(\frac{B_t}{P_t Y_t} - \frac{B}{PY} \right) \right] - 1 \qquad (5)$$

The model: Households

We assume that the law of motion of the housing stock evolves as follows:

$$D_t^j = (1 - \delta)D_{t-1}^j + \left[1 - S\left(\frac{I_t^{D,j}}{I_{t-1}^{D,j}} \right) \right] I_t^{D,j} \tag{6}$$

Following Christiano, Eichenbaum, and Evans (2005), we introduce an adjustment cost function, $S(.)$, which is convex (i.e. $S''() > 0$).

This allows the model to generate hump-shaped responses of residential investment to shocks. Short-cut for time-to-build.

The model: Labor supply and wage setting

Nominal wage stickiness is introduced as in Smets and Wouters (2007) and Iacoviello and Neri (2010):

$$\omega_t^C - \omega_{t-1}^C + \Delta p_t^C - \varphi_{C,W} \Delta p_{t-1}^C = \beta E_t \left(\omega_{t+1}^C - \omega_t^C + \Delta p_{t+1}^C - \varphi_{C,W} \Delta p_t^C \right)$$

$$+\kappa^{C,W} \left[\frac{c_t - \varepsilon c_{t-1}}{1 - \varepsilon} + \left[(\varphi - \iota)\alpha + \iota \right] l_t^C + (\varphi - \iota)(1 - \alpha) l_t^D - \omega_t^C \right] \quad (7)$$

and

$$\omega_t^D - \omega_{t-1}^D + \Delta p_t^C - \varphi_{D,W} \Delta p_{t-1}^C = \beta E_t \left(\omega_{t+1}^D - \omega_t^D + \Delta p_{t+1}^C - \varphi_{D,W} \Delta p_t^C \right)$$

$$+\kappa^{D,W} \left[\frac{c_t - \varepsilon c_{t-1}}{1 - \varepsilon} + \left[(\varphi - \iota)(1 - \alpha) + \iota \right] l_t^D + (\varphi - \iota)\alpha l_t^C - \omega_t^D \right] \quad (8)$$

The model: Households

The allocation of expenditures between home and foreign-produced goods is:

$$C_{H,t} = \tau \left(\frac{P_{H,t}}{P_t^C} \right)^{-\iota_C} C_t \tag{9}$$

$$C_{F,t} = (1 - \tau) \left(\frac{P_{F,t}}{P_t^C} \right)^{-\iota_C} C_t. \tag{10}$$

The price index for non-durables is (the CPI):

$$\left(P_t^C \right)^{1-\iota_C} = \left[\tau \left(P_{H,t} \right)^{1-\iota_C} + (1 - \tau) \left(P_{F,t} \right)^{1-\iota_C} \right]. \tag{11}$$

The model: Producers

- Suppliers behave as competitive monopolists when selling their products, subject to a Calvo-type restriction with backward indexation. This gives raise to NK Phillips Curves in both sectors.

- The production function is linear in labor in the nondurable sector. It is Cobb-Douglas in labor and land in the durable (housing) sector.

Closing the model

Monetary policy is conducted with a Taylor rule:

$$R_t = \bar{R}^{1-\gamma_R} R_{t-1}^{\gamma_R} \left(\frac{\Pi_t^{EMU}}{\bar{\Pi}^{EMU}}\right)^{(1-\gamma_R)\gamma_\pi} \exp(\varepsilon_t^m) \qquad (12)$$

where Π_t^{EMU} is the weighted inflation rate in the currency union.

Calibration

Table 1: Calibrated Parameters of the Model

n	Size of Spain inside the EMU	0.1
α	Share of the nondurable sector in the GDP	0.9
$1 - \tau$	Fraction of EMU imports consumed in Spain	0.15
$1 - \tau^*$	Fraction of Spain imports goods consumed in the EMU	0.015
κ	Debt elasticity of the domestic interest rate	0.02
σ_C, σ_D	Elasticity of substitution between intermediate goods	10
β	Discount factor	0.99
δ	Depreciation rate of housing stock	0.025
η	Labor supply elasticity	0.9

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ι_C	Elasticity of subs. between goods	4.4
ι_L	Costly labor reallocation	1.3
γ	Share of non-durable consumption in the CPI	0.82
ψ	Investment adjustment costs	0.3
θ_C	Calvo lottery for the non-durable sector, prices	0.87
θ_D	Calvo lottery for the durable sector, prices	0.34
ϕ_C	Price indexation, non-durables	0.5
ϕ_D	Price indexation, durables	0.7
$\theta_{C,W}, \theta_{D,W}$	Calvo lottery for wages	0.75
$\phi_{C,W}, \phi_{D,W}$	Wage indexation	1
γ^π	Inflation parameter of the Taylor rule	1.25
γ^R	Interest rate smoothing parameter of the Taylor rule	0.77

Mostly taken from a companion paper of ours where we estimated this model with Bayesian methods (Aspachs-Bracons and Rabanal, 2010).

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IR functions: Monetary policy shock
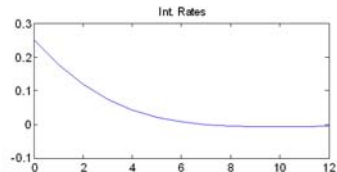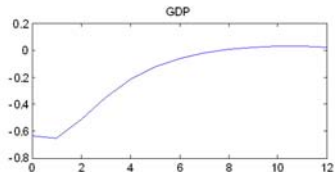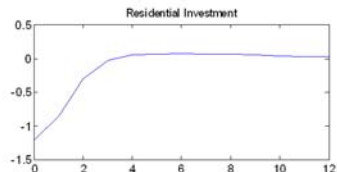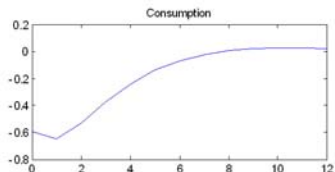
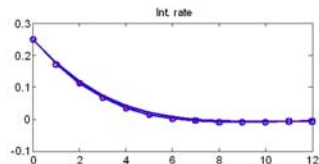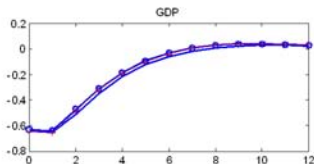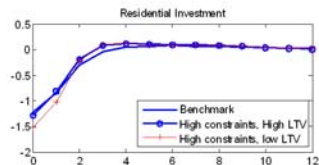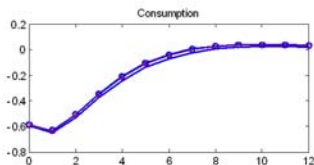# IR functions: Housing preference shock
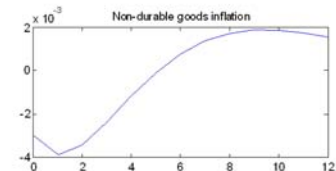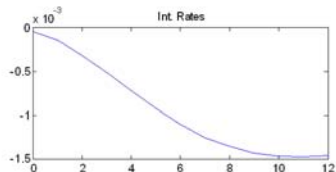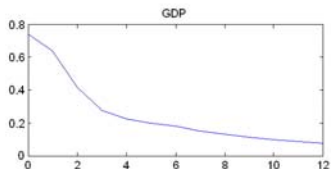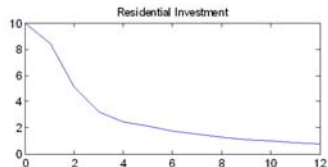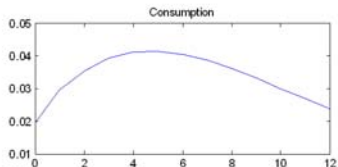
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The effects of belonging to the EMU

The goal: study how would a small open economy react in a two country model when faced with housing demand shocks.
We introduce:

1. Taylor rules for both countries,

$$r_t = \gamma_R r_{t-1} + (1 - \gamma_R)\gamma_\pi \Delta p_t^C + (1 - \gamma_R)\gamma_D \Delta p_t^D \quad (13)$$
$$r_t^* = \gamma_R^* r_{t-1}^* + (1 - \gamma_R^*)\gamma_\pi \Delta p_t^{C^*}. \quad (14)$$

2. An uncovered interest rate parity condition,

$$r_t - r_t^* = E_t ner_{t+1} - ner_t - \kappa b_t \quad (15)$$

3. Producer currency pricing for imports and exports of non-durable goods, as in Lubik and Schorfheide (2006).

The effects of belonging to the EMU. Housing preference shock
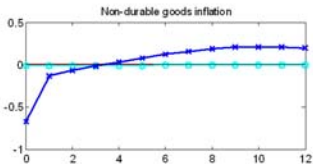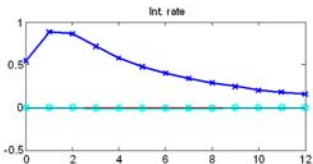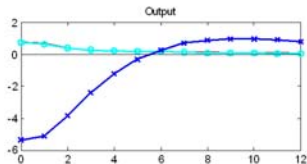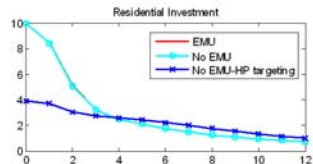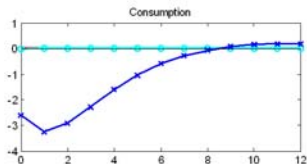
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- We assume that a fraction $1 - \lambda$ of agents:
  - are more impatient: $\beta^B < \beta$

  - $S_t^{B,j} \leq (1 - \chi) D_t^{B,j} P_t^D$

Financially constraint households can borrow from unconstrained households within a country only, while unconstrained households can borrow and lend at the national and international level.

IR functions: the role of financial frictions. Monetary policy shock.
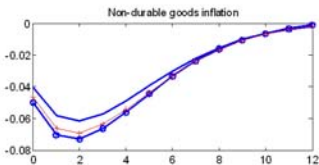
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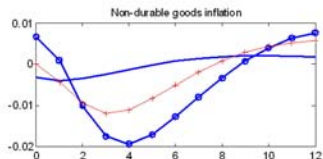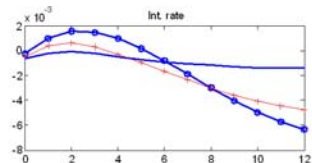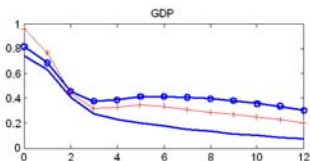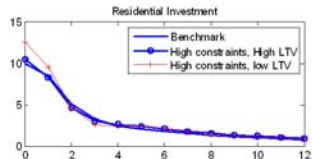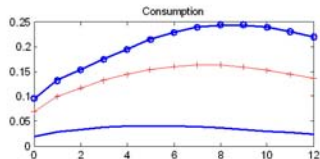
The role of labor market frictions.

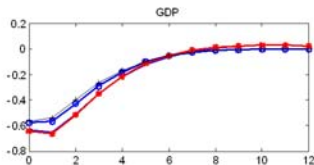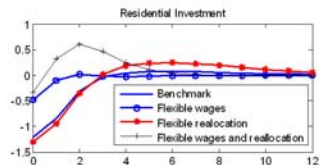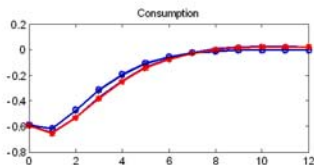We analyze how the response to both shocks changes when:

1. we remove wage stickiness and indexation,

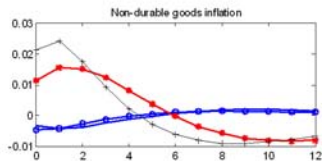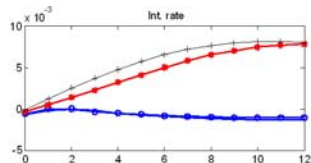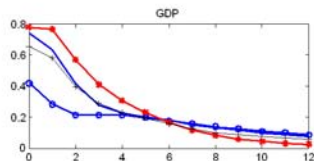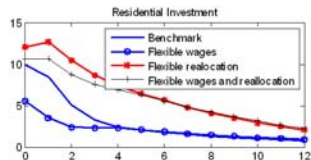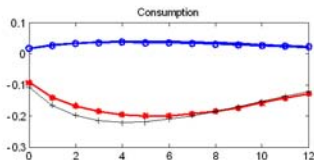$$\theta_{C,W} = \theta_{D,W} = \phi_{C,W} = \phi_{D,W} = 0$$

2. we remove the labor reallocation cost,

$$\iota_L = 0$$

The role of labor market frictions. Monetary policy shock.
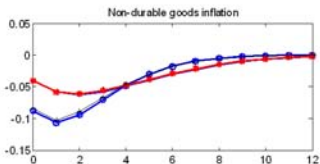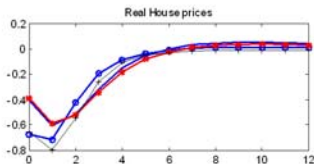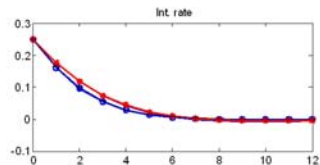
The role of labor market frictions. Housing preference shock

Concluding Remarks

1. We have presented a model capable of replicating the VAR evidence since Spain joined the EMU.

2. Labor market rigidities are necessary to obtain the right comovement between the two sectors of the economy. Financial frictions play a minor role in the propagation mechanism.

3. **Policy message**: If Spain had not belonged to the EMU the boom-and-bust cycle in housing prices between 1996-2007 could not have been avoided by using monetary policy. Using higher nominal interest rates would have created a recession in the rest of the economy. Similar results for the U.S. appear in Dokko et al. (2009).

Concluding Remarks

4. Fatás et al. (2009) and Dokko et al. (2009) study the relationship between the stance of monetary policy (proxied by Taylor rule residuals) and real house price increases during 2002-2006. The cross-country relationship between the two variables is statistically weak.

5. **Future direction:** macro-prudential policies. Kannan, Rabanal and Scott (2009), Angeloni and Faia (2010), Angelini, Neri, Panetta (2010), BIS (2010). Question: How much bite will they have? Regulatory arbitrage in a currency union?