Monetary Policy and Housing Bubbles: Some Evidence when House Price is Sticky

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Motivation (I)

Asset Price Bubbles: House Price vs. Stock Price?

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  - yet, the only explanation provided has to do with *credit* : credit growth, asset prices, leverage.
  - e.g. Mian and Sufi (2014), Jorda *et al.* (2012, 2015, 2016)
  - policy design: credit.

Motivation (II)

The role of Monetary Policy, more evidence?

- focus on output-inflation, unless threat to policy goal.
  - bubbles are hard to detect
  - e.g. Bernanke and Gertler (1999,2000), Kohn (2006)

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  - this calls for the role of monetary policy.
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Debate has been going on...and off...
but empirical evidence has been surprisingly missing.

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monetary model*	**evidence****
fully flexible house price	sticky house price
+ credit constraint	

*e.g. Icaoviello (2005, 2006), Icaoviello and Neri (2005), Livio *et al.* (2013)
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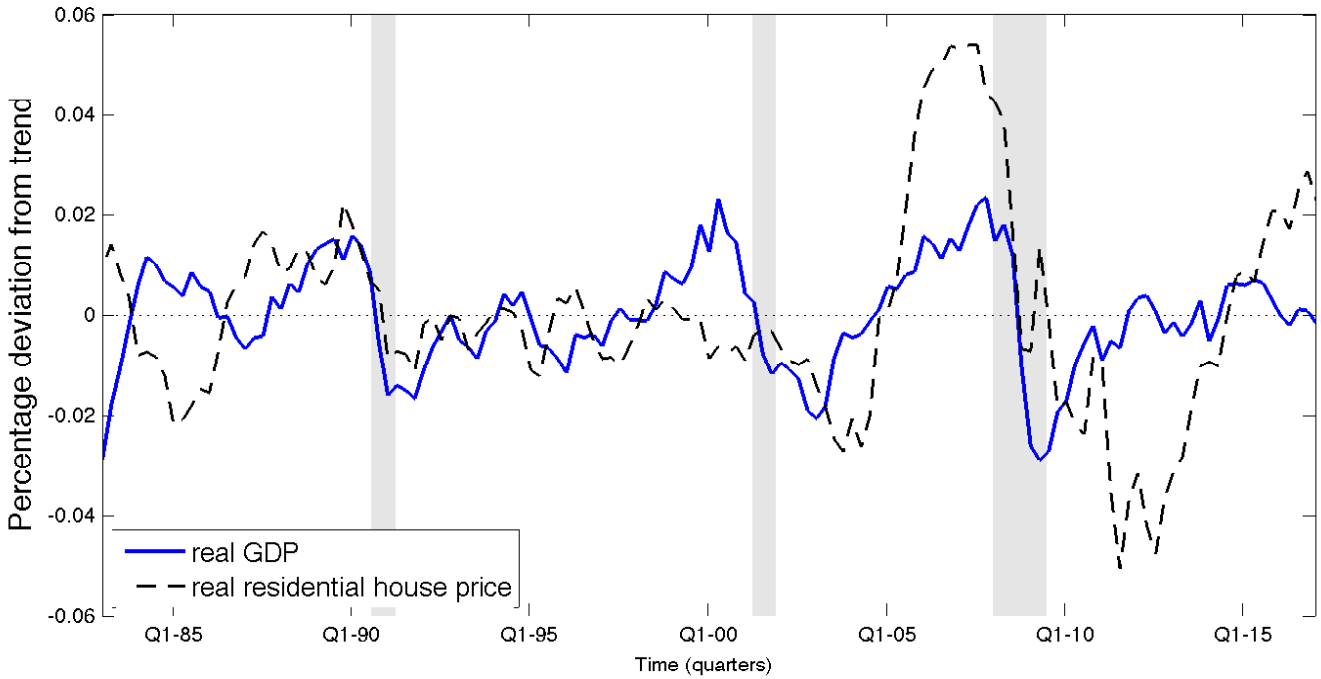
Sticky House Price? (I)

- **House price is always assumed to be fully flexible.**



Sticky House Price? (II)

- AR(1) model: $dp_t = \xi dp_{t-1} + \epsilon_t$, ϵ_t is i.i.d. with sd. σ_ϵ

	real residential house price		real stock price	
Country	AR(1) coeff. ξ	Std. of innovations σ_ϵ	AR(1) coeff. ξ	Std. of innovations σ_ϵ
U.S.	0.69 (0.05)	0.88	0.31 (0.07)	1.67
Japan	0.76 (0.05)	1.07	0.36 (0.07)	1.70
Germany	0.63 (0.06)	0.63	0.37 (0.07)	1.81
France	0.60 (0.06)	2.20	0.35 (0.07)	2.14
Italy	0.83 (0.04)	0.80	0.37 (0.07)	2.22
UK	0.67 (0.06)	2.53	0.26 (0.07)	2.07
Canada	0.77 (0.05)	1.86	0.28 (0.07)	1.75
Spain	0.42 (0.07)	2.12	0.29 (0.09)	2.26
Finland	0.71 (0.05)	2.01	0.38 (0.07)	2.96
Ireland	0.64 (0.06)	2.03	0.38 (0.07)	2.26
Norway	0.65 (0.06)	1.90	0.25 (0.09)	2.66
NZ	0.52 (0.06)	2.04	0.19 (0.07)	1.75
Sweden	0.83 (0.04)	1.46	0.37 (0.07)	2.71
Switzerland	0.75 (0.05)	1.35	0.29 (0.07)	1.89

Table: Fit first difference of log real asset price to the AR(1) model

Sticky House Price? (III)

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Friction in housing markets:
Handbook of Macroeconomics (new chapter on housing; 2016)
(I) collateral constraint
(II) incomplete markets $\rightarrow$ dual role of housing (own vs. rent)
(III) transaction costs

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$\Rightarrow$ *this paper : model explicitly duality in housing markets.*
(I) use more disaggregated data.
(II) consistent with theoretical work, but unchallenged empirically.

Theoretical Works: Duality in Housing Markets

- literature: preference for housing services, housing tenure choice.
- **Henderson and Ioannides (1983)**
  - high preference for housing services: consume (rent)
  - low preference for housing services: invest (owner-occupied).
- **Huber (2017a, 2017b)**
  - OLG model + duality in housing markets.
  - study the relationship of "preference for housing services" and "housing bubbles"
  - lower preference for housing services $\rightarrow$ more vulnerable to bubbles.

Research Questions

- Is there heterogeneity in homeowners' vs. renters' residential housing market?
- Are both market similarly vulnerable to housing bubbles, or one is more bubble-prone than the other?
- Can we better understand rent puzzle from duality in housing markets?
- Can monetary policy influence housing bubbles dynamics? in which direction?

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- Observed house price

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- Dynamic response of house price to interest rate shock

$$\frac{\partial q_{t+k}}{\partial \epsilon_t^m} = (1 - \gamma_{t-1}) \frac{\partial q_{t+k}^F}{\partial \epsilon_t^m} + \gamma_{t-1} \frac{\partial q_{t+k}^B}{\partial \epsilon_t^m}$$

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- Theory suggests :

$$\frac{\partial q_{t+k}^F}{\partial \epsilon_t^m} < 0$$

- Conventional view :

$$\frac{\partial q_{t+k}^B}{\partial \epsilon_t^m} < 0 \rightarrow \frac{\partial q_{t+k}}{\partial \epsilon_t^m} < 0$$

Empirical Setup

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- baseline $\rightarrow$ **simple SVAR**.

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- baseline $\rightarrow$ **simple SVAR**.
- γ_t is time-varying $\rightarrow$ **time-varying SVAR**.

Empirical Model (I)

x_t is a vector of $[\triangle y_t, \triangle p_t, \triangle d_t, \triangle p_t^c, i_t, \triangle p_t^h]$

- **simple SVAR:**

$$x_t = A_0 + A_1 x_{t-1} + A_2 x_{t-2} + ... + A_p x_{t-p} + u_t$$

$$E_t\{u_t u'_{t-k}\} = \Sigma,\ u_t = S\epsilon_t$$

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Empirical Model (II): TVC-SVAR Law of Motions

- **time-varying coefficient**
  $\rightarrow$ Let $\theta_t = vec(A_t')$

$$\theta_t = \theta_{t-1} + \omega_t, \omega_t \sim N(0, \Omega)$$

$\rightarrow$ coeff. to be estimated: $\{\theta^T, \Omega\}$

Empirical Model (II): TVC-SVAR Law of Motions

- **time-varying variance-covariance matrix**
  $\rightarrow$ Let $\Sigma_t \equiv F_t D_t F_t'$
  F_t is lower triangular matrix with ones on the main diagonal
  D_t is a diagonal matrix.
  Define $\sigma_t = vec(D_t^{1/2})$ and $\phi_{i,t} = vec(F_t^{-1})$

$$\begin{aligned} \log\sigma_t &= \log\sigma_{t-1} + \zeta_t, \zeta_t \sim N(0, \Psi) \\ \phi_{i,t} &= \phi_{i,t-1} + \nu_{i,t}, \nu_t \sim N(0, \Xi) \end{aligned}$$

  $\rightarrow$ coeff. to be estimated: $\{\sigma^T, \phi^T, \Psi_i, \Xi\}$
- special case: $\Omega = 0$, $\Xi_i = 0$, $\Psi = 0 \rightarrow$ simple SVAR

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- **Identification**: monetary policy shock (CEE; 2005):
  - i_t monetary policy instrument
  - S and S_t are lower-triangular, for all t.

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- **Estimation of TVC-SVAR**: Bayesian, Gibbs sampling.
  e.g. Primiceri (2005), Gali and Gambetti (2015).

Duality in Housing Dividends (I): Setup

- compare SVAR (TVC-SVAR) for homeowners vs. renters

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$$d_t = \omega p_t^{oer} + (1 - \omega) p_t^{rent}$$

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model for homeowners: low preference for housing services

$$\omega = 1,\ d_t = p_t^{oer}$$

model for renters: high preference for housing services

$$\omega = 0,\ d_t = p_t^{rent}$$

Duality in Housing Dividends (II): Data

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- composition of U.S. rent inflation (*sources: BLS*):
  1. **owners' equivalent rent** (OER; p_t^{oer}):
     24% of CPI basket
  2. **tenant rent** (p_t^{rent}):
     6% of CPI basket
  3. others:
     3% of CPI basket

Result for Homeowners

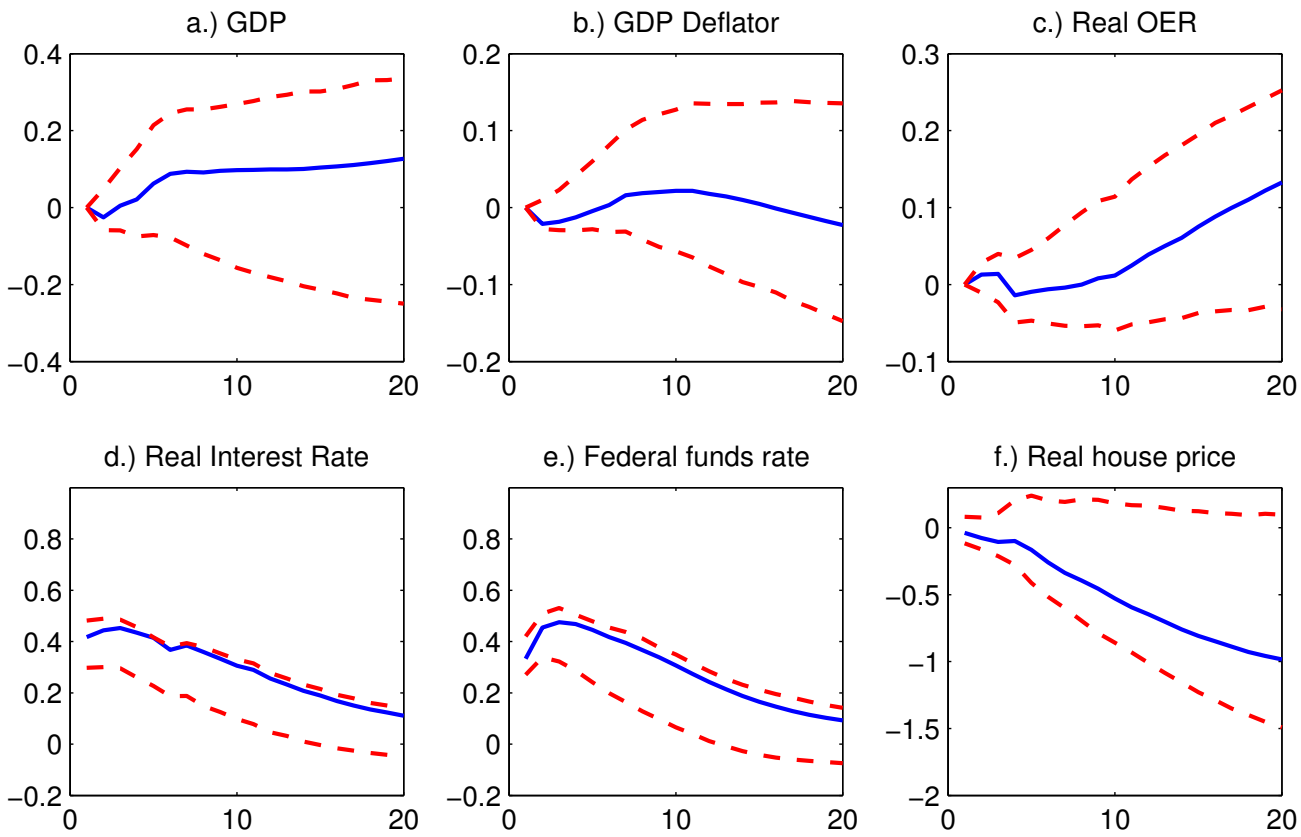

Figure: SVAR cumulated IRF from monetary policy shock for **homeowners** (low preference for housing services)

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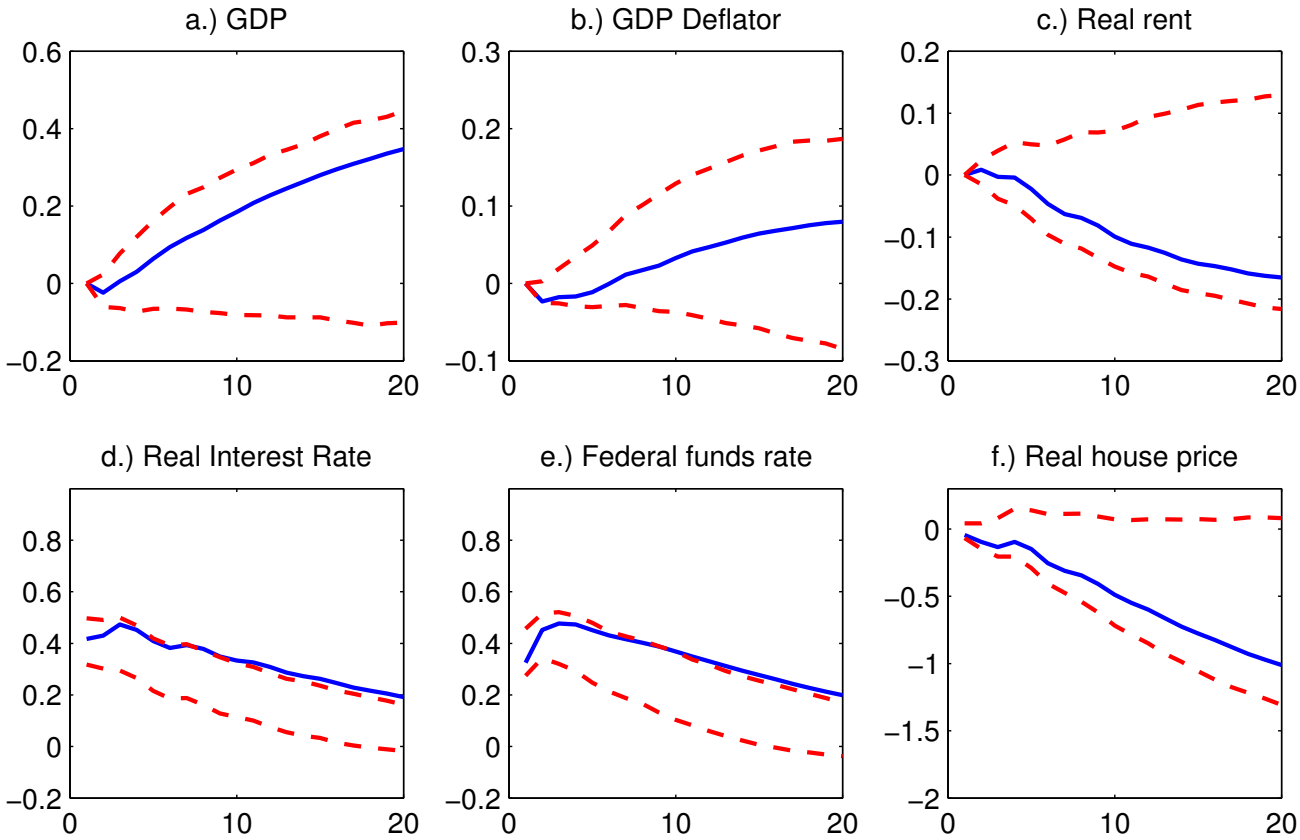

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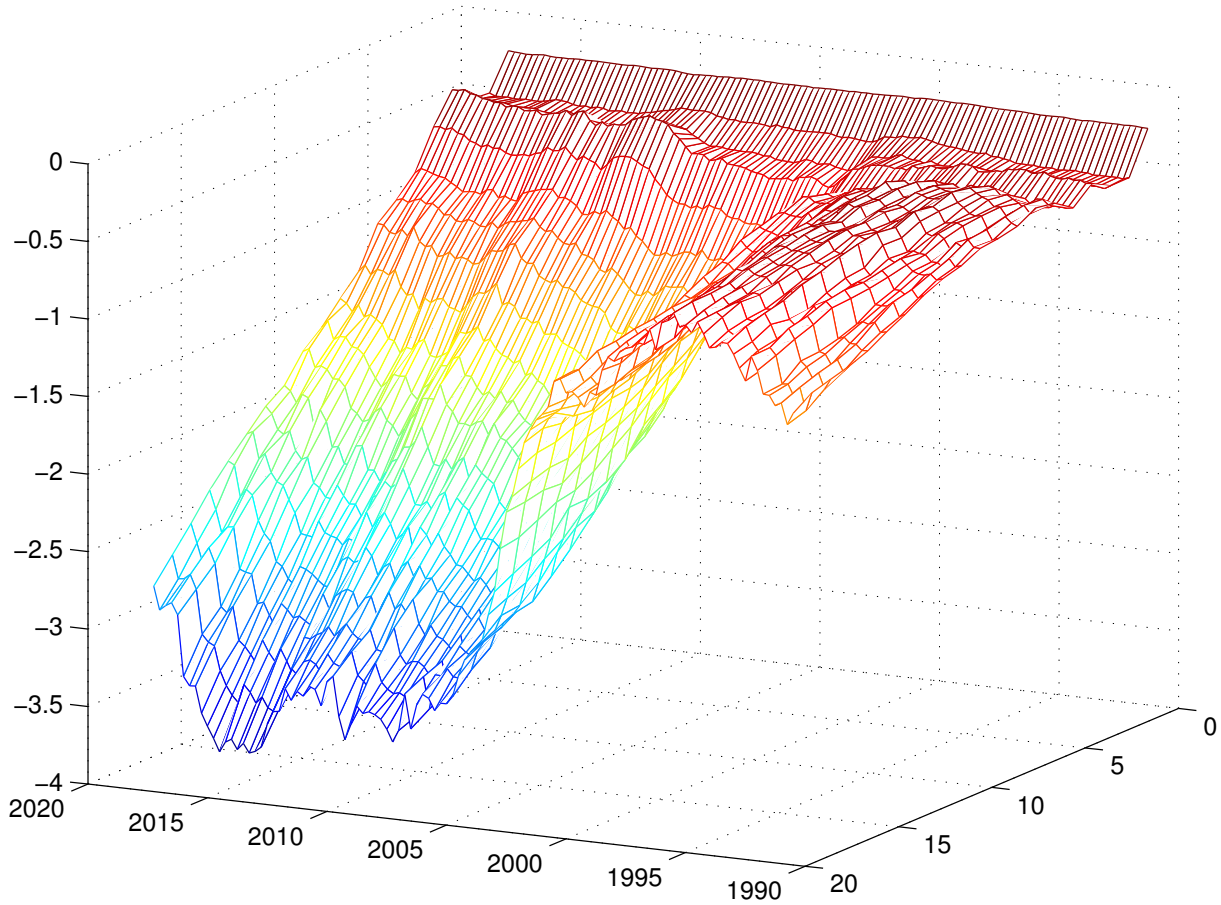
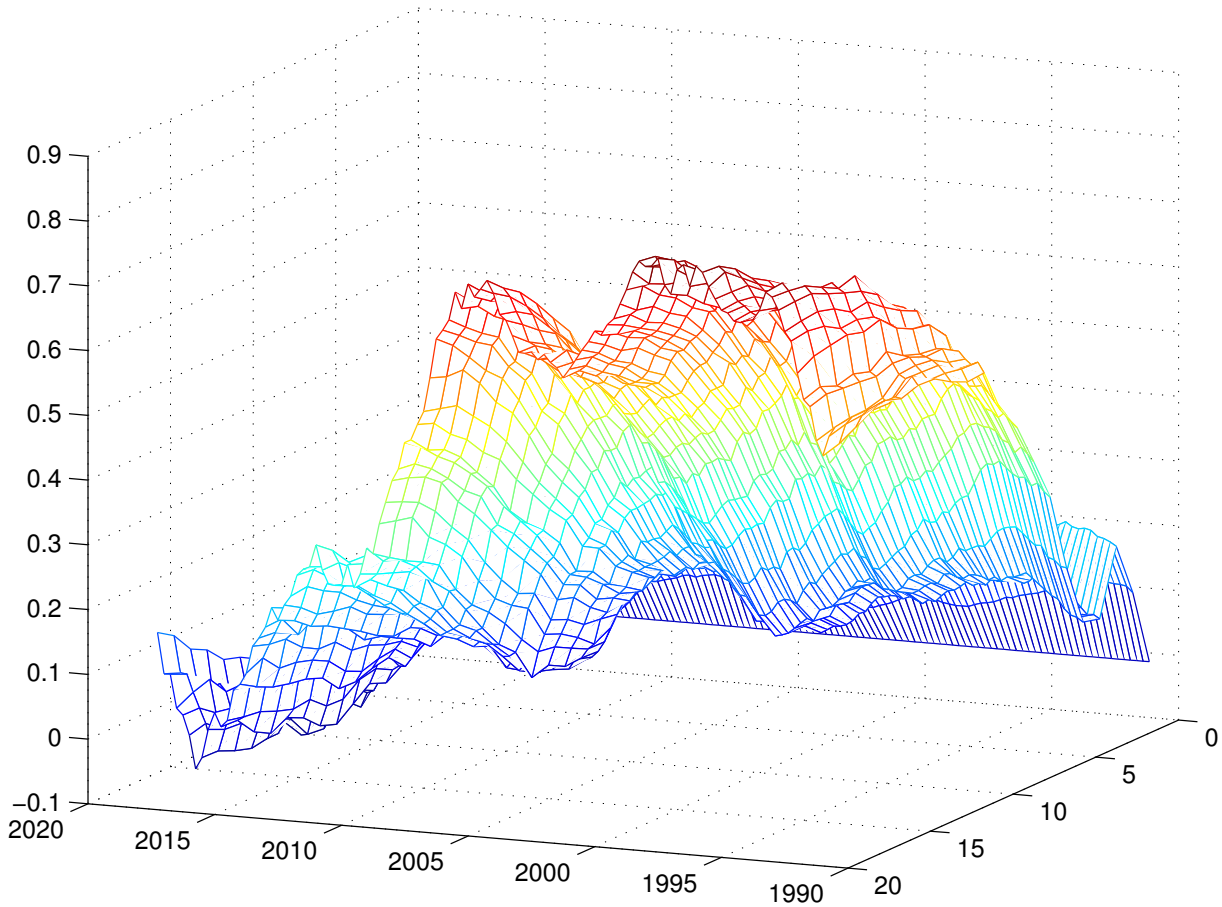


(a) Real house price

Result for Homeowners (II)



(b) Real OER

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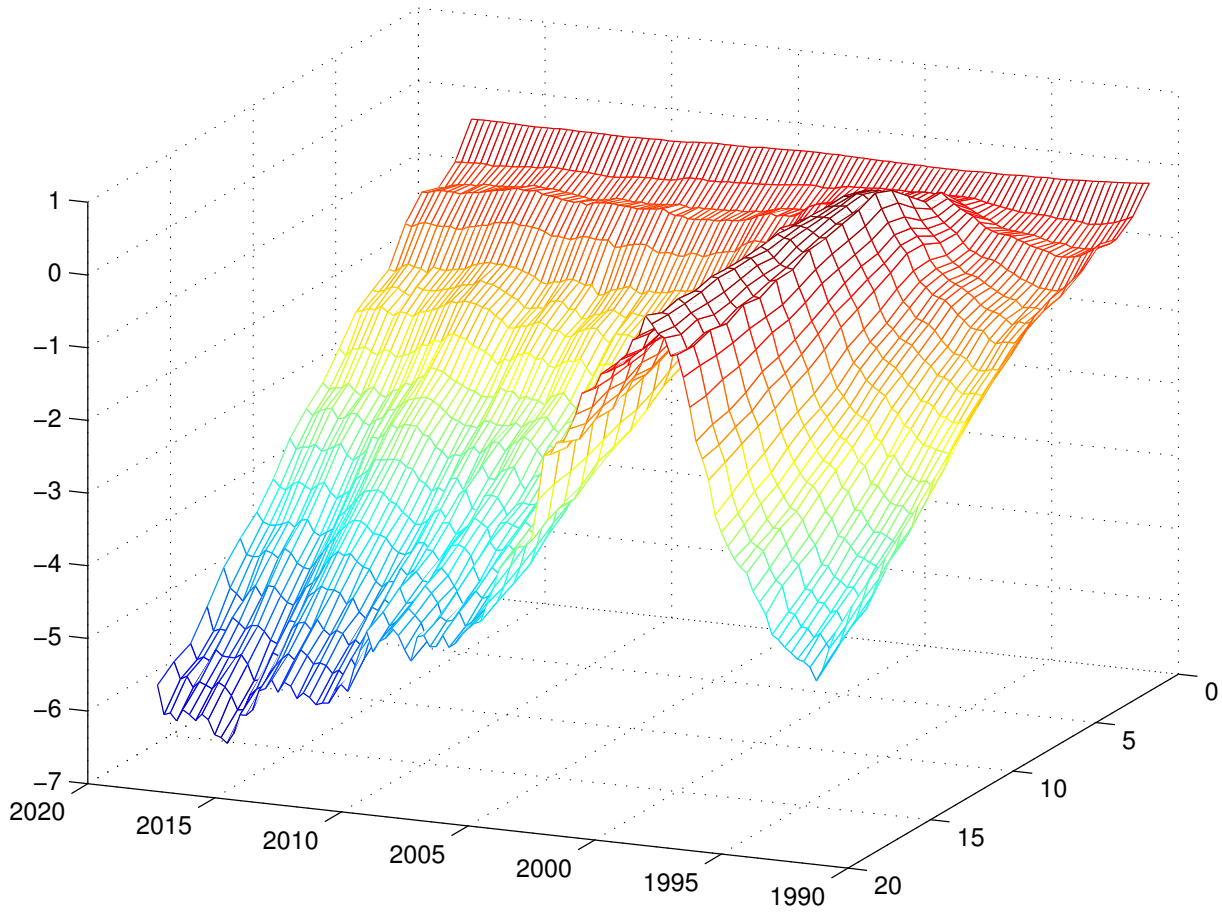

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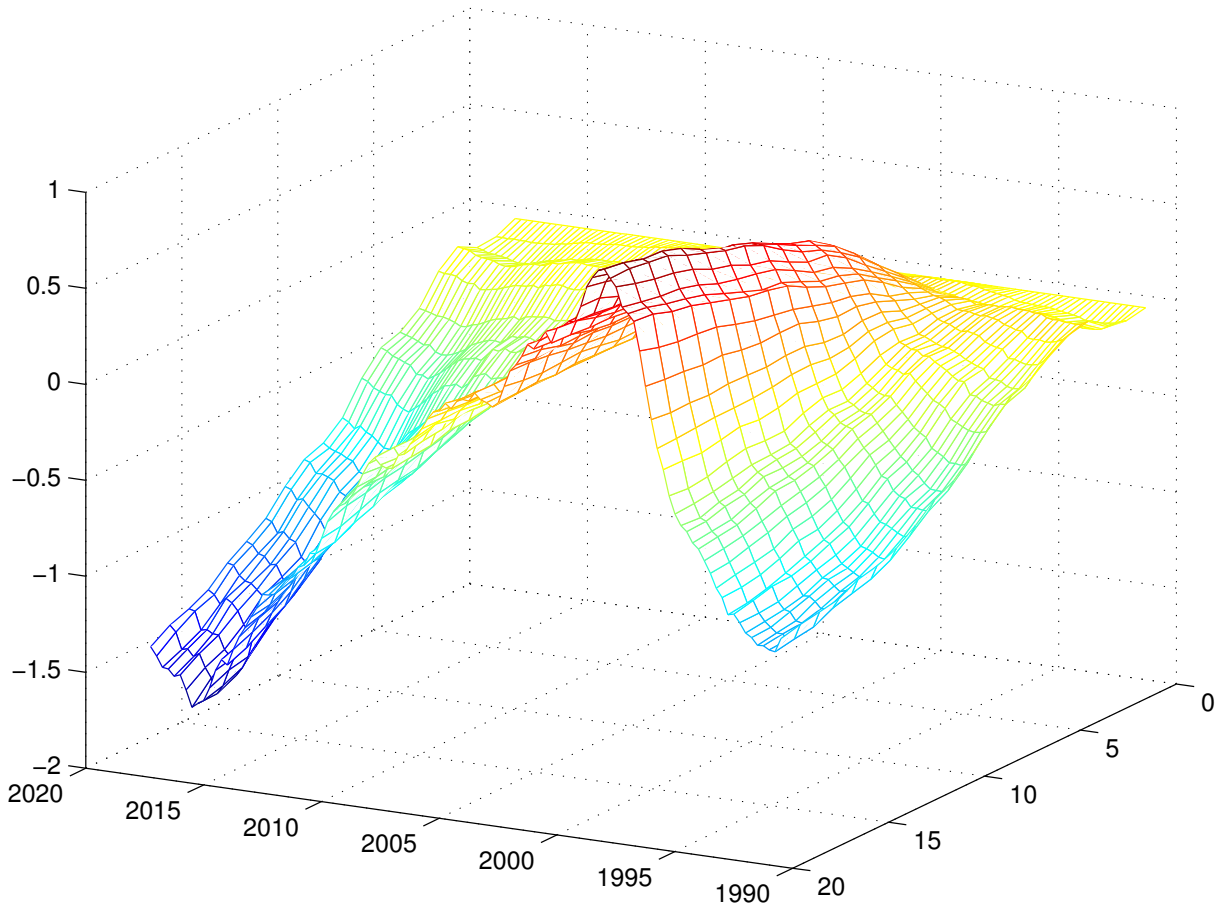

(b) Real tenant rent

Preference for Housing Service and Bubbles (I)

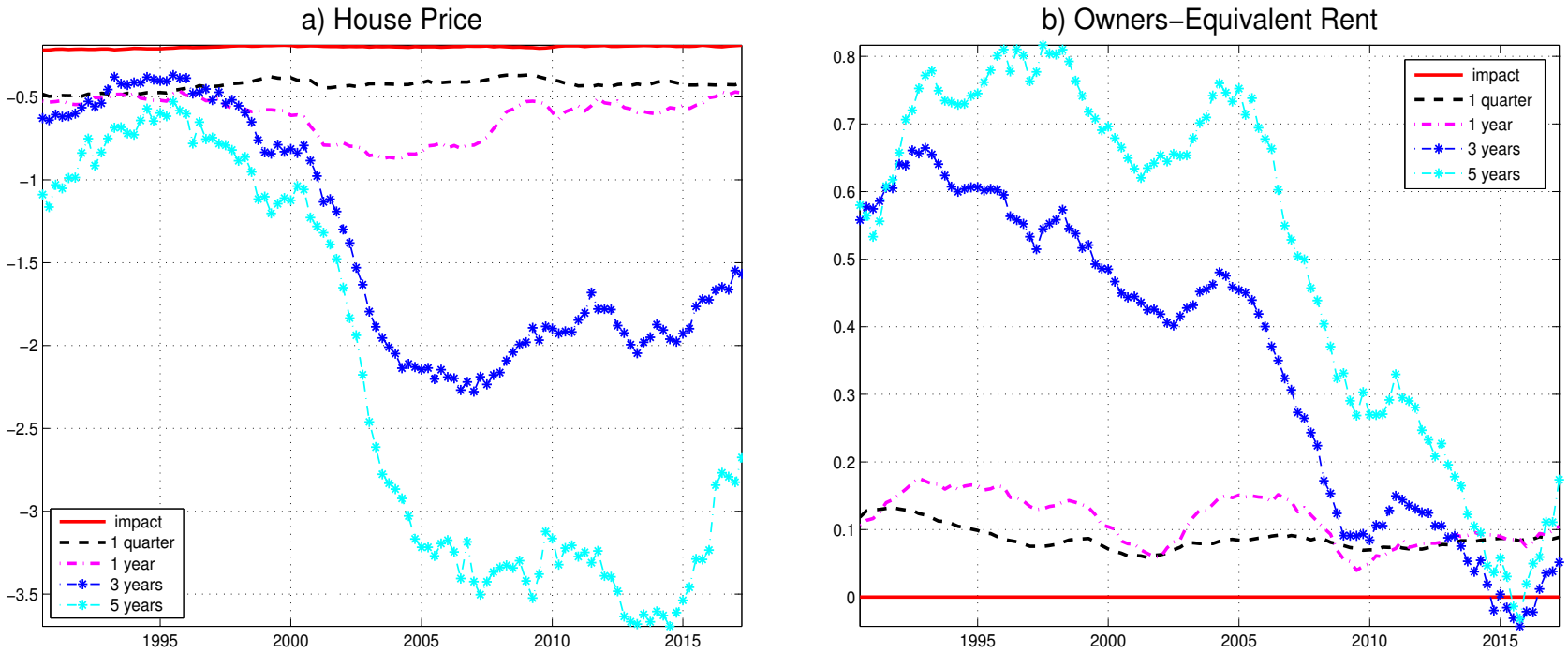

Figure: Homeowners' market.

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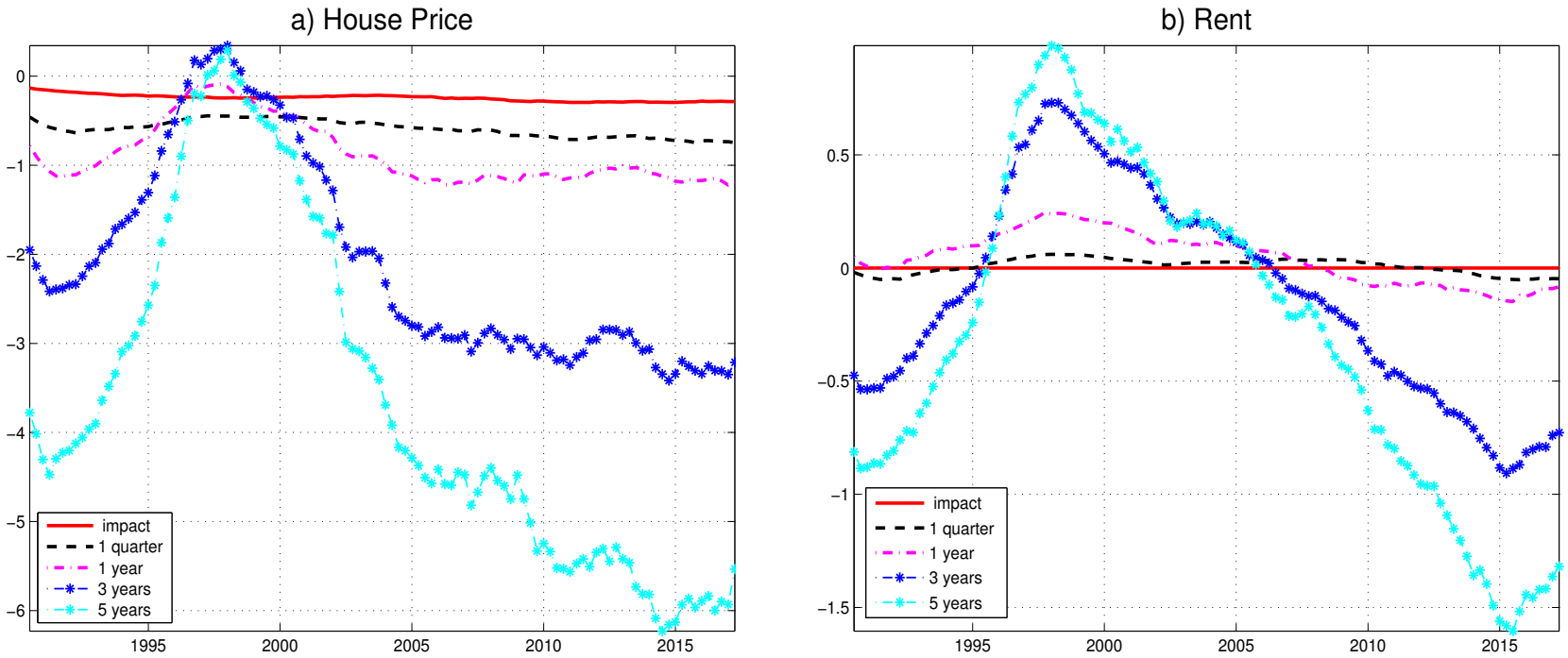

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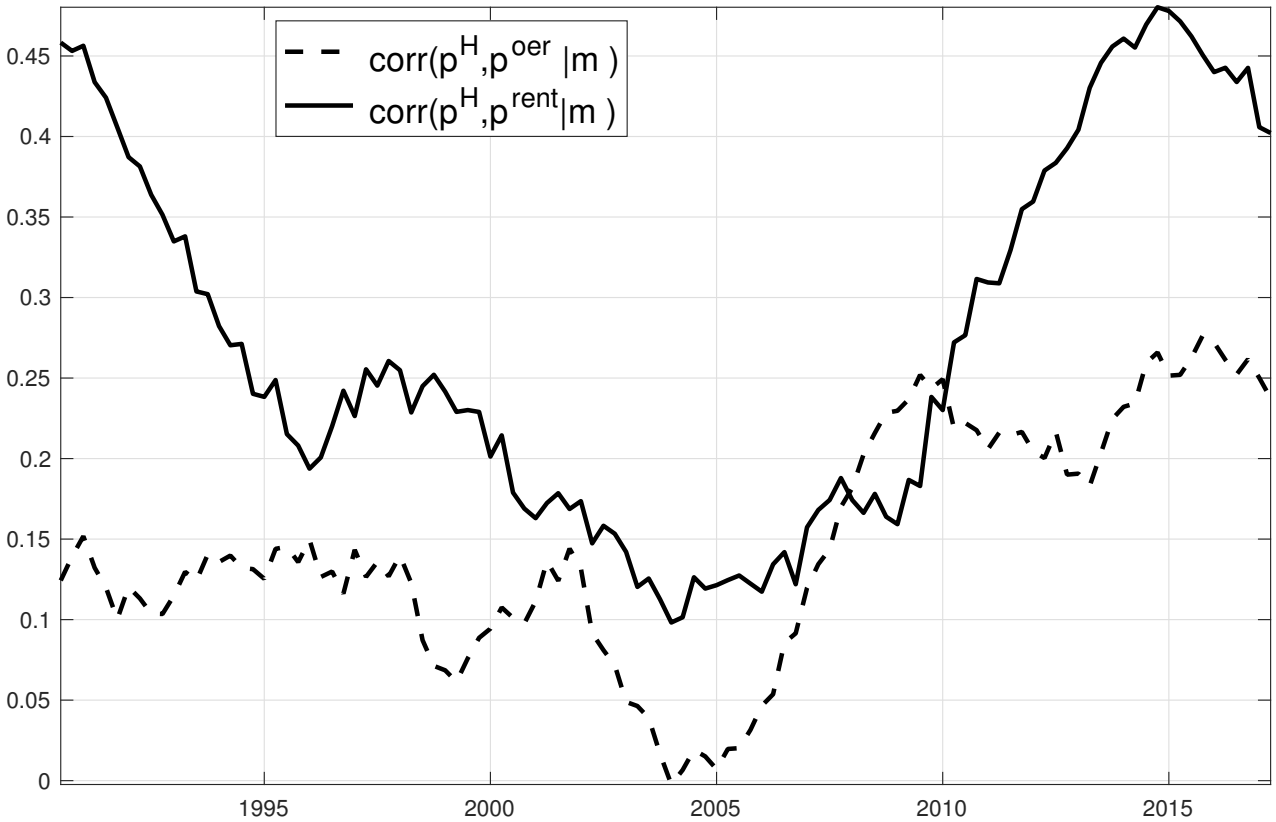
- Homeowners' markets are more bubble-prone.

Conditional Correlation



Time-varying correlation conditional on monetary policy shock

Rent Puzzle?

- Definition of fundamental

$$Q_t^F \equiv E_t\left\{\left(\prod_{j=0}^{k-1}(1/R_{t+j})\right)D_{t+k}\right\}.$$

log linearizing this equation would become:

$$q_t^F = const + \sum_{k=1}^{\infty}\Lambda^k[(1-\Lambda)E_t\{d_{t+k+1}\} - E_t\{r_{t+k}\}]$$

thus,

$$\frac{\partial q_{t+k}^F}{\partial \epsilon_t^m} = \sum_{j=0}^{\infty}\Lambda^j\left((1-\Lambda)\frac{\partial d_{t+k+j+1}}{\partial \epsilon_t^m} - \frac{\partial r_{t+k+j}}{\partial \epsilon_t^m}\right)$$

Conclusions

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(3) rent puzzle occurs mainly in homeowners' market.

(4) monetary policy can influence bubbles dynamics.

- tightening monetary policy bridge the gap of price-rent ratio in homeowners' market.

- loosening monetary policy could pose a risk to housing market.

Extensions

- counterfactual: allowing for alternative calibrations of endogenous policy response.
  - alternative level of house price coefficients in interest rate rule.