

Global Housing Markets and Monetary Policy Spillovers

Evidence from OECD Countries

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Outline

- 1 Motivation
- 2 Overview
- 3 Empirical Model
- 4 Empirical Results: Variance Decomposition
- 5 Empirical Results: Understanding Global Housing Risk Premium
- 6 Conclusive Remarks
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Research Questions

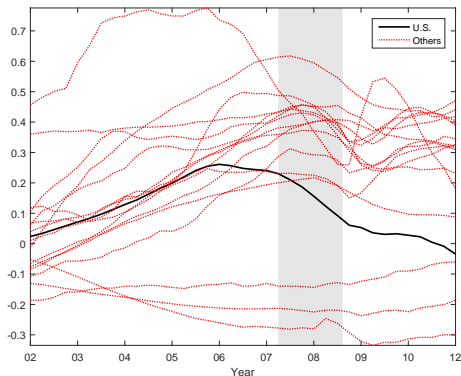
- Rey (2015), Miranda-Agrippino and Rey (2015) and Rey (2016):
 “Global Financial Cycle” Hypothesis
 - Even under floating exchange rate regime, individual countries lack controls over the domestic financial conditions

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- Rey (2015), Miranda-Agrippino and Rey (2015) and Rey (2016):
 “Global Financial Cycle” Hypothesis
 - Even under floating exchange rate regime, individual countries lack controls over the domestic financial conditions
- Miranda-Agrippino and Rey (2015) : extracting a common factor from international equity and bond prices

Research Questions (cont.)

- If you look at the global housing market...



Housing Market Conditions in 17 OECD Countries around Financial Crisis

Research Questions (cont.)

- Previous studies on housing markets in an open economy framework are relatively limited. . .
- . . . especially for the role of global financial cycle in the international housing markets

Research Questions (cont.)

- Previous studies on housing markets in an open economy framework are relatively limited. . .
- . . . especially for the role of global financial cycle in the international housing markets
- This paper: Use international housing markets to test the global financial cycle hypothesis.

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A Quick Overview

What we did:

- Integrate the Campbell-Shiller decomposition with a dynamic factor model and apply this approach to the housing price-rent ratios in 17 OECD countries over 1981-2015...

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- Integrate the Campbell-Shiller decomposition with a dynamic factor model and apply this approach to the housing price-rent ratios in 17 OECD countries over 1981-2015...

What we found:

- 1 The global factor can explain the bulk of housing markets variability across OECD advanced economies, *especially for the years leading up to the financial crisis*
- 2 The global housing risk premium component is the key driver
- 3 US monetary policy has a significant impact on the global housing risk premium

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Campbell-Shiller Decomposition

The one-period simple return on housing as a financial asset

$$H_{it} = (P_{it} + D_{it})/P_{it-1}$$

Taking log-linear approximation to the return yields the following dynamic relation (suppress constant):

$$pd_{i,t} = \Delta d_{i,t+1} - h_{i,t+1} + \rho \cdot pd_{i,t+1} \quad (1)$$

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Solve (1):

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Further decompose expected return into risk free and risk premium components:

$$pd_{i,t} = \hat{\mathbb{E}}_t \Delta d_{i,t} - \hat{\mathbb{E}}_t r_{i,t} - \hat{\mathbb{E}}_t rp_{i,t} \quad (3)$$

Dynamic Factor Model

Each component in equation (3) can be further split into a country-specific and a global parts by a dynamic factor model

$$X_{it} = \tilde{X}_{i,t} + \beta_i^X \bar{X}_t$$

where as in Stock and Watson (1989), $\tilde{X}_{i,t}$ and \bar{X}_t follow AR processes

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where as in Stock and Watson (1989), $\tilde{X}_{i,t}$ and \bar{X}_t follow AR processes
The resulting price-rent ratio decomposition becomes:

$$pd_{i,t} = \underbrace{\hat{\mathbb{E}}_t \Delta \tilde{d}_{i,t} - \hat{\mathbb{E}}_t \tilde{r}_{i,t} - \hat{\mathbb{E}}_t \tilde{r}p_{i,t}}_{\text{Local Factors}} + \underbrace{\beta_i^d \hat{\mathbb{E}}_t \Delta \bar{d}_t - \beta_i^r \hat{\mathbb{E}}_t \bar{r}_t - \beta_i^{rp} \hat{\mathbb{E}}_t \bar{r}p_t}_{\text{Global Factors}} \quad (4)$$

Then one can use (4) to evaluate the fraction of price-rent volatility due to specific component.

Data and Estimation

- Global housing data: OECD iLibrary Analytical House Price Indicators Dataset
- Coverage: 1981Q1-2015Q4 and 17 OECD countries: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and United States
- Other macroeconomic data: OECD, IFS and FRED database
- Estimation
 - Maximum Likelihood Method
 - Expectations are estimated by VAR following finance literature.
 - The conditioning information set in the VAR includes some macro fundamentals such as GDP growth and inflation. Two lags are used based on information criterion.
 - Results are qualitatively robust to an expanded VAR.

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Volatility Contribution: Global vs. Local

Table 1: The Local Factor Contribution to Price-Rent Ratios Volatility

Country	1981Q3-1998Q4	1999Q1-2007Q4	2008Q1-2015Q4	1981Q3-2015Q4
Australia	0.2184	0.0530	0.6913	0.0217
Belgium	0.5280	0.0728	0.6219	0.0446
Canada	0.7440	0.0621	0.8935	0.1500
Denmark	0.9379	0.4493	0.9178	0.3575
Finland	0.9219	0.1440	0.8808	0.2546
France	0.9269	0.7415	0.8870	0.4595
Germany	0.9015	0.2061	0.9655	0.3053
Ireland	0.7983	0.3595	0.9635	0.4356
Italy	0.9973	0.9581	0.9979	0.9272
Japan	0.8955	0.0996	0.8392	0.2950
Netherlands	0.7338	0.2324	0.9613	0.3030
Norway	0.8650	0.2083	0.8677	0.1710
Spain	0.9698	0.4795	0.9813	0.5273
Sweden	0.9763	0.3957	0.9609	0.5938
Switzerland	0.9860	0.7030	0.9749	0.7328
United Kingdom	0.9212	0.2506	0.7380	0.2548
United States	0.7197	0.2345	0.9225	0.3279
Average	0.8260	0.3324	0.8862	0.3624
Median	0.9015	0.2345	0.9178	0.3053

Volatility Contribution: The Role of Housing Risk Premium

- To further unveil the sources housing market variability, according to (3) the variance decomposition can be written as

$$\begin{aligned} \text{var}(pd_{it}) &= \text{var}(\hat{\mathbb{E}}_t \Delta d_{i,t}) + \text{var}(\hat{\mathbb{E}}_t r_{i,t}) + \text{var}(\hat{\mathbb{E}}_t rp_{i,t}) \\ &- 2\text{cov}(\hat{\mathbb{E}}_t \Delta d_{i,t}, \hat{\mathbb{E}}_t rp_{i,t}) - 2\text{cov}(\hat{\mathbb{E}}_t \Delta d_{i,t}, \hat{\mathbb{E}}_t r_{i,t}) + 2\text{cov}(\hat{\mathbb{E}}_t r_{i,t}, \hat{\mathbb{E}}_t rp_{i,t}) \end{aligned}$$

- The variance terms can be further decomposed to variances at local and global levels based on (4).
- The impact of covariance is either small or actually negative in the data.
- We focus on variance shares.

Volatility Contribution: The Role of Housing Risk Premium (cont.)

Table 2: The Campbell-Shiller Component Volatility Contribution

Country	Global			Local		
	$\Delta \bar{d}$	\bar{r}	$\bar{r}p$	$\Delta \bar{d}$	\bar{r}	$\bar{r}p$
Australia	0.0000	0.1542	0.4717	0.0008	0.0653	0.0913
Belgium	0.0037	0.3956	0.3257	0.0024	0.0290	0.0963
Canada	0.0000	0.3079	0.2845	0.0002	0.1126	0.3111
Denmark	0.0003	0.0969	0.3254	0.0023	0.2528	0.5078
Finland	0.0064	1.1058	0.2531	0.2196	0.1462	0.6370
France	0.0077	0.2973	0.1718	0.0043	0.0598	0.5263
Germany	0.0129	0.2605	1.4265	0.0091	0.1084	0.3064
Ireland	0.0006	0.0025	0.5321	0.0965	0.0142	0.5485
Italy	0.0100	0.8325	0.3590	0.0632	0.1724	0.9444
Japan	0.0097	0.3838	1.7319	0.0232	0.0600	0.2796
Netherlands	0.0017	0.3182	0.2225	0.0003	0.1304	0.4979
Norway	0.0000	0.0496	0.5335	0.0001	0.0367	0.2961
Spain	0.0004	0.1866	0.1575	0.0100	0.0347	0.4009
Sweden	0.0063	0.0307	0.3076	0.0366	0.0134	0.5333
Switzerland	0.0142	0.1155	0.5168	0.0078	0.0684	0.6940
United Kingdom	0.0083	0.9806	0.2241	0.0702	0.2466	0.6428
United States	0.0044	0.9575	0.2242	0.0022	0.4279	0.3849
Average	0.0051	0.3809	0.4746	0.0323	0.1164	0.4529
Median	0.0044	0.2973	0.3254	0.0078	0.0684	0.4979

Volatility Contribution: The Role of Housing Risk Premium (cont.)

Table 3: The Campbell-Shiller Component Volatility Contribution (1999Q1-2007Q4)

Country	Global			Local		
	$\Delta \tilde{d}$	\tilde{r}	\tilde{r}_p	$\Delta \tilde{d}$	\tilde{r}	\tilde{r}_p
Australia	0.0000	0.0182	0.8013	0.0006	0.0317	0.1004
Belgium	0.0005	0.0469	0.7256	0.0014	0.0264	0.0866
Canada	0.0000	0.0415	0.7325	0.0002	0.0347	0.1092
Denmark	0.0000	0.0102	0.4705	0.0003	0.0401	0.5660
Finland	0.0010	0.1553	0.5613	0.0286	0.0771	0.1577
France	0.0005	0.0174	0.1984	0.0013	0.0186	0.8533
Germany	0.0020	0.0364	0.9881	0.0097	0.0293	0.2337
Ireland	0.0001	0.0003	0.6302	0.0311	0.0010	0.3206
Italy	0.0008	0.0585	0.0320	0.0010	0.0386	1.1194
Japan	0.0017	0.0599	1.1938	0.0009	0.0453	0.0449
Netherlands	0.0003	0.0428	0.5913	0.0004	0.1115	0.0862
Norway	0.0000	0.0058	0.7129	0.0001	0.0381	0.4106
Spain	0.0001	0.0251	0.4056	0.0019	0.0188	0.6034
Sweden	0.0013	0.0056	0.5618	0.0097	0.0059	0.3820
Switzerland	0.0021	0.0157	0.3633	0.0091	0.0100	0.8124
United Kingdom	0.0011	0.1206	0.5017	0.0147	0.1017	0.4723
United States	0.0007	0.1333	0.5041	0.0034	0.2482	0.6543
Average	0.0007	0.0467	0.5867	0.0067	0.0516	0.4125
Median	0.0005	0.0364	0.5618	0.0014	0.0347	0.3820

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The Driving Force of Global Housing Risk Premium

- What are the driving forces of Global Housing Risk Premium?

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- Bruno and Shin (2015), Rey (2015), Miranda-Agrippino and Rey (2015) and Rey (2016):
liquidity effect brought about by monetary policy shock in center country such as United States is likely to spillover to other countries, through the risk-taking channel or credit channel
 - ① Risk-taking channel: risk metrics adopted by banks
 - ② Credit channel: financial conditions

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 - ① Risk-taking channel: risk metrics adopted by banks
 - ② Credit channel: financial conditions
- This paper: spillover of US monetary policy shock to global housing markets through risk-taking/credit channel?
US Monetary Policy Shock → Global Housing Risk Premium → Housing Market Volatility

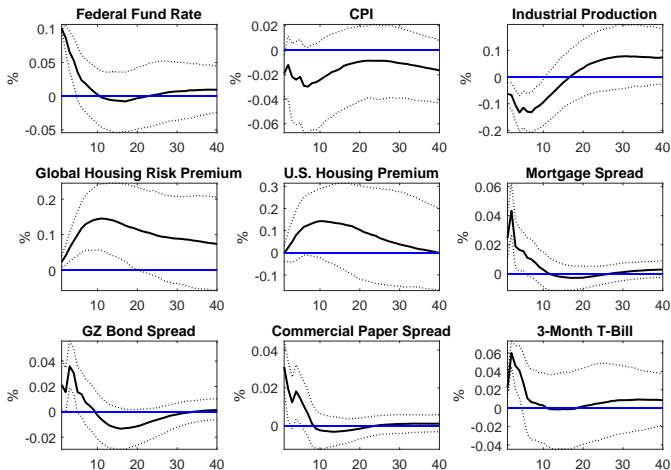
A SVAR Model Identified via IV Method

- Stock and Watson (2012) and Mertens and Ravn (2013): IV method to identify monetary policy shock
- As in Gertler and Karadi (2015), we instrument the policy indicator with the surprises in Fed Funds futures within a tight time window around Federal Open Market Committee (FOMC) announcement.
- In our SVAR model
 - US macro variables: CPI, Industrial Production
 - US financial indicators: Mortgage Spread, GZ Bond Premium, Commercial Paper Spread, T-Bill Rate
 - Global Housing Risk Premium , US Housing Risk Premium

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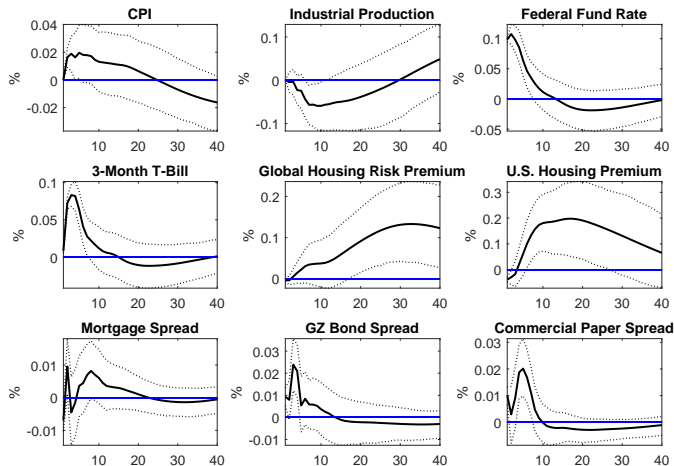
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- In our SVAR model
 - US macro variables: CPI, Industrial Production
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 - Global Housing Risk Premium , US Housing Risk Premium
- We want to see if US monetary policy shock would affect housing risk premium, especially the global one.

Impulse Responses to A Monetary Tightening: IV Approach



Notes: This figure provides the impulse responses to 10 basis point increase in monetary policy indicator identified through instrumental variable method. The F-Statistics for the first stage regression is 25.08, and R^2 is 8.17%. Dotted lines are 90% confidence bands based on bootstrapping.

Impulse Responses to A Monetary Tightening: Cholesky



Notes: This figure provides the impulse responses to 10 basis point increase in monetary policy indicator identified through Cholesky scheme. Dotted lines are 90% confidence bands based on bootstrapping.

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Conclusion

Two Most Important Takeaways

- For an average country, the global housing market implied risk premium is a key determinant of the housing market volatility, especially for the years before financial crisis.
- Risk or credit cost related to the global housing market experiences a significant and persistent increase after an unexpected U.S. monetary policy tightening.

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Main Contributions

- Add evidence on the global financial cycle with a focus on the international housing markets
- Among the first to uncover risk-taking or credit channel of monetary policy spillover in global housing markets

The end

Many thanks !
Comments are welcomed !

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