Asymmetric effects of monetary policy in regional housing markets

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Monetary policy and house prices

- There is a large literature finding strong effects of monetary policy shocks on aggregate house prices
  - **US evidence:** Iacoviello (2005), Jarocinski and Smets (2008), Del Negro and Otrok (2007)
  - **International evidence:** Anundsen and Jansen (2013), Bjørnland and Jacobsen (2010), Otrok and Terrones (2005), Sa, Towbin and Wieladek (2011), Jorda, Schularick and Taylor (2015a,b)

- The general conclusion is that **interest rates matter for house price dynamics**
While understanding these dynamics is interesting

Real US house prices, 1975q1–2013q4
...it masks this...

Percentage change in house prices for US MSAs, 2000–2006

120% to 165%
90% to 120%
60% to 90%
30% to 60%
10% to 30%

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Percentage change in house prices for US MSAs, 2006–2010

-60% to -50%
-50% to -30%
-30% to -10%
-10% to 0%
0% to 15%

...and this!
Contribution of this paper - What we do

Research question: What role can a common monetary policy have in explaining the large cross sectional variations?

1. Is the effect of monetary policy dependent on region-specific housing supply elasticities?
2. Is the impact of monetary policy shocks on house prices asymmetric?

What we do:
- Estimate the asymmetric effects of monetary policy shocks on house prices for 263 US MSAs

Main findings:
- The impact of expansionary monetary policy shocks is considerably stronger in markets with an inelastic housing supply
- An expansionary MP shock has stronger effects on house prices than a contractionary MP shock for most MSAs
- Some evidence supporting that this is related to a momentum effect that is more important when house prices are increasing
Some related literature

- **Regional heterogeneity in the US housing market:**

- **Housing supply elasticities and the amplitude of boom-bust cycles:**
  - Malpezzi (1996), Green et al. (2005), Glaeser et al. (2008), Saiz (2010), Huang and Tang (2012) and Anundsen and Heebøll (2016) document that large inter-MSA differences in housing market dynamics are related to restrictions on housing supply.

- **Lending standards and house prices:**
  - Mian and Sufi (2009), Pavlov and Wachter (2011) and Favara and Imbs (2015) find that differences in credit standards are important for house price heterogeneity.

- **Asymmetric effects of monetary policy on the real economy:**
  - Angrist et al. (2016), Barnichon and Matthes (2016) and Tenreyro and Thwaites (2016) find a smaller effect of monetary policy when it is expansionary.
Theoretical motivation: Expansionary MP Shocks

Market 1: High supply elasticity
Market 2: Low supply elasticity

**Note:** $D_0$ is the original demand curve, while $D_1$ is the demand curve after the interest rate reduction. The supply curve is given by $S$. The initial equilibrium is given by point A. The new equilibrium after the interest rate reduction is given at point B. The dotted part of the housing supply curve illustrates that housing supply is rigid downwards, so that the supply curve kinks at A before the shock and at B after the shock.
Theoretical motivation: Contractionary MP Shocks

**Figure:** Contractionary monetary policy shocks

**Market 1: High supply elasticity**

**Market 2: Low supply elasticity**

**Note:** $D_0$ is the original demand curve, while $D_1$ is the demand curve after the interest rate increase. The supply curve is given by $S$. The initial equilibrium is given by point A. The new equilibrium after the interest rate increase is given at point B.
Theoretical implications

- **Conjecture # 1:** Expansionary shocks have a larger impact on house prices in markets with an inelastic housing supply.

- **Conjecture # 2:** The effect of contractionary monetary policy shocks is independent of supply elasticity.

- **Conjecture # 3:** For any positive supply elasticity, contractionary shocks have a larger impact on house prices than expansionary shocks.
Data

1. Quarterly panel of 263 US MSAs from 1983q1–2007q4, with data on typical demand shifters:
   - House prices (FHFA)
   - Income per capita (Moodys)
   - Net migration rates (Moodys)

2. Combine this with exogenous (narrative) monetary policy shocks of Romer and Romer (2004), updated by Wieland and Yang (2016)

3. And explore differences across areas with different supply elasticities of Saiz (2010)
   - Regulatory restrictions
   - Topographic supply restrictions

4. Time-varying index of branching deregulation by Rice and Strahan (2010)
   - Constructed to capture the regulatory changes the US banking sector has gone through regarding banks’ geographic expansion
Empirical approach


\[
ph_{i,t+h} - ph_{i,t-1} = \alpha_i + \beta^{Exp.}_h R_{t}^{Exp.} + \beta^{Exp.,El.}_h Elasticity_i \times R_{t}^{Exp.} \\
+ \beta^{Cont.}_h R_{t}^{Contr.} + \beta^{Cont.,El.}_h Elasticity_i \times R_{t}^{Contr.} + \Gamma' W_{i,t} + \varepsilon_{i,t}
\]

- where \( i \) indexes MSA and \( \alpha_i \) is the MSA fixed effects
- \( RR \) is the Romer and Romer MP shock and \( Elasticity_i \) is the time-invariant supply elasticities calculated by Saiz (2010)
- \( R_{t}^{Exp.} \) denote a variable measuring expansionary shocks, and it is calculated as \( R_{t}^{Exp.} = R_{t} \times I(R_{t} \geq 0) \). Contractionary shocks are measured by \( R_{t}^{Contr.} = R_{t} \times (1 - I(R_{t} \geq 0)) \)
- \( W_{i,t} \) contains a set of control variables, including lagged changes in log house prices, lagged values of the log change in disposable income per capita, lagged changes in net migration rates and the branching deregulation index.
### Effect of contractionary and expansionary MP shocks

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<td>-0.08</td>
<td>-0.80</td>
<td>-3.53***</td>
<td>-6.29***</td>
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<td></td>
<td>(0.29)</td>
<td>(0.67)</td>
<td>(1.16)</td>
<td>(1.77)</td>
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<td>-0.06</td>
<td>0.20</td>
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<tr>
<td>× Elasticity</td>
<td>(0.13)</td>
<td>(0.23)</td>
<td>(0.38)</td>
<td>(0.54)</td>
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<td><strong>Exp. MP shock</strong></td>
<td>-0.18</td>
<td>2.85***</td>
<td>7.81***</td>
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<td>(0.22)</td>
<td>(0.67)</td>
<td>(1.01)</td>
<td>(1.33)</td>
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<td><strong>Exp. MP shock</strong></td>
<td>0.11</td>
<td>-0.59***</td>
<td>-1.59***</td>
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<td>(0.23)</td>
<td>(0.33)</td>
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<tr>
<td><strong>R^2</strong></td>
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Effect of contractionary MP shock after 2 years

Below -5.50%
-4.58% to -5.50%
-3.65% to -4.58%
-2.10% to -3.65%
Above -2.10%

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Theoretical implications and empirical results

- **Conjecture # 1:** Expansionary shocks have a larger impact on house prices in markets with an inelastic housing supply.
  - We find that more inelastic areas see a larger house price increase following a reduction in the interest rate.

- **Conjecture # 2:** The effect of contractionary monetary policy shocks is independent of supply elasticity.
  - Our findings suggest that the effect of contractionary shocks are independent of the supply elasticity.

- **Conjecture # 3:** For any positive supply elasticity, contractionary shocks have a larger impact on house prices than expansionary shocks.
  - We find that expansionary shocks have a larger impact on house prices for most MSAs! Only in the most elastic areas does contractionary shocks kick harder.
Momentum effect

- Following Case and Shiller (1989), numerous papers have documented that aggregate house price changes are autocorrelated.
- Momentum in house prices has been accepted as a key feature of the housing market (Glaeser et al. (2014)).
- Several explanations have been proposed for why house price momentum effects occur:
  - Variations in time-on-market due to search frictions (Head et al. (2014)).
  - Information frictions (Anenberg (2016)).
  - Extrapolative expectation formation (Case and Shiller (1987), Glaeser et al. (2008), Glaeser and Nathanson (2017)).
  - Heterogeneous beliefs and existence of momentum traders ((Piazzesi and Schneider (2009) and Burnside et al. (2016)).
  - Strategic complementarities (Guren (2017)).
Evidence of asymmetric momentum effects

- Estimate an AR(4)-model for house price growth
  - Allow the AR-coefficients to have additional effects whenever house prices are increasing.
- Report the sum of the AR-coefficients
- Results support the notion of a momentum effect that is far more pronounced when house prices are increasing

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<td>0.57</td>
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<td>23,212</td>
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<td>23,212</td>
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Expansionary MP Shocks with momentum effects

**Figure:** Expansionary monetary policy shocks with momentum effects

Market 1: High supply elasticity

Market 2: Low supply elasticity

**Note:** $D_0$ is the original demand curve, while $D_1$ is the demand curve after the interest rate reduction. The supply curve is given by $S$. The initial equilibrium is given by point A. The new equilibrium after the interest rate reduction is given at point C. The dotted part of the housing supply curve illustrates that housing supply is rigid downwards. The dotted part of the demand curves illustrates how the demand curve would look in the case where there is no momentum effect. Point B shows the equilibrium that would prevail in the absence of a price-to-price feedback loop.
Figure: Contractionary monetary policy shocks with momentum effects

Market 1: High supply elasticity

Note: $D_0$ is the original demand curve, while $D_1$ is the demand curve after the interest rate increase. The supply curve is given by $S$. The initial equilibrium is given by point A. The new equilibrium after the interest rate increase is given at point B. The dotted part of the demand curves illustrates how the demand curve would look in the case where there is no momentum effect.
Case et al. (2012) collected data, which measure house price expectations over the next year for four metro areas over the period 2003–2012.

- Current house prices is a much better predictor of house price expectations in periods of increasing house prices, with an $R^2$ that is almost twice as large.
Asymmetric expectation formation

To formally address the asymmetries in expectation formation, we estimate a model for house price expectations where we allow the AR-coefficient to have additional effects whenever house prices are increasing.

| Current house price growth | 0.27*** (0.02) | 0.18*** (0.04) |
| Current house price growth when $\Delta ph_{i,t} > 0$ | | 0.16** (0.07) |
| Observations | 40 | 40 |
| $R^2$ | 0.84 | 0.86 |
Robustness checks

- MSA-by-MSA analysis
  - Group MSAs into five equally sized groups, depending on supply elasticity.
  - Use mean group estimator of Pesaran and Smith (1995)

- Control for region-time fixed effects
  - Census Division by quarter fixed effects

- Asymmetric momentum and supply elasticities
  - Estimate MSA-specific models allowing for a different effect of lagged house prices in a booming market
  - Suggests that the result of an additional momentum effect in booming market is maintained in the cross section
  - The additional momentum effect is, if anything, somewhat stronger in markets with a low supply elasticity
Conclusion

- We have analyzed the effects of contractionary and expansionary monetary policy shocks in regional housing markets.

- We find that:
  - Expansionary shocks have a substantially greater impact on house prices in markets with an inelastic housing supply
  - Due to the durability of housing, the effect of a contractionary shock is independent of the elasticity of housing supply
  - For most elasticities, the effect of an expansionary shock is greater (in absolute value) than the effect of a contractionary shock
    - Our results suggest that this is related to a momentum effect that is more important when house prices are increasing than when they are falling
    - This may be attributed to an asymmetric and extrapolative expectation formation.
Our results have direct bearing on the discussion on the trade-offs faced by monetary policymakers when it comes to real economic stability and financial stability.

- As documented in Tenryro and Thwaites (2016), Barnichon and Matthes (2016) and Agrist et al. (2017), a reduction in the interest rate is less effective in stimulating the real economy than an interest rate increase is in dampening economic activity.
- We find the opposite to be true for most housing markets.
- Therefore, reducing the interest rate in order to stimulate the real economy may not be very effective, but at the same time it may contribute to amplify the volatility of house prices.
- At the same time, an increase in the interest rate may have a large impact on the real economy without affecting house prices to the same extent as an expansionary monetary policy shock.