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- **Role of Housing and Mortgages in how Monetary Policy works?**
Increase in policy interest rate reduces consumption and increases savings; lowering output and inflation. How?
- **Potential Housing Related Channels:**

An increase in policy interest rate...

- 1 **House Price Channel**
...causes fall in value of houses. Resultant loss of wealth leads to reduced consumption.
- 2 **Liquidity Channel**
Highly leveraged households are especially sensitive and reduce consumption by greater amount.
- 3 **Cash-Flow Channel (Asymmetric?)**
When policy interest rate is cut, households can refinance at new lower rate. Freeing up cash-flow to increase consumption.
US: empirically fixed-rate mortgages. Model: adjustable-rate mortgages, so symmetric.
- 4 **Redistribution Channel**
Surprise change in interest rates will redistribute income between borrowers and lenders, who may consume different fractions of it.

Monetary Policy, Heterogeneity, and the Housing Channel

- Build model to help understand role and size of channels.
- Incomplete-markets hetero-agent with income shocks.
Helps: capture differences across households.
- Directed-search housing market.
Helps: house prices and number of homes sold move up and down together.
- Long-term nominal mortgages.
Helps: Cash-flow channel, Redistribution effect of Monetary policy. (US: should be fixed-rate?)
- Sticky prices and sticky wages (Rotemberg quadratic-adjustment costs).
Helps: Otherwise monetary policy will be largely pointless (largely short-run neutral).

Model: Monetary Policy

- Monetary policy sets interest rate following Taylor rule:

$$(1 + i_{t+1}) = (1 + i_t) \left(\frac{1 + \pi_t}{1 + \bar{\pi}} \right)^{\phi_T} e^{\epsilon_t}$$

- $\bar{\pi}$ is target inflation rate.
- ϵ_t follows an AR(1) (autocorrelation=0.6).
- ϵ_t is the shock to monetary policy that paper studies.
- ϵ_t appears to be modelled as an 'MIT-shock'.

$\phi_T = 1.25$. $\bar{\pi} = ?, 0?$

Criticism (Hopefully Constructive)

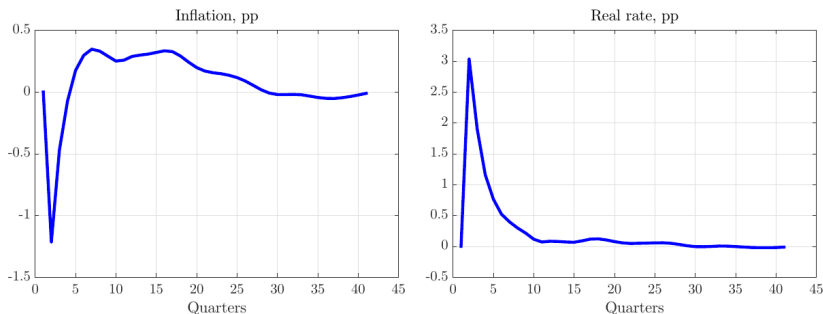
- **Conceptual Criticism:** everyone in model thinks that 'Monetary Policy' is an impossibility.
Expected probability of a change in the interest rate is zero. (Modelled as 'MIT-shock'.)
- **Matters because then overstate the effect of monetary policy changes.**
People will be more 'exposed' to interest rate changes than they would be if they expected their possibility.

What is modelled is less Impulse Response Function, more transition path.

Criticism (Hopefully Constructive)

- Practical Criticism: A 1 percentage point rise in nominal interest rates leads to a more than 1 percentage point fall in inflation and a 3 percentage point rise in real interest rates.

FIGURE 4 – Contractionary policy shock



Consensus is that the reaction of economy to monetary policy is much smaller than this.

Criticism (Hopefully Constructive)

- In model...
- Mortgagors have to make fixed schedule of repayments and have no other way to borrow.
- Remortgaging (increasing size of mortgage, or simply repaying slower than fixed schedule) is very expensive.
Mortgage initiation cost of 4% of entire mortgage, plus the ' q_{mt} -cost'.
- This may make those who are borrowing or liquidity constrained over-sensitive to monetary policy.
Their other options to react have been shut down.
- Loosening this may result in more realistically sized reaction of economy to monetary policy.

Criticism (Hopefully Constructive)

- Hopefully Constructive: 'consensus view' that monetary policy is not nearly this powerful is based on mixture of effects of anticipated & unanticipated monetary policy.
- In this model it is purely unanticipated monetary policy.
- Cochrane (1998) shows that unanticipated monetary policy has much larger effects than anticipated monetary policy.
Can't make quantitative comparison to results of present paper as uses money supply to measure monetary policy, rather than interest rates.
- So maybe if monetary policy here were anticipated the results would be more 'plausible' in size.
Or consensus view is wrong? But that would require much stronger evidence than this paper.
(Explicitly making monetary policy anticipated in current model is probably computationally infeasible, but at least this helps us understand why estimates are so much larger than consensus view.)

Minor (less helpful) Gripe

- Please label *all* graph axes. (The heat-axis has no scale ;)

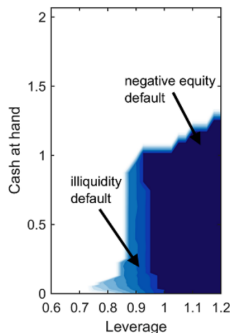


Figure: Mortgage Default Heat Map

- Also, when describing parts of state space: is anyone actually there?
(Paper discusses bottom-middle of this Figure)
If no households are actually in that part of state space then who cares?

- Build model to understand and quantify housing-related channels of monetary policy.
- Important: both to understand Great Recession, and for current debates about house prices, monetary, etc.
- Definite improvement on existing work, really tries to capture these channels.
- Unfortunately, present estimates of effects of monetary policy appear unrealistically large.
Relative to 'consensus view', and seemingly to traction of monetary policy in Great Recession.
- If this can be resolved, will become a great contribution to our understanding.

- 'Consensus view' of size of effect of monetary policy, e.g., Christiano, Eichenbaum, and Evans (2005); Romer and Romer (2004) and innumerable others.
- Contractionary monetary policy is stronger than expansionary: Tenreyro and Thwaites (2018).

- Lawrence J. Christiano, Martin Eichenbaum, and Charles L. Evans. Nominal rigidities and the dynamic effects of a shock to monetary policy. *Journal of Political Economy*, 113(1):1–45, 2005.
- John Cochrane. What do the vars mean? measuring the output effects of monetary policy. *Journal of Monetary Economics*, 41(2):277–300, 1998.
- Christina Romer and David Romer. A new measure of monetary shocks: Derivations and implications. *American Economic Review*, 94(4): 1055–1084, 2004.
- Sylvana Tenreyro and Gregory Thwaites. Pushing on a string: Us monetary policy is less powerful in recessions. *American Economic Journal: Macroeconomics*, Forthcoming:AA, 2018.

Model: Households

- Households: infinitely lived.
- Preferences over consumption, housing services, and leisure (c, s, l) .

$$E \sum_{t=0}^{\infty} \beta^t \frac{[(1-\phi_h)c_t^{1-\gamma_h} + \phi_h s_t^{\gamma_h}]^{\frac{1-\sigma}{1-\gamma_h}}}{1-\sigma} + \psi \frac{l^{1+\varphi}}{1+\varphi}$$

- Households can save in risk-free bond, interest rate of which gets determined by monetary policy.
- Renters cannot borrow. Homeowners can borrow with mortgage M_t at rate r_{mt} .

Model: Houses

- Various sizes of house $\{h_1, \dots, h_n\}$.
- Sell houses to 'real-estate brokers' in directed search markets.
Introduces risk/probability that you will be unable to sell house (different markets for different house sizes).
- Buy any 'size' house for price p_H .
- Renters can rent apartments for price r_H .
Apartments do not form part of housing market, and rental price is constant (relative to final good price).

Housing supply is perfectly inelastic (a fixed constant). Supply of apartments is perfectly elastic. Model is about fluctuations, not housing trends.

Model: Mortgages

- Long-term adjustable rate mortgages.
- Household with a mortgage of M_t must repay at least fraction χ each period.
Or can refinance mortgage any time, by fully repaying and then getting a new mortgage. This is the only way to 'remortgage'.
- Adjustable interest rate on mortgage: r_{mt}
- When a new mortgage with nominal face-value M_{t+1} is issued, the household gets $q_{mt}^0 M_{t+1}$ units of final good.
- $q_{mt}^0 = q_{mt}/(1 + \zeta)$, where $\zeta = 0.04$ is the 'mortgage initiation cost'.
- q_{mt} is less than 1 and depends on probability that borrower repays early or defaults.

Seems like household does not receive 'amount' of mortgage, but rather the 'sale or default adjusted' amount of mortgage...