Macroprudential Policy Interactions in a Sectoral DSGE Model with Interest Rate Stickiness

Marc Hinterschweiger, Kunal Khairnar, Tolga Ozden, Tom Stratton

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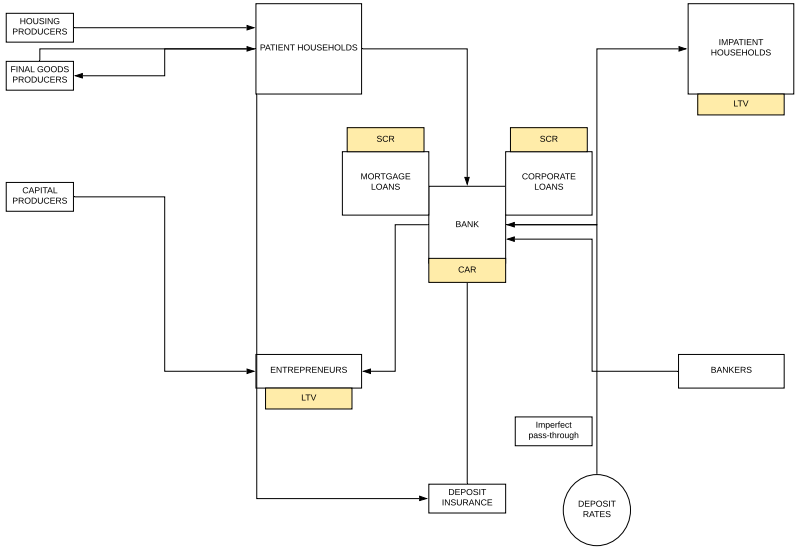
Overview

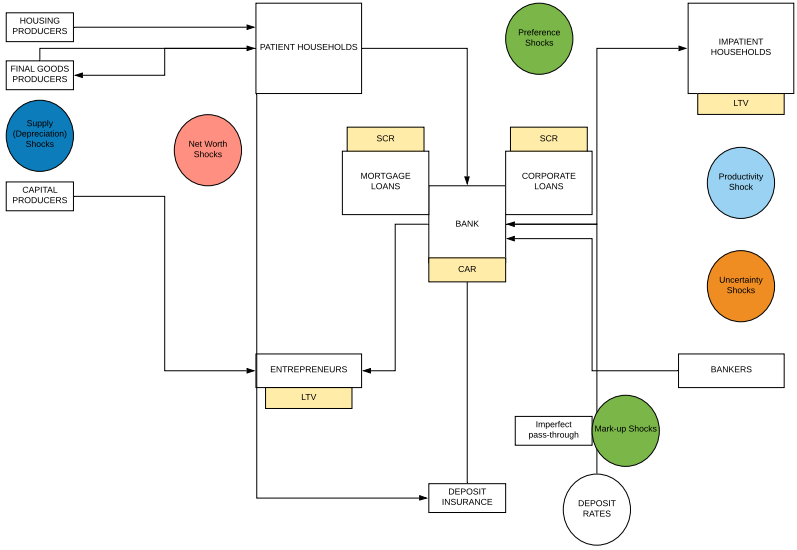
- Model summary
- Estimation highlights
- Macroprudential Policy (CAR, SCR, LTV & CCyB)
- Interest rate stickiness & Macroprudential policy
- User Interface

Model Overview-I

- Key distortions: (i) Limited liability, (ii) Bankruptcy costs, (iii) Imperfect interest rate pass-through.



Model Overview-II

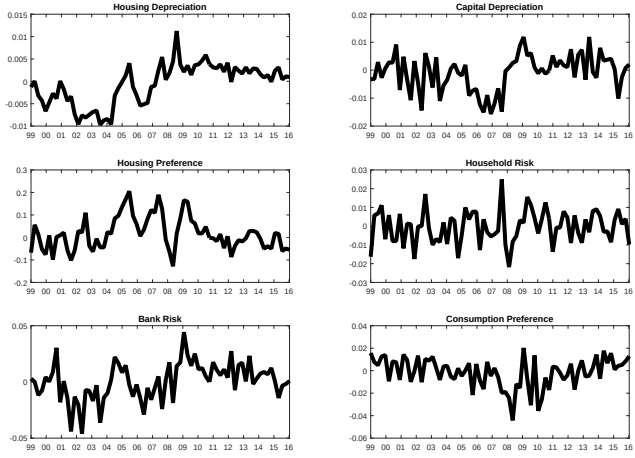


Estimation

- Quarterly data for the U.K. economy over 1998Q1-2016Q4.
- 10 observables in:
  - Interest rates (Official bank rate, mortgage & corporate rates)
  - Real growth rates (output, investment, consumption and wages)
  - Credit growth rates (mortgage & corporate sectors)
  - House price growth

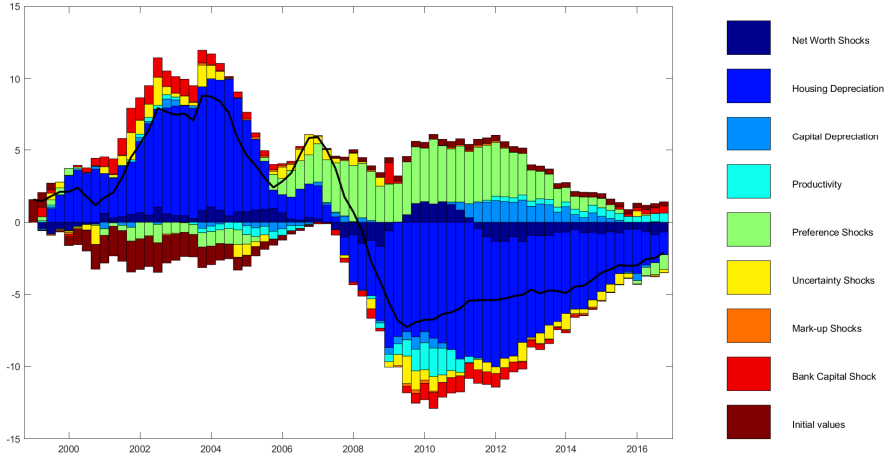
Estimated shocks over 1998Q1-2016Q4.

- What does it take in the model to generate the observed data?
  - Sequence of shocks over the estimation sample.

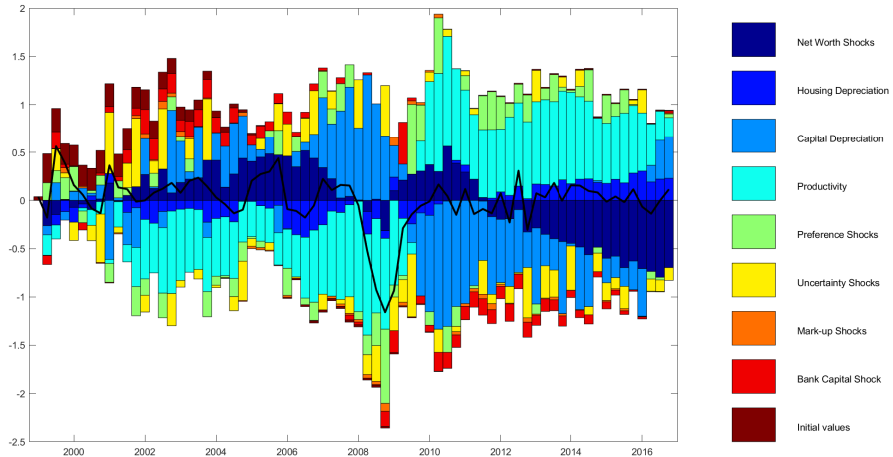


Historical Variance Decomposition: Household Lending Growth

- Each variable over the sample will be given as a combination of different shocks.

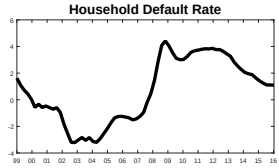


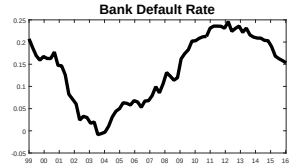
Historical Variance Decompositions: Output Growth

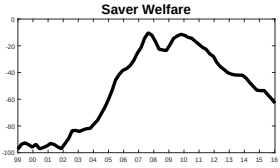


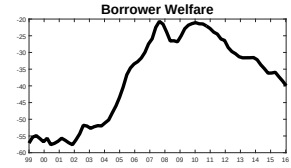
Some key unobservables estimated by the model

- Household defaults are dominant during the crisis period.
- Welfare of both household types have an upward trend before the crisis, and downward afterwards.









Macroprudential Policy

- Available tools in the model:
  - Minimum and sectoral capital requirements (Benchmark: 11 % CAR, no SCR)
  - LTV limit on businesses and households (Benchmark: 86 %)
  - CCyB (Benchmark: 0)

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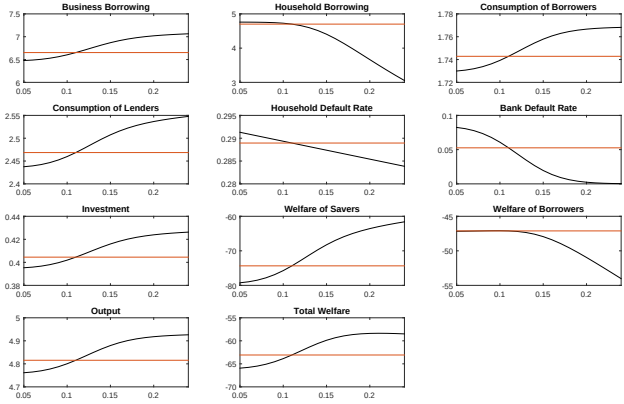
- **Welfare analysis:** what is the impact of macroprudential tools on household welfare?

- **Counterfactuals:** what would have happened if different macroprudential tools had been in place from 1999 onwards?

Example: Sectoral Capital Requirements on Mortgage Lending and Key Variables in Steady-state

- **Steady state:** long-run equilibrium of the model, in the absence of any shocks.



Optimal Policies

- Ad-hoc mean-variance objective: $E[W_t] - \omega\sqrt{Var[W_t]}$
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Table: Optimal macroprudential parameters, one at a time. Results with $\omega = 0.1$. Benchmark values are: 11 % for CAR, 86 % for LTV limit, no SCR.

Parameter	Optimal Value	Welfare Improvement
LTV Limit	86.6 %	0.001 %
SCR-Mortgage	17.6 % (11 % CAR, 6.6 % add-on)	4.26 %
SCR-Corporate	16.7 % (11 % CAR, 5.7 % add-on)	3.22 %
CAR	14.5 %	3.82 %

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Table: Optimal joint SCRs and LTV

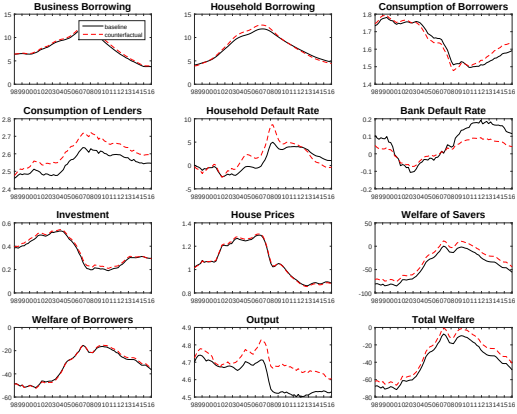
Parameter	
LTV	94.06 %
SCR-Mortgage	15.88 %
SCR-Corporate %	12.5 %
Welfare Improvement	4.8 %

- **Larger improvement with lower SCRs when macroprudential tools are coordinated.**
- **LTV limit can be relaxed if SCRs are sufficiently high.**

Counterfactual Exercise

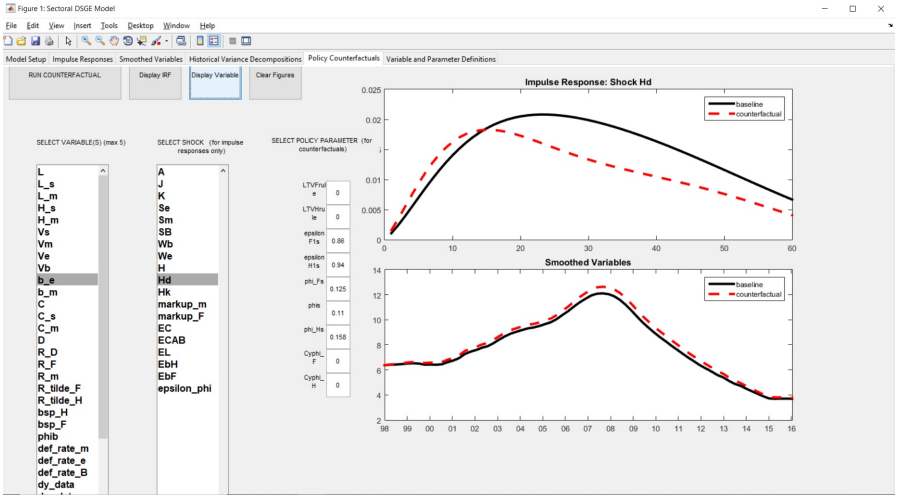
- What would be the implied path of economic variables if macroprudential tools had been in place from 1999 onwards?

Figure: Counterfactual with optimized values: SCR-Mortgage 15.88 %, SCR-Corporate 12.5 (CAR 12.5 %), %, LTV 94 %.



Interface

- Most policy experiments are available in our user interface.



Other Key Results

- Phasing-in the policies has a smaller impact.
- CCyB typically has a smaller impact than CAR & SCRs.
- Significant interest-rate stickiness in U.K. lending rates:
  - 5-6 months on corporate rates, 8-11 months on mortgage rates.
- Interest rate stickiness plays an important role in the transmission of macroprudential tools:
  - Stickier rates $\Rightarrow$ weaker transmission of macroprudential tools.

Conclusions & Future Work

- Conclusions:
  - Coordination of macroprudential tools may have a welfare improving effect
  - macroprudential tools would have improved some macroeconomic indicators but not have prevented the crisis altogether
  - Interest rate stickiness may weaken the transmission of macroprudential tools that work through interest rates
- Future work:
  - Interaction between LTI & LTV limits
  - Introduction of monetary policy
  - Household heterogeneity
    - The impact of heterogeneous expectations on the effectiveness of macroprudential tools

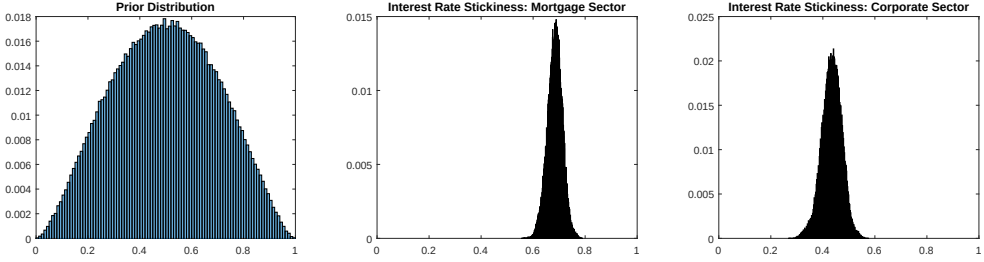
Appendix-Estimation

- The model is (partially) estimated using Bayesian methods.

$$\begin{cases} Model: X_t = f(E_t X_{t+1}, X_{t-1}, \epsilon_t) \\ Measurement\ equations: y_t = F X_t \end{cases}$$

- Estimated using Bayesian methods.

Figure: Estimation example: Interest rate pass-through



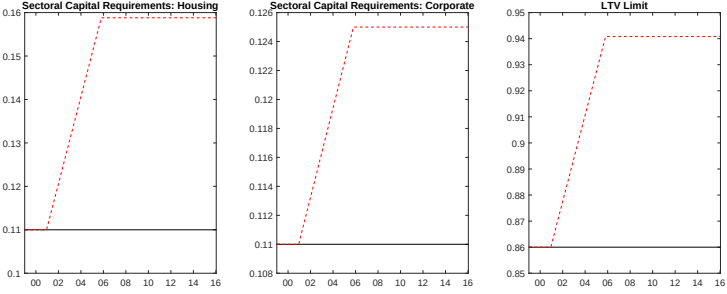
- Average Bank Rate pass-through is $[4.73, 5.93]$ months on corporate rates and $[8.21, 11.1]$ months on mortgage rates.

Appendix-Counterfactual I: Changes in the Level and Volatility

Variable	Change in Level	Change in Volatility
Corporate Credit	0.039	0.041
Mortgage Credit	0.024	0.147
Output	0.019	-0.354
Household Welfare	0.175	0.0437

Appendix-Counterfactual II: Phasing-in

Figure: Same counterfactual phased-in over a 5-year period over 2001-2006 in equal increments.



Appendix-Changes in the Level and Volatility

Table: Policies introduced at once at the beginning of the sample.

Variable	% Change in Level	% Change in Volatility
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Table: Appendix-Policies phased-in over 2001-2006.

Variable	% Change in Level	% Change in Volatility
Corporate Credit	0.024	-0.001
Mortgage Credit	0.006	-0.007
Output	0.014	-0.356
Household Welfare	0.12	0.096

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Household Welfare	0.12	0.096

Table: Appendix-Policies phased-in over 2001-2006, without interest rate sluggishness.

Variable	% Change in Level	% Change in Volatility
Corporate Credit	0.041	0.02
Mortgage Credit	0.029	0.08
Output	0.02	-0.28
Household Welfare	0.12	0.098

Appendix-Introducing CCyB

- CCyB does not improve the outcome nearly as much as the SCRs.

Table: Improvements over baseline when only SCRs and LTV are in place.

Variable	% Change in Level	% Change in Volatility
Optimal SCR+LTV		
Corporate Credit	0.039	0.041
Mortgage Credit	0.024	0.147
Output	0.019	-0.354
Household Welfare	0.175	0.0437

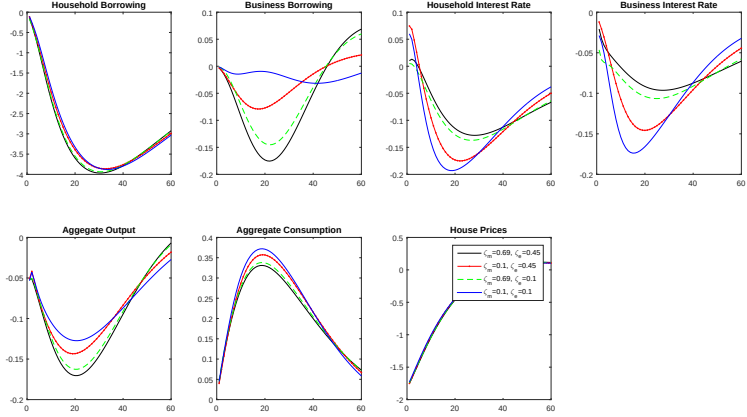
Table: Appendix-Improvements over baseline when only CCyB is in place.

Variable	% Change in Level	% Change in Volatility
Baseline SCR andLTV		
Corporate Credit	0.007	0.042
Mortgage Credit	0.003	0.029
Output	0.0019	0.37
Household Welfare	0.003	-0.002

Appendix-The effect of Interest rate Stickiness on Shock Transmission-I

- A shock originating in the household sector:
  transmission to corporate side and the real economy will depend on the degree of stickiness

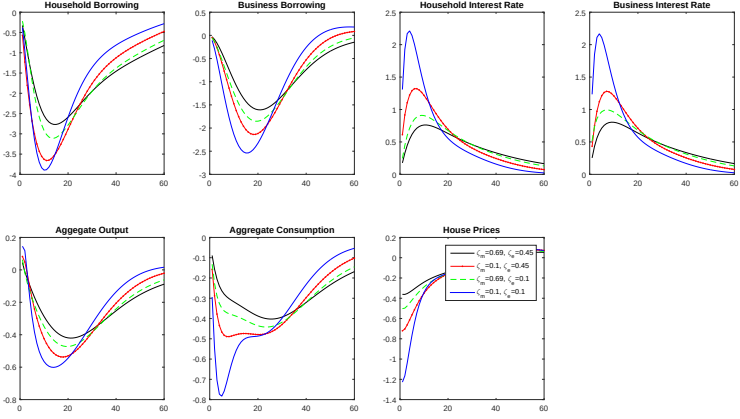
Figure: Negative housing preference shock



Appendix-The effect of Interest rate Stickiness on Shock Transmission-II

- A shock originating in the banking sector:
  transmission to both corporate and household sectors will depend on the degree of stickiness

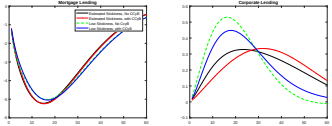
Figure: Negative bank capital shock



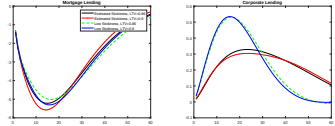
Appendix-Interest Rate Pass-through & Prudential Policy Interactions

- The impact of macroprudential tools will be weaker in cases where interest rate stickiness is high.

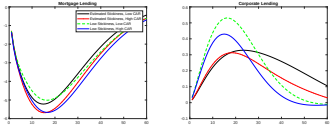
Figure: Positive housing depreciation shock.



(a) Impact of CCyB with and without interest-rate stickiness



(b)



(c) Impact of CAR with and without interest-rate stickiness