

Update on the Sectoral DSGE Model

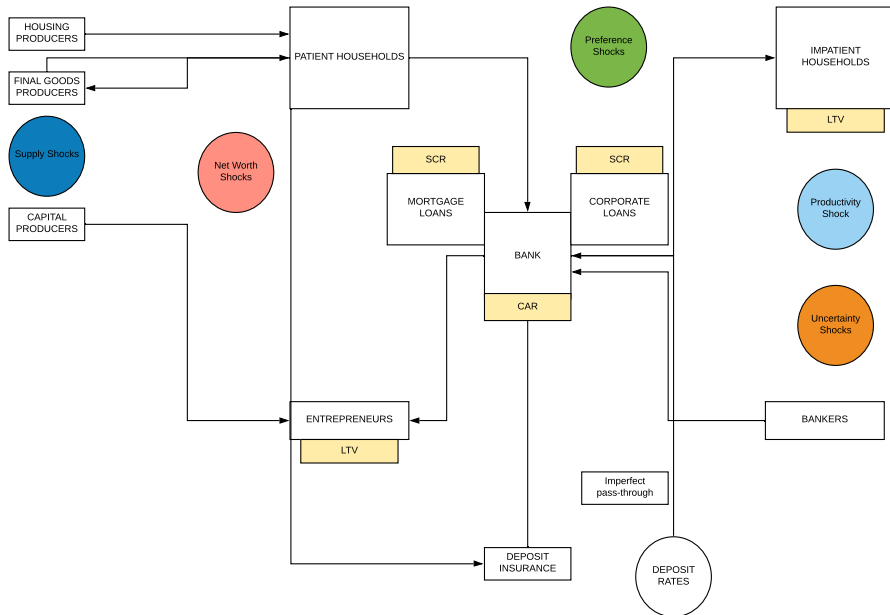
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October 30, 2019

Overview

- ▶ Model overview
- ▶ Estimation highlights
- ▶ Policy analysis & Counterfactuals
- ▶ Interest rate pass-through & Prudential policy

Model Overview



Estimation-I

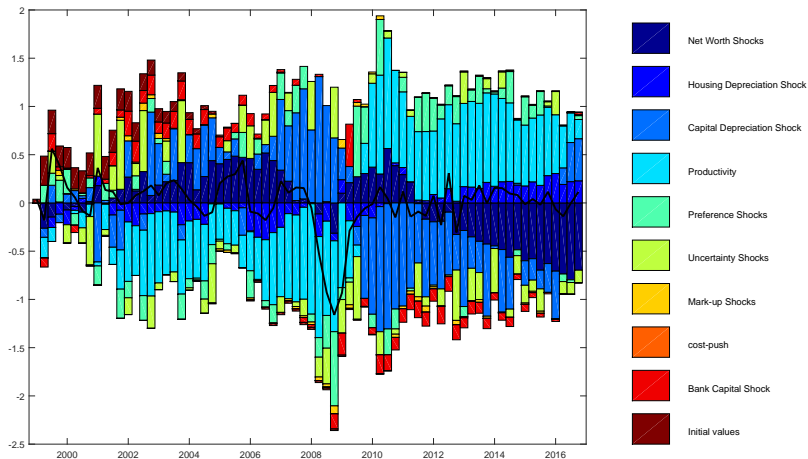
- ▶ Quarterly data for the U.K. economy over 1998Q1-2016Q4.
- ▶ 10 observables in:
 - ▶ Interest rates (Official bank rate, mortgage & corporate rates)
 - ▶ Growth rates (Real output, investment, consumption and wages)
 - ▶ Credit growth rates (Mortgage & corporate)
 - ▶ House price growth

Estimation-II

- ▶ Model: $X_t = f(E_t X_{t+1}, X_{t-1}, \epsilon_t)$
- ▶ Linear approximation around steady-state: $X_t = TX_{t-1} + R\epsilon_t$
- ▶ Problem: steady-state is not available in closed-form: has to be numerically approximated for each parameter draw.
- ▶ Solution: the vast majority of parameters affecting the steady-state are calibrated / fixed using conventional values.
- ▶ Prudential regulation parameters fixed at their historical averages.
- ▶ The remaining parameters estimated using a Bayesian likelihood approach.

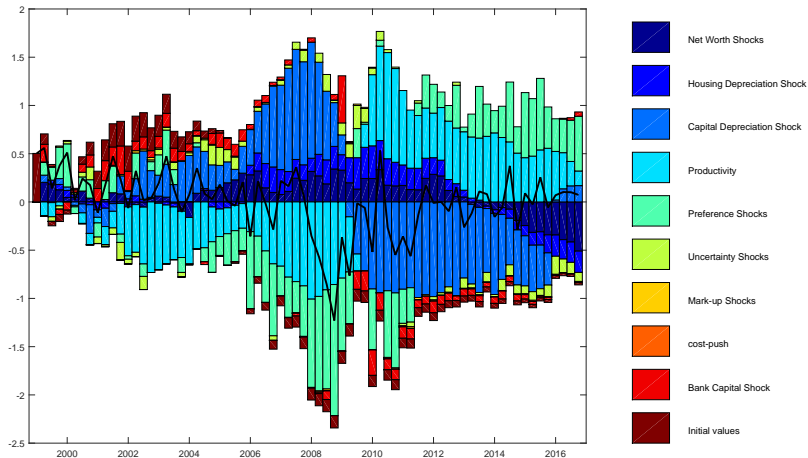
Historical Variance Decompositions: Output Growth

- Each variable over the sample is a combination of shocks



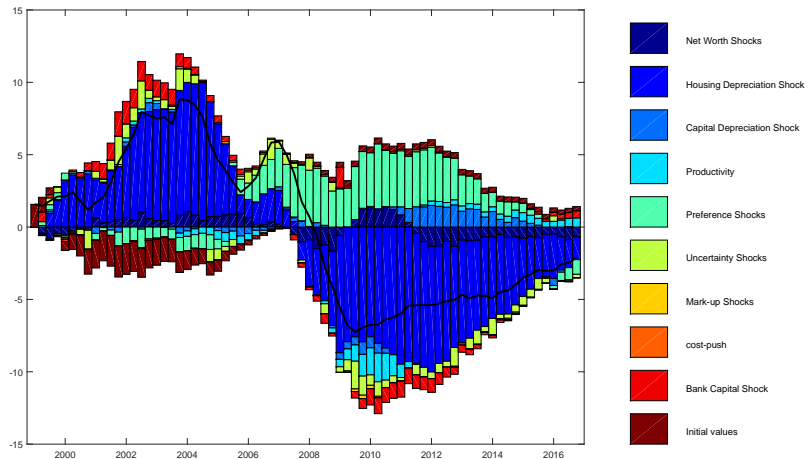
Historical Variance Decompositions: Consumption Growth

- Each variable over the sample is a combination of shocks



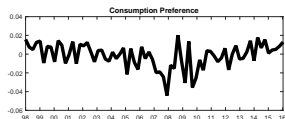
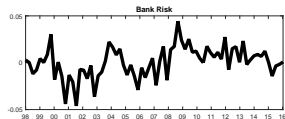
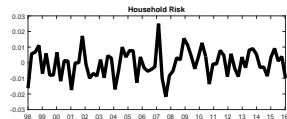
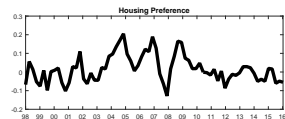
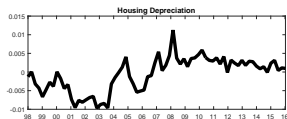
Historical Variance Decomposition: Household Lending Growth

- Each variable over the sample is a combination of shocks

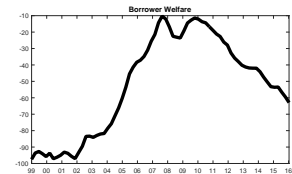
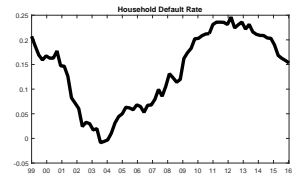
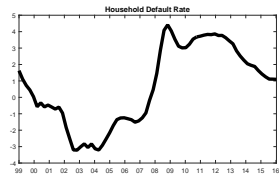


Estimated Shocks

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



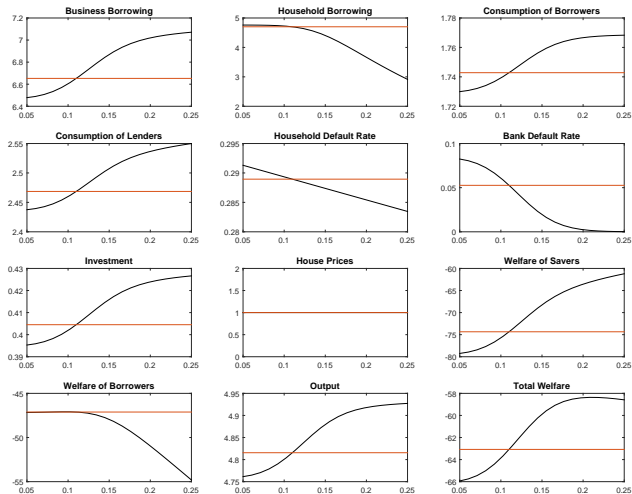
Some Key Unobservables



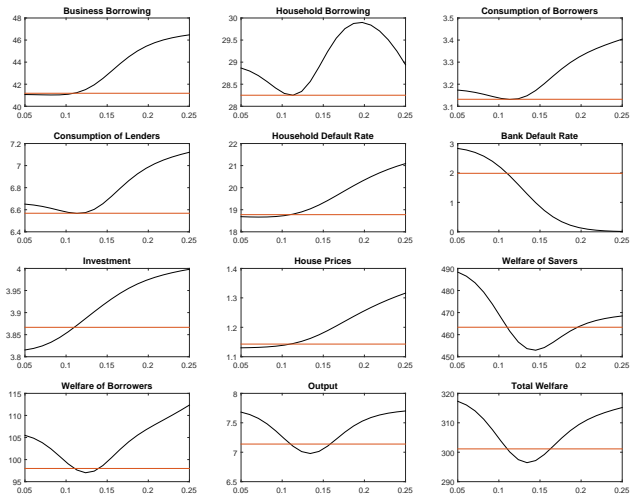
Macroprudential Policy

- ▶ Available tools in the model:
 - ▶ Minimum and sectoral capital requirements (Benchmark: 11 %)
 - ▶ LTV limit on businesses and households (Benchmark: 86 %)
 - ▶ CCyB (Benchmark: 0)
- ▶ Steady-state welfare analysis
- ▶ Shock propagation and counterfactuals
- ▶ Prudential policy & Imperfect interest-rate pass through

Minimum Capital Requirements and Steady-state



Minimum Capital Requirements and Volatility



Optimal Policies

- Ad-hoc objective function: $E[W_t] - \omega \sqrt{\text{Var}[W_t]}$

Table: Maximizing over prudential policy parameters, one at a time.

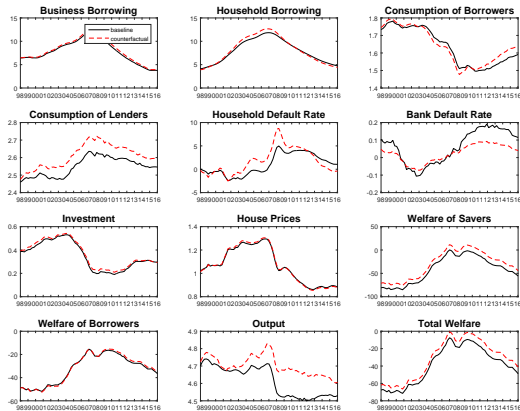
	ω	0	0.1
Parameter			
LTV		89.4 % (0.014 %)	86.6 % (0.001 %)
SCR-Mortgage		20.7 % (7.47 %)	17.6 % (4.26 %)
SCR-Corporate		15.5 % (3.33 %)	16.7 % (3.22 %)
CAR		15.5 % (5.11 %)	14.5 % (3.82 %)
CCyB		0 % (0 %)	Max. attainable

Table: Optimal joint SCRs and LTV

	ω	0	0.1
Parameter			
LTV		91.25 %	94.06 %
SCR-Mortgage		21.25 %	15.88 %
SCR-Corporate		5(Min. attainable) %	12.50 %
Welfare Improvement		8.01 %	4.8 %

Counterfactual I

Figure: Counterfactual I: using optimized values with 0.1 weight on volatility. $\phi_H = 15.8\%$, $\phi_F = 12.5\%$, $\epsilon_H = 94\%$.

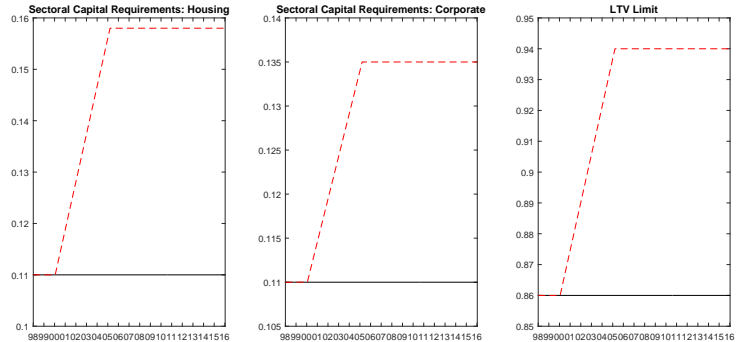


Changes in the Level and Volatility

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

Counterfactual II: Phasing-in

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



Changes in the Level and Volatility

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

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

Table: 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

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

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

Introducing CCyB

Table: Does CCyB improve things when optimal SCRs are in place?

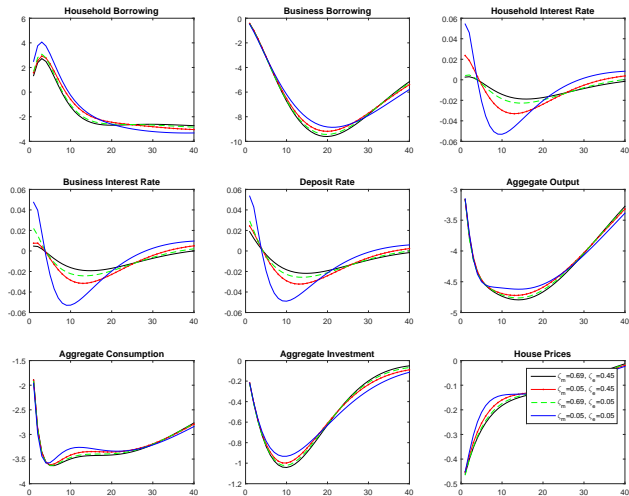
Variable	% Change in Level	% Change in Volatility
Optimal SCR+LTV		
Corporate Credit	0.039	0.041
Mortgage Credit	0.024	0.147
Output	0.019	-0.354
Household Welfare	0.175	0.0437

Table: Does CcyB improve things when SCRs are at their baseline value?

Variable	% Change in Level	% Change in Volatility
Baseline SCR+LTV		
Corporate Credit	0.007	0.042
Mortgage Credit	0.003	0.029
Output	0.0019	0.37
Household Welfare	0.003	-0.002
No Interest Stickiness		
Corporate Credit	0.016	0.072
Mortgage Credit	0.008	0.108
Output	0.005	0.675
Household Welfare	0.013	-0.009

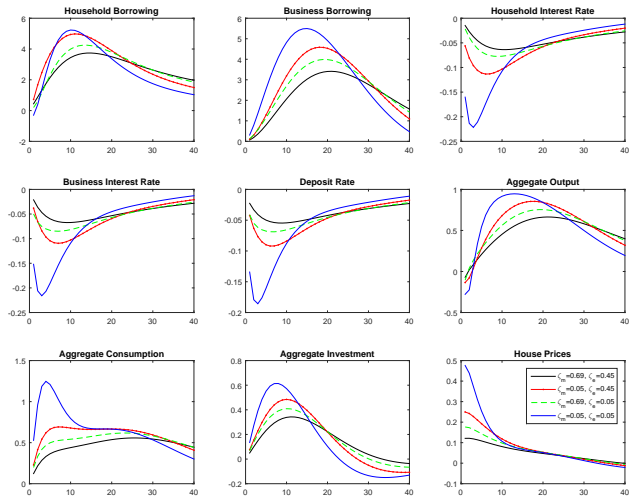
Interest-rate Stickiness on Shock Propagation-I

Figure: TFP Shock



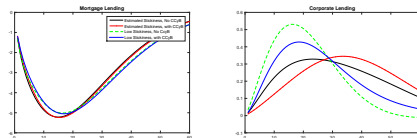
Interest-rate Stickiness on Shock Propagation-II

Figure: Bank Capital Shock

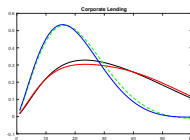
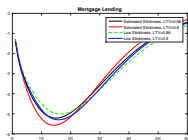


Interest Rate Pass-through & Prudential Policy Interactions-I

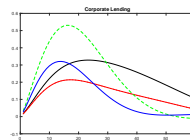
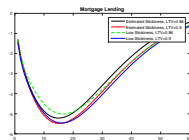
Figure: Positive housing supply shock. Cumulative difference calculated as the



(a) Cumulative differences: 0.24 % and 0.59 %.



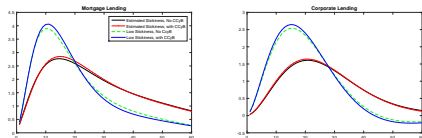
(b) Cumulative differences: -2.13 % and 0.17 %.



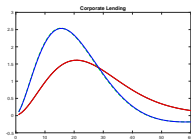
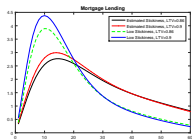
(c) Cumulative differences: 0.36 % and 0.92 %.

Interest Rate Pass-through & Prudential Policy Interactions-II

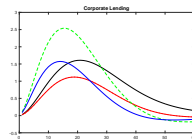
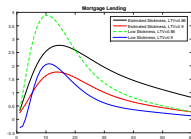
Figure: Positive bank capital shock.



(a) Cumulative differences: 2.9 % and 2.14 %.



(b) Cumulative differences: 3.74 % and 0.69 %.



(c) Cumulative differences: 4.83 % and 5.04 %.